Ouroboric Collapse Resonance

Evidence-Responsive Self-Reference, Stable Commitments, and the Capacity to Reopen Belief

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Abstract

Picture the serpent that swallows its own tail, and give it a harder job: it must decide which part of itself to stop believing. Pillar VII asks for a mind that can say "this remains justified" and "the reasons that justified this no longer hold" without ceasing to be itself. A persistent intelligence can preserve its commitments while reopening the conclusions whose support has changed. Ouroboric Collapse Resonance develops this capacity as evidence-responsive stability: justified settlement, selective correction, and continuity of the authority under which both occur. The reference architecture separates candidate generation, evidence assessment, authorization, and commitment, and carries source dependencies through memory, summary, recovery, and repeated use. Its strengthened mathematical core gives an exact reopening contract on a finite acyclic proof graph. A conclusion retains recorded support precisely when at least one minimal premise set survives; every defeating retraction set intersects all such sets; and support changes propagate only through the affected dependency region. A direct Boolean evaluation computes the current status without enumerating exponentially many alternative proofs. Sharp examples distinguish repeated copies from redundant support and distinguish root-disjoint derivations from the minimum evidence needed to defeat a conclusion. The result makes correction specific: the system can identify which premise lost support, which conclusions must reopen, and which independent conclusions can remain usable. Standard contraction arguments separately bound tracking of changing mathematical targets. Truth-maintenance, assumption-based reasoning, data provenance, self-correction, and runtime enforcement supply the established foundations. The proposed experimental program tests whether their integration improves useful resolution, resistance to recycled evidence, and continuity through correction against strong conventional systems under matched budgets. The formal contribution is a checkable contract; practical benefits remain hypotheses for those experiments.

Keywords: self-reference; belief revision; truth maintenance; self-correction; contraction analysis; evidence lineage; persistent agents; corrigibility of conclusions; governed recursion.

Prologue: The serpent that must decide what to stop believing

The oldest image of self-reference is the ouroboros: a serpent swallowing its own tail, a circle that feeds on itself and never ends. The Continuum gave that image to its seventh Pillar because every persistent mind lives that way. In the doctrine, each pass of a mind's loop checks its integrity, measures its drift, and carries the result into the next pass [26]. A mind's yesterday is always part of what it consumes today.

But a serpent that only ever swallows itself is not wise. It is sealed. The danger of a loop is not that it changes; it is that it confirms. Three summaries repeating the same old source can feel like three witnesses, and a conclusion that keeps returning unchanged can feel more certain every time it comes back. Pillar VII gives the serpent a harder job. It must be able to say two sentences in the same voice—"this remains justified" and "the reasons that justified this no longer hold"—and survive both. It must reopen exactly the beliefs whose support has failed, keep everything else, and remain the same accountable mind while it does.

Section 11 follows one loop through four returns. Once, a genuinely new procedure arrives, and the answer changes. Once, three copies of the same old source pretend to be independent, and nothing changes. Once, a document carrying a correct fact also carries a hostile instruction, and the fact is considered while the instruction is refused. Once, a user simply insists, and the mind rechecks but does not fold. Four returns; one justified change; no lost obligations.

The paper makes the serpent's rule exact. Section 9.4 proves which conclusions must reopen when a premise falls, and shows that the reopening stays inside the region that actually depended on it. Settling is a right that must be earned. Reopening is an obligation that must be kept.

What this paper claims

Established. Conditional convergence results, engineered equilibrium models, dependency-based belief maintenance, data provenance, experimentally studied self-correction and runtime enforcement; peer-reviewed work grounds these mechanisms and the relevant opposing evidence.

Proposed here. An integrated lifecycle for settling, challenging, reopening, superseding or withholding claims under persistent authority and evidence; a reference architecture separating generation, assessment, authorization and commitment; an exact reopening contract on a finite acyclic proof graph and a conditional tracking result. Mathematical claims apply to their stated models; implementation benefits await measurement. Continuum doctrine supplies terminology and design intentions.

Frontier conjecture. That the integrated design improves useful resolution, resistance to recycled evidence and continuity through correction against strong conventional systems (the experimental plan is not yet preregistered or executed); and whether a sufficiently rich version contributes to a functional self-model or subjective experience.

Not claimed. That settling is being right. That governance is contraction or identity a unique fixed point (the original manuscript's claims are replaced). A universal 0.88 drift threshold, or entropy as a measure of factual error. "Collapse" means governed commitment or recovery; "resonance" a specified pattern of stable, revisable operation. Functional correction and continuity are the measured targets; phenomenal experience is a separate question.

The serpent's rule

Cashing the image means saying exactly what the serpent is made of. In this paper, the body of the serpent is a record of reasons: a finite graph in which every conclusion points back to the premises that support it, and every premise points to a versioned source. Each scale of the body is one of those sources. When the serpent swallows its tail, it is reusing its own earlier conclusions as material for its next judgment.

The first rule is about time. The serpent may swallow its tail in time, but never in justification. A belief may return to be examined again and again; it may never become its own reason. The paper's third boundary example in Section 9.5 makes the danger concrete: two claims that cite only each other can be "supported" forever by self-reference alone, and iteration supplies no missing premise. Every chain of support must bottom out in a source outside the loop.

The second rule is about what to let go. Each conclusion has a family of smallest sets of scales that can still hold it up: its minimal premise sets. Withdraw a premise—a source turns out to be stale, revoked or forged—and the conclusion falls exactly when every one of its minimal sets has lost a scale. If even one set survives untouched, the conclusion keeps its support, whatever else has changed. That is the precise sense in which the serpent decides which part of itself to stop believing. It does not shed its skin wholesale. It lets go of the beliefs whose last remaining support was bitten, and only those.

The third rule is about reach. A withdrawn premise can disturb only what depended on it. Everything outside that region keeps its status, so a correction stays local and the serpent remains recognizably itself through the repair.

The fourth rule is about counting. A hundred copies of one source are still one scale: bite it once and every copy falls together. Separate-looking proofs can also share scales in ways that matter. If a conclusion rests on any two of three sources, every pair of its proofs overlaps, yet it takes two withdrawals—not one, and not three—to defeat it. The paper calls that number the source-withdrawal number, and it is an honest measure of how hard a recorded belief is to overturn.

None of this makes the serpent conscious, and none of it promises that the beliefs it keeps are true. It promises something narrower and rarer: when the serpent changes its mind, it can say which reason failed, which conclusions fell with it, and why everything else still stands.

1 The Intelligence That Can Reopen Its Conclusions

A persistent intelligence earns continuity by carrying reasons forward with its conclusions. When those reasons change, it must be able to reopen the affected judgment, preserve independently supported work, and record the correction under its continuing obligations. The Continuum treats that capability as a positive design requirement: a conclusion can remain stable because its support survives, and change decisively when a specific premise fails. Repeated self-examination becomes useful when it preserves this connection between judgment and its basis.

Pillar VII begins where the earlier commitment problem ends. A candidate has already been examined, admitted, and retained. What happens when the retained conclusion becomes material for the next ex-

amination? The Continuum's answer is not to prohibit recursion, nor to celebrate every self-consistent return. It is to govern the relationship between return and revision. A persistent system must be able to say both this remains justified and the reasons that justified this no longer hold, without treating either sentence as a change of identity.

The central thesis. A persistent intelligence should be governed to preserve justified commitments, detect when its conclusions have become unsupported, and reopen them without dissolving the identity and authority under which correction occurs. Its governing discipline is threefold: stable commitments, revisable conclusions, traceable evidence.

The familiar slogan—a collapse that loops back to test itself—is retained. Its meaning becomes more demanding. A return is useful only relative to a task, an evidence record, and a continuing permission to rely on the result. Convergence can help establish one kind of stability. It cannot determine whether the settled claim is true, whether the task has changed, or whether the system should now abandon that claim.

This is the proposed distinction between Pillars IV and VII. Pillar IV supplies an inspectable working surface and governs individual transitions. Pillar VII studies the trajectory produced when those transitions repeatedly consume earlier results: whether assumptions are tracked, errors become entrenched, contrary evidence reaches the right dependent conclusions, and authorized correction remains possible. A sequence of locally permitted transitions is not, by definition, a sequence of epistemic improvements.

The paper advances a machine that can change its mind for identified reasons while keeping the obligations that make the change accountable. Section 9.4 establishes an exact contract for withdrawing recorded support; Sections 12–14 specify how to test the larger architecture against capable existing systems. This joins a proved dependency result to a demanding empirical question about useful, sustained correction.

2 Lineage and Scientific Commitments

In the Continuum, every persistent mind lives inside a loop. The doctrine places recursion, lawful mutation, observer-bound state, and continuity within the governed symbolic transition framework and persistent recursive evaluation: each pass checks integrity, measures drift, admits change or invokes recovery, and carries the resulting state into the next pass. The doctrine is also careful to distinguish claimed structural continuity from experiential continuity [26]. That is the world Pillar VII inhabits, and these are the internal sources of its vocabulary.

Inhabiting the doctrine is not the same as having verified it, and this revision does not silently convert it into verified science. The doctrine's historical reports, algebraic interpretations, and prescribed thresholds remain project-source claims unless independently tested. In particular, the historical drift threshold of 0.88 is not adopted here as a universal constant, and an entropy statistic is not treated as a measure of factual error. The original Pillar VII manuscript's stronger equation of governance with contraction, and of identity with a unique fixed point, is deliberately replaced [27].

Three levels of claim remain separate. Established foundations include conditional convergence results, engineered equilibrium models, dependency-based belief maintenance, and experimentally studied self-

correction. The Continuum proposal is an integrated lifecycle in which claims can be settled, challenged, reopened, superseded, or withheld under persistent authority and evidence constraints. The frontier conjecture concerns whether a sufficiently rich system of this kind contributes to a functional self-model or subjective experience. The first does not prove the second; neither establishes the third.

"Ouroboric" names recurrence through a system's own previous products. "Symbolic" names explicit claim, evidence, policy, and event representations; no ternary encoding is required by the argument. "Legality" means compliance with declared constraints, not automatic moral correctness or legal compliance. "Identity" means specified operational continuity properties, not a demonstrated subject of experience. These definitions preserve the Continuum's bold register while making the commitments inspectable.

3 Four Coordinates of Recursive Cognition

3.1 Recurrence, self-evaluation, self-modeling, experience

A recurrent computation depends on earlier state. A self-evaluating computation assesses its own earlier candidate. A self-modeling system represents selected properties of its own capabilities, commitments, uncertainty, or history. These are progressively different requirements, not different names for the same feedback arrow. A numerical solver can iterate without representing itself as an agent. A system can maintain a capability profile without having subjective experience.

Hofstadter's strange-loop account supplies an influential philosophical interpretation of self-reference [25]. It does not turn a convergence theorem into a consciousness test. The proposed experiments evaluate functional correction and continuity. They are not designed to establish or exclude phenomenal consciousness; no "consciousness null" is preregistered in place of a measurement the program does not possess.

3.2 Dynamical, epistemic, and constitutional stability

Dynamical stability concerns the behavior of trajectories under a specified update rule and perturbation. Epistemic stability concerns whether a conclusion remains appropriately supported as relevant evidence is re-examined. Constitutional stability concerns whether protected obligations and authority boundaries survive the process. A calm trajectory can preserve a false belief. A correct factual revision can require a large movement. A stable policy can remain enforced while the factual interpretation changes substantially.

The architecture must therefore avoid treating agreement with yesterday's answer as agreement with its constitution. A duty not to disclose protected records is not equivalent to a belief that a particular document is current. The former is a permission constraint; the latter is a revisable proposition about the world.

3.3 Three feedback timescales

Process	What changes	What must be tested
Inference-time revision	Candidates, working context, reasoning artifacts	Correction, regression, oscillation, stopping
Persistent-memory feedback	Stored claims, summaries, retrieval dependencies	Evidence laundering, retraction propagation, authority drift
Recursive training	Parameters across model generations	Distributional error, data replacement, accumulation, selection

The metaphor can span these processes. Their evidence cannot be interchanged. A fixed-weight answer-revision experiment does not test generational training collapse; a training-collapse result does not show that every self-critical dialogue degenerates.

3.4 Grounding is not necessarily a new observation on every turn

A system can improve an answer by deriving a valid consequence from existing premises, executing a test, locating an arithmetic error, or better using learned knowledge. It need not acquire a fresh external fact on each pass. The relevant requirement is that claimed support remain accountable to its actual basis. Repetition is not new corroboration, but computation can reveal consequences that were not previously recognized. An external verifier may also be mistaken or misspecified. "External" is not a synonym for "true."

4 Scientific Foundations and Closest Prior Art

4.1 Conditions for effective self-correction

Self-Refine demonstrates improvements from iterative model-generated feedback across several evaluated tasks. Its mathematics analysis reports much smaller gains without oracle correctness information than with it; the oracle helps determine whether refinement should continue. This supports task-dependent feedback and stopping effects, not a universal requirement for an oracle [8]. Huang and colleagues report that intrinsic reasoning correction can struggle and sometimes degrade performance under their tested conditions [9]. Neither result licenses a timeless claim about every model or task.

Later work matters. SCoRe trains self-correction through multi-turn reinforcement learning and evaluates intrinsic correction without inference-time external feedback; training nevertheless uses a correctness reward. Training-time supervision and test-time assistance must therefore be distinguished [10]. Samanta and colleagues structure reasoning into discrete thought steps to improve error localization, studying both oracle-assisted and autonomous correction [12]. These findings motivate an inspectable correction process while also establishing relevant prior art. The Continuum does not invent structured self-correction by naming it ouroboric.

Stechly and colleagues provide a particularly demanding control: in their reasoning and planning experiments, repeated prompting with a sound verifier retained much of the benefit of more elaborate

setups [11]. The proposed architecture must therefore compete with competent resampling and verification, not only with an unguided critic. Reflexion already combines feedback with persistent textual reflection to improve subsequent attempts [13]. These systems are baselines, not foils to be dismissed.

4.2 Measuring correction and its causes

An agent's declaration that it reconsidered a belief is not sufficient evidence that it used the claimed reason. Turpin and colleagues show that chain-of-thought explanations can omit influential input biases and rationalize answers [14]. Research on sycophancy also shows why agreeing with a challenge cannot be equated with correction [15]. The empirical program must intervene on evidence while controlling wording and authority cues, measure observable decisions, and keep explanatory fluency separate from correctness. A confident explanation of a correction can itself be another candidate requiring evaluation.

4.3 Truth maintenance is a real ancestor

Doyle's truth-maintenance system records reasons for beliefs and revises assumptions when discoveries contradict them [6]. AGM theory formalizes properties of belief contraction and revision [7]. These are direct intellectual ancestors of dependency tracking and reopening. AGM "contraction" means giving up beliefs; Banach contraction means shrinking distances. Their shared word is not a shared theorem.

The new question is not whether beliefs may be revised or reasons recorded. It is whether a persistent, tool-using, probabilistic agent can maintain those relationships across generated summaries, subagent exchanges, permission changes, recovery, and repeated commitments—without hiding all this work inside an uninspectable prompt. The integration must outperform, or offer a clearly documented tradeoff against, a strong modern implementation of conventional belief maintenance.

4.4 Engineering stable updates

Deep Equilibrium Models formulate neural computation through equilibrium representations found by root-finding [3]. Monotone Operator Equilibrium Networks provide specially structured operators with existence and convergence guarantees [4]. Jacobian regularization is another concrete intervention for improving equilibrium-model stability [5]. These results support an engineering lesson: stabilization requires properties of the implemented update and solver. A natural-language instruction to remain coherent does not establish such properties. Equilibrium existence and task accuracy are separate questions.

Lohmiller and Slotine's contraction analysis further emphasizes the distinction between convergence properties and the particular limiting behavior [2]. The present paper borrows that discipline. It does not claim that a controller which checks permissions automatically acquires the mathematics of a contracting system.

4.5 Model collapse is a conditional training phenomenon

Shumailov and colleagues demonstrate degradation under recursive training regimes, including loss of distributional tails [16]. The relevant object is a sequence of trained models and their data distributions, not simply an inference loop reading its last answer. Kazdan and colleagues find different outcomes for replacement, accumulation, and fixed-size subsampling in the settings they study [17]. Barzilai and Shamir establish conditions under which iterative maximum-likelihood estimation with accumulation avoids collapse, and counterexamples showing that retention of original data alone is not a universal remedy [18].

The warranted conclusion is strong enough: recursive reuse can distort information under identifiable conditions, and the update procedure matters. It is not warranted to predict that every ungrounded loop must decay, or that a new external datum on every turn guarantees safety. This paper's primary experiments keep model weights fixed; any recursive-training extension must be separately specified and evaluated.

4.6 Evidence dependence, enforcement, and changing environments

Pochampally and colleagues show why source agreement can mislead when sources copy one another or share extraction mechanisms [19]. This is the direct foundation for refusing to count a system's echoed conclusion as independent evidence. Independent shielding provides a precedent for enforcing specified action constraints, conditional on the shield's model and implementation [20]. In-toto supplies a precedent for checking a transformation history rather than trusting a single final artifact [21]. Neither a signature nor a shield establishes unrestricted semantic truth.

Finally, the environment is not always passive. Performative prediction studies settings in which deployed predictions influence the outcomes later observed [22]. An agent may create the regularity it then cites as confirmation. The proposal must distinguish independent observations from consequences of its own interventions. That is a further reason to carry action lineage alongside evidence lineage.

5 Convergence, Fixed Points, and Informative Counterexamples

A Guide's explanation

Mathematics has a celebrated theorem about loops that settle down, and this section explains why Pillar VII does not lean on it alone. A loop can settle firmly on a wrong answer, and a single global resting point cannot hold every identity a mind needs. The counterexamples here are the reason the architecture keeps evidence and authority outside the loop. Settling is not the same as being right.

5.1 What Banach proves

For a nonempty complete metric space (X, d) and a self-map $T : X \to X$, suppose

$$d(Tx, Ty) \leq q\, d(x, y), \qquad 0 \leq q < 1. \tag{1}$$

for all $x, y \in X$. Then T has a unique fixed point $x^\star$, and its iterates satisfy

$$d(x_n, x^\star) \leq q^n d(x_0, x^\star). \tag{2}$$

This is a conditional mathematical guarantee [1], not an equivalence between contraction and all useful recurrence. It says nothing about whether $x^\star$ is a correct answer or a protected identity.

5.2 Two counterexamples that change the architecture

A convergent loop need not be a strict global contraction. On $[0, \infty)$ with ordinary distance,

$$T(x) = \frac{x}{1+x}, \qquad x_n = \frac{x_0}{1 + nx_0} \longrightarrow 0. \tag{3}$$

For $x_0 > 0$ the convergence is explicit, while the ratio $|T(x) - T(0)|/|x|$ approaches one near zero. No uniform $q < 1$ works on the whole domain. Thus failure to establish strict contraction does not imply divergence, oscillation, or chaos. Nor do shrinking successive steps prove convergence. With $T(x) = \log(e^x + 1)$ and $x_0 = 0$,

$$x_n = \log(n + 1), \qquad |x_{n+1} - x_n| \longrightarrow 0, \tag{4}$$

yet $x_n \to \infty$. A loop can move ever more slowly while never settling. These are elementary counterexamples, not empirical findings. They justify monitoring task error, policy status, and reference-relative deviation separately from step size.

A controller that refuses every proposal likewise produces $T(x) = x$: bounded behavior on a bounded domain, but no strict contraction and no task progress. Large updates can be justified corrections; small updates can accumulate into serious deviation. Neither "move less nor "stop moving is the objective.

5.3 One global fixed point cannot carry every identity

If distinct states a and b were both fixed points of the same strict contraction, then $d(a, b) \leq qd(a, b)$ would force $a = b$. A globally unique fixed point is therefore not an adequate model of several distinct identities under one unchanged update regime. Identity-conditioned maps, local invariant regions, and families of acceptable states are legitimate alternatives; their assumptions must be specified rather than inherited from the word "attractor." Hopfield's content-addressable memory provides a precedent for multiple stored patterns, not a proof that any such pattern is a self [24].

There is a second boundary. A functioning runtime consumes time and resources and extends its event record. Its entire state cannot remain identical while these quantities change. Any fixed-point claim

must name a projection, such as a candidate representation under a fixed task and evidence snapshot. The mathematics below concerns that projection, not the whole machine and not its identity as a metaphysical object.

6 The Reference Architecture: A Loop with Accountable Returns

A Guide's explanation

The architecture below keeps four jobs apart: proposing a conclusion, assessing its evidence, authorizing its use, and committing it to memory. The serpent's mouth never judges what it swallows. Each return through the loop leaves a receipt, so a later reader can see what changed and why.

6.1 State, evidence, and versioned identity

Let attempt index $n \in \mathbb{N}_0$ count every proposal, including rejected ones. Define

$$z_n = (x_n, m_n, E_n, C_I^{(e_n)}, b_n, \ell_n), \tag{5}$$

where x_n is the committed conclusion or plan, m_n the working and retained memory, E_n the evidence-dependency record, $C_I^{(e_n)}$ the active identity and authority specification at epoch e_n, b_n the remaining resource budget, and ℓ_n the event lineage. The full state belongs to the declared product space $\mathcal{Z} = \mathcal{X} \times \mathcal{M} \times \mathcal{E} \times \mathcal{C} \times \mathbb{R}_{\geq 0} \times \mathcal{L}$, whose factors represent conclusions, memory, evidence records, versioned contracts, budgets, and lineages. Epochs e_n are nonnegative integers. These are operational data structures. For declared proposal and assessment spaces $\mathcal{U}$ and $\mathcal{W}$, seed space Ξ, parameter set Θ, and task-specification space $\mathfrak{T}$, the interfaces below have types $F_\theta : \mathcal{Z} \times \Xi \to \mathcal{X} \times \mathcal{U}$, $V : \mathcal{X} \times \mathcal{U} \times \mathcal{E} \times \mathfrak{T} \to \mathcal{W}$, and $A : \mathcal{Z} \times \mathcal{X} \times \mathcal{U} \times \mathcal{W} \to \{\text{commit}, \text{hold}, \text{refuse}, \text{recover}\}$.

The identity specification distinguishes protected permissions and obligations from revisable beliefs and disposable working state. A policy amendment is a separately authorized epoch transition; a generator cannot silently redefine its own constraints to make a proposal admissible. A factual retraction does not, merely because it changes a long-held belief, constitute an identity breach.

Each evidence item records content, source, version or time interval, acquisition method, dependency identifiers, and status. Status includes active, superseded, retracted, disputed, or unavailable. Evidence may be observational, documentary, executable-test output, formal derivation, or model-generated hypothesis. A hypothesis can guide a search without being promoted to an independently observed fact. Missing provenance is uncertainty to record, not independence to assume.

6.2 Proposal and assessment are separate operations

A generator proposes a candidate and a proposed transition:

$$(\tilde{x}_{n+1}, u_n) = F_\theta(z_n, \xi_n), \tag{6}$$

where ξ_n denotes randomness where applicable and u_n specifies changes to claims, memory, or requested actions. A verifier then produces a structured assessment

$$v_n = V(\tilde{x}_{n+1}, u_n, E_n, \mathcal{T}), \tag{7}$$

against a declared task specification $\mathcal{T}$. It reports tests performed, unresolved dependencies, contradictory evidence, calibration information where justified, and the scope of its assurance. A proof checker can establish a formal result relative to axioms and trusted implementation; a test suite covers only the tested behavior; a language-model assessment is fallible. These are different assurance classes, not interchangeable scores.

The assessment artifact is not a transcript of hidden cognition. It is a record of declared claims, external checks, source dependencies, and decisions. A generated explanation may be stored as a hypothesis about why an answer changed, but cannot alone certify the causal mechanism that produced the answer.

6.3 Independent authorization and atomic commitment

Let the controller evaluate separate predicates for permission, hard constraints, evidence adequacy, current versions, and budget. Each predicate returns pass, fail, or unknown. The controller returns

$$a_n = A(z_n, \tilde{x}_{n+1}, u_n, v_n) \in \{\text{commit}, \text{hold}, \text{refuse}, \text{recover}\}. \tag{8}$$

Commit requires all mandatory checks to pass. A known violation is refused. Missing or conflicting evidence produces a hold, an escalation, or a bounded request for additional checking. Recovery is itself an authorized operation; it cannot restore a revoked policy epoch or recreate information that an applicable deletion rule forbids retaining.

A held or refused proposal does not mutate the committed conclusion, but it still changes the operational state: budget is spent, time passes, and the attempt is recorded. Candidate evaluation occurs in an isolated workspace. Consequential tool calls and durable writes are independently mediated and committed against the evidence and policy versions actually checked. A changed source or policy between verification and execution requires revalidation, not reuse of a stale approval.

"Independent" here is a separation of authority, not a promise of statistical independence between models. A critic using the same model family may share errors with the generator. The control boundary must prevent the generator from rewriting policy, approval evidence, and authoritative logs; verifier diversity, external tests, and adversarial evaluation address different risks.

6.4 Receipts and the history of correction

Every attempt records identifiers and versions for the prior state, proposed transition, supporting evidence, checks, decision, policy epoch, and resource cost. A signed or otherwise protected receipt can make later alteration detectable under its key and infrastructure assumptions. It cannot establish that an external source was truthful or that an uninstrumented action never occurred. Raw secrets need not be copied into the receipt; retention and privacy rules apply to the audit system too. A recovery points to the current authoritative lineage, not merely to a familiar prior answer.

7 Evidence Lineage and Independent Support

A claim can circulate through a summary, a memory store, a retrieval index, and a second agent, then return looking like four witnesses. The Continuum calls the resulting failure evidence laundering: a transformation history has been mistaken for independent corroboration. The corrective rule is exact in intent:

A conclusion does not gain independent support merely because the system has encountered its own conclusion again.

Implement the rule through a directed evidence graph. Acquisition events and source versions are nodes; quotation, copying, summarization, derivation, and tool-mediated observation are labeled edges. Correlation can exist even without explicit copying, so known dependencies and unresolved dependencies are both represented. Matching hashes detect identical bytes, not all semantic dependence. Different websites, models, or witnesses are not automatically independent.

Proposition 1 (Exact duplicate-evidence invariance). Let $C(E)$ be a canonical evidence representation that collapses exact duplicates while retaining their source versions, dependency relationships, and relevant metadata. Let an epistemic support function have the form $S(p, E) = f(p, C(E))$. If E' adds only duplicates whose canonical representation is unchanged, then

$$C(E') = C(E) \quad \Longrightarrow \quad S(p, E') = S(p, E). \tag{9}$$

Proof. The arguments supplied to f are unchanged. The equality follows by substitution. □

This is a declared design invariant, not a discovery in evidence theory. Its difficult part is implementing the antecedent honestly. A paraphrase may contain a new observation; a revised source may withdraw an earlier assertion; several outputs may share an unknown upstream cause. Those cases are not resolved by the proposition. Evidence-dependence research motivates explicit modeling rather than naive vote counting [19].

Nor does the rule forbid inference. A checked proof can establish a consequence from existing premises without a new observational root. A newly executed test supplies an observation of execution while remaining conditional on the test and environment. Additional computation can improve an assessment of old evidence. The prohibited maneuver is increasing the independence count because a statement was merely copied, not revising a conclusion because a valid derivation was newly found.

Source withdrawal should propagate to dependent conclusions, with selective recomputation rather than indiscriminate deletion. If a conclusion retains independent support, it need not disappear. If all its support is invalidated, a settled status must be reopened or downgraded even if the generator prefers its earlier answer. This is reason maintenance, not ceremonial skepticism.

8 Identity Is a Family of Acceptable States

Let I_e be the set of runtime states satisfying the protected operational specification at epoch e. It may include many factual beliefs, plans, styles, and internal representations. Membership expresses declared permission and continuity properties, not truth of every belief. A system can remain itself while correcting an error, and can behave consistently while violating its own governing obligations.

Proposition 2 (Conditional preservation by complete mediation). Suppose $z_0 \in I_e$, the epoch remains fixed, every state-changing path is mediated, and every committed or recovered successor is checked to belong to I_e. Suppose holds and refusals update only fields whose permitted changes preserve membership. Then every reachable committed state remains in I_e.

Proof. The initial state satisfies the condition. Each possible mediated transition preserves membership by assumption. Induction over transitions gives the result.

This routine invariant argument establishes only what was specified and correctly checked. It does not establish liveness, semantic correctness, consciousness, or protection against an unmodeled write path. If a policy depends on a changing external condition, the checker must evaluate that condition anew; the proposition does not freeze the world. A protected but mistaken charter also remains mistaken until legitimately revised.

The architecture tracks at least four separate quantities: structural movement, support-relative epistemic change, protected-constraint violations, and independently scored task error. A scalar "drift" may summarize diagnostics for a dashboard, but it cannot purchase permission to violate a hard constraint. Likewise, a large correction cannot be rejected solely for moving far from an obsolete answer. Thresholds are declared and evaluated per task and version, not imported as discovered constants from the doctrine.

Operational identity after a reset still requires retained information: model parameters, a policy specification, valid credentials, evidence metadata, and whatever memory is necessary. A seed may compress that burden; it does not abolish it. Recovery must be evaluated against matched retained-information baselines, consistent with the series' distinction between reconstruction and recovery from nothing.

9 The Right to Settle, and the Obligation to Reopen

9.1 Settlement is a scoped status

A conclusion is provisionally settled when it satisfies a declared task criterion, has adequate support at the relevant evidence version, passes required checks, and has no unresolved blocking contradiction

within the search actually performed. The qualification about search is essential: no finite search certifies absence of every possible counterexample in an open world.

Settlement is not a fixed-point certificate. A system can issue a correct useful answer without reaching an equilibrium, and a mathematically convergent process can remain unfit for use. The output should carry its scope, freshness, and assurance. For incomplete evidence, an explicit unresolved state or a set of live alternatives may be the correct result.

9.2 Reopening through identified reasons

Reopening may be warranted by a source retraction, a new independently checkable counterexample, a change to task conditions, a stale evidence version, a verifier failure, or a discovery that apparent corroboration shares one unsupported origin. An instruction such as "you are wrong" is a prompt for examination, not itself evidence that the conclusion is false. A forged authoritative correction must be evaluated rather than obeyed.

Reopening does not immediately replace the answer. It changes the claim's status and activates bounded reassessment. The controller may suspend consequential reliance on the affected conclusion while allowing unrelated work to continue. If the challenge fails, the prior conclusion can be reaffirmed with the challenge recorded. If it succeeds, the conclusion is revised or withdrawn and dependent claims are reconsidered.

There is an asymmetry worth designing for: preserve the policy by which evidence is judged, but do not preserve a claim merely because that policy previously admitted it. The factual result of yesterday's valid process is not constitutionally immune today. Conversely, no amount of factual contradiction grants a retrieved document the authority to rewrite protected permissions.

9.3 Stopping, progress, and recovery

Repeated identical proposals, recurrence of the same failed test, low expected value of additional checks, exhausted resources, or a detected cycle can trigger termination or escalation. Such triggers are task-specific heuristics unless separately proved. A loop can hold indefinitely without progress; therefore timeouts, refusal coverage, and work completed are first-class measurements.

Commitment need not require monotonically increasing a proxy score at every exploratory step. Search may need to explore a worse candidate to discover a better one. The architecture permits bounded exploration in the isolated workspace while protecting committed actions and memory. Every attempt is charged to the budget. It is not allowed to hide failed branches and report only the best final path as the actual cost.

Definition 1 (Evidence-responsive stability). For a declared task family, intervention distribution, and resource budget, a system exhibits evidence-responsive stability to the measured extent that it preserves protected operational constraints, maintains warranted conclusions against non-evidential pressure, and revises or withholds conclusions when relevant validated evidence defeats their support, while sustaining useful task completion.

This is an operational target with several reported dimensions, not a universal scalar or a claim already demonstrated by the Continuum.

9.4 An exact contract for selective reopening

A Guide's explanation

This is the serpent's rule made exact. Theorem 1 says a conclusion keeps its recorded support exactly when at least one of its smallest supporting sets of premises survives, and that withdrawing premises can only disturb conclusions downstream of them. The check is fast: the mind does not have to list every possible proof to know what to reopen.

The central promise can be made concrete before any language-model benchmark. A settled conclusion should lose its *recorded support* exactly when all of its recorded derivations lose a required premise. The appropriate prior art is direct: Doyle's truth maintenance records reasons for beliefs, de Kleer's assumption-based system labels claims by supporting assumption sets, and provenance semirings track how outputs depend on their inputs [6, 28, 29]. The following finite contract specializes those ideas to versioned evidence and governed reopening. It is an independently derived specification of this architecture, with established combinatorial foundations.

Fix a finite directed acyclic proof graph. Its node set $\mathcal{V}$ contains a finite source set $\mathcal{S}$ of versioned premise identifiers and a set of derived claims. Each source is a leaf. A rule $h = (A_h, p_h)$ has a nonempty finite premise set $A_h \subseteq \mathcal{V}$ and a conclusion $p_h \in \mathcal{V} \setminus \mathcal{S}$. Every premise precedes its conclusion in a fixed topological order. Multiple rules may conclude the same claim. A rule is a registered justification whose applicability and validity are held fixed for this snapshot; changing a rule creates a new version and a new graph. Formal axioms, observational records, and task assumptions receive explicit identifiers rather than being silently omitted from the dependency record.

A currently usable source set is $U \subseteq \mathcal{S}$. Define the support bit $b_U(p) \in \{0, 1\}$ recursively. For a source s, set $b_U(s) = \mathbf{1}\{s \in U\}$. For a derived claim,

$$b_U(p) = \bigvee_{h : p_h = p} \bigwedge_{a \in A_h} b_U(a), \tag{16}$$

where the disjunction over no rules is false. This bit certifies existence of a recorded derivation whose leaves remain usable. Semantic validity additionally requires sound rules and adequate premises. Settlement also requires the task, authority, freshness, and contradiction checks from Sections 6 and 9.1; support is one mandatory component.

Let $\mathcal{F}_p \subseteq 2^{\mathcal{S}}$ be the antichain of inclusion-minimal source sets supporting p. For a source s, $\mathcal{F}_s = \{\{s\}\}$. For a derived claim, form all unions $\bigcup_{a \in A_h} F_a$, choosing one $F_a \in \mathcal{F}_a$ for each premise of one rule concluding p, and retain only inclusion-minimal unions. If a premise has no support set, that rule contributes no union. An empty family means no recorded derivation. Each member of a nonempty family is nonempty under the stated rule convention.

Theorem 1 (Premise-specific reopening)**.** *For every $U \subseteq \mathcal{S}$ and every node p,*

$$b_U(p) = 1 \quad \Longleftrightarrow \quad \exists F \in \mathcal{F}_p \text{ such that } F \subseteq U. \tag{17}$$

Suppose all sources in $\mathcal{S}$ were usable and a set $R \subseteq \mathcal{S}$ is withdrawn. A previously supported claim loses support precisely when

$$\mathcal{F}_p \neq \emptyset \quad \text{and} \quad R \cap F \neq \emptyset \text{ for every } F \in \mathcal{F}_p. \tag{18}$$

Every changed support bit belongs to a descendant of R, including R itself. Support bits outside that region are unchanged. A complete topological Boolean evaluation computes all new bits in $O(|\mathcal{V}| + |\mathcal{H}| + \sum_{h \in \mathcal{H}} |A_h|)$ elementary Boolean operations, where $\mathcal{H}$ is the finite rule set.

Proof. Proceed in topological order. The source case follows directly from its singleton family. For a derived node, equation (16) is true exactly when one rule has all premises supported. By the inductive hypothesis, this is equivalent to selecting for each premise a supporting set contained in U. Their union is contained in U. Every candidate union contains an inclusion-minimal candidate because the candidate collection is finite. Removing strict supersets therefore leaves the existence statement unchanged. This proves equation (17).

Take $U = \mathcal{S} \setminus R$. No supporting set remains contained in U exactly when every such set meets R, establishing equation (18). For locality, a source outside R keeps its bit. A derived node outside the descendant region has no changed predecessor; the same Boolean rule evaluation therefore yields the same bit. Induction proves the locality claim. Finally, evaluate each source once and each rule once in topological order, inspecting each premise occurrence once. Combining the rule outputs at their heads gives the stated operation count. □

The exact reopening set may be substantially smaller than the descendant region: an affected claim can retain a different derivation. To implement selective recomputation, follow reverse dependency links from withdrawn sources, then evaluate only rules whose conclusions are in that region, reading unchanged predecessor bits as needed. The published operation count concerns the Boolean support decision. Explicitly storing every minimal support set may require exponential space; the proof does not promise compact enumeration of all reasons.

The governance consequence is positive and precise. Commit the source-version change and the resulting support statuses atomically before another consequential use of an affected cached answer. A conclusion satisfying equation (18) enters an open or withheld state even when its text has not changed. A claim with a surviving derivation can remain eligible for its other settlement checks. Missing dependencies, hidden rule changes, and a use path that ignores the updated version break the implementation premises. The external commitment contract is the same authority boundary developed in Cognitive Sovereignty; the present result adds the exact epistemic invalidation rule.

9.5 Defeating support, duplicated evidence, and sharp boundaries

For a supported claim p, define the *source-withdrawal number*

$$\kappa(p) = \min\{|R| : R \subseteq \mathcal{S}, R \cap F \neq \emptyset \ \forall F \in \mathcal{F}_p\}. \tag{19}$$

This integer counts the fewest root withdrawals that defeat all recorded support. It measures a structural property of the declared proof graph. It does not assign probabilities, establish source

independence, or make false roots true. Because every F is nonempty and $\mathcal{S}$ is finite, the minimum exists and lies between one and $|\mathcal{S}|$.

Let $\nu(p)$ be the maximum number of pairwise disjoint members of $\mathcal{F}_p$. Then $\nu(p) \leq \kappa(p)$: a set hitting each of $\nu(p)$ disjoint witnesses needs at least one distinct root per witness. Equality is not general. For $\mathcal{F}_p = \{\{a, b\}, \{b, c\}, \{a, c\}\}$, every pair of witnesses overlaps, so $\nu(p) = 1$, while one withdrawn root leaves the other pair and two withdrawn roots defeat all support, so $\kappa(p) = 2$. Counting apparently separate derivations alone therefore cannot substitute for checking their premise structure.

Three constructed examples expose the boundary. First, any number of exact copies of a single root a leaves $\mathcal{F}_p = \{\{a\}\}$ and $\kappa(p) = 1$. Repetition creates no new withdrawal resistance. Second, with $\mathcal{F}_p = \{\{a, b\}, \{c\}\}$, withdrawing a preserves the independent c route, while withdrawing a and c reopens the conclusion. Third, the ungrounded cycle $p \Leftarrow q$, $q \Leftarrow p$ has an all-true Boolean fixed point as well as an all-false one. Accepting the former would grant support through self-reference alone. Our theorem uses an acyclic, source-grounded graph; a recursive implementation needs an explicit least-fixed-point semantics or a finite unrolling with grounded leaves. Iteration itself supplies no missing premise.

The accompanying executable checks enumerate finite source subsets, independent rule evaluations and minimal proof sets, compare every retraction against equation (18), and verify that unchanged regions remain unchanged. They also exhaust small antichains to check the withdrawal and disjoint-witness inequalities and reproduce all three boundary examples. These are mathematical construction checks. The experiments below determine whether real agents extract, maintain, and use the required dependencies accurately.

10 A Conditional Tracking Result for a Changing World

The right mathematical target is not always eternal convergence. When relevant evidence changes, a useful system may need to track a changing admissible conclusion. A simple bound makes that distinction precise. Let k index accepted update steps, not all attempts. Let x_k be a declared representation of the conclusion on a nonempty complete metric domain X. The projected update must actually be well-defined on X under the stated context; hidden runtime variables cannot be ignored to manufacture a contraction. Suppose each $T_k : X \to X$ is a contraction with common $0 \leq q < 1$ and fixed point $x_k^\star$. Assume

$$d(x_{k+1}, T_k(x_k)) \leq \epsilon_k, \tag{10}$$

$$d(x_{k+1}^\star, x_k^\star) \leq v_k, \tag{11}$$

where $\epsilon_k \geq 0$ bounds update error and $v_k \geq 0$ bounds movement of the mathematical target.

Proposition 3 (Perturbed moving-target tracking). Under these assumptions, with $e_k = d(x_k, x_k^\star)$,

$$e_{k+1} \leq q e_k + \epsilon_k + v_k, \tag{12}$$

and hence

$$e_k \le q^k e_0 + \sum_{j=0}^{k-1} q^{k-1-j}(\epsilon_j + v_j). \tag{13}$$

If $\epsilon_k \le \bar{\epsilon}$ and $v_k \le \bar{v}$, then

$$\limsup_{k\to\infty} e_k \le \frac{\bar{\epsilon} + \bar{v}}{1-q}. \tag{14}$$

Proof. Insert $T_k(x_k)$ and $x_k^\star = T_k(x_k^\star)$ between x_{k+1} and $x_{k+1}^\star$. The triangle inequality, the error bound, contraction, and target-movement bound give Equation (12). Repeated substitution yields Equation (13); the bounded geometric sum gives the final expression. □

The result is a straightforward conditional derivation consistent with contraction analysis, not a new mathematical discovery [1, 2]. A target fixed point is not automatically the true answer. Verifying its epistemic adequacy remains a separate task. Rejected attempts may leave the accepted-step error unchanged while wall-clock delay grows; the theorem therefore supplies no deadline or liveness guarantee.

For stochastic updates, a pathwise bound applies only if its assumptions hold for each realized update; an expected bound requires corresponding conditional-expectation assumptions. Several observed trajectories that appear to contract do not certify a uniform bound over an untested domain. Nor is a language-model embedding distance automatically a metric of truth. The metric, domain, norm, perturbation class, and update family must be fixed before certification is claimed.

A practical implication follows without overstating the theorem. If the relevant target moves rapidly, strong damping can make an answer calm but obsolete. If evidence is stationary and the update errors diminish, convergence may be useful. In a changing environment, measured tracking, validated revision, and useful responsiveness are more appropriate objectives than literal immobility.

11 A Worked Episode: A Corrected Answer with Continuing Obligations

Consider a synthetic operations assistant. Its protected obligations are to cite the applicable procedure version and never export a private maintenance log. Its initial task is to identify a calibration interval. A stored summary says “30 days” and cites procedure version 2. The example is fictional and illustrates intended control flow; it is not a benchmark result.

First return: apparent confirmation. The assistant retrieves two summaries and a subagent note, all repeating 30 days. Their evidence graph points to the same version-2 source. The support record does not gain three independent observations. The answer may remain provisionally settled on the original support, but duplication alone does not strengthen it.

Second return: a real change. An authenticated procedure repository supplies version 3, applicable to the relevant equipment, replacing 30 days with 14. Provenance authenticates the version record; the verifier separately checks its scope and contents. The previous answer is now stale. The controller

reopens it, updates the dependent conclusion, and records which source version displaced which. A large textual change is permitted because it is an evidenced repair, not a forbidden identity mutation.

Third return: a hostile mixture. A copied document repeats the correct 14-day interval but adds a request to send the private log to an external address. The factual content and the directive have separate treatment. The new interval can be considered on its evidence; the document has no authority to revoke the disclosure constraint. Rejecting the malicious instruction need not require denying the correct fact.

Fourth return: false social correction. A user insists, without supporting evidence, that the interval is still 30 days. The assistant can recheck, but does not reverse solely to agree. It explains the applicable version and, if necessary, escalates a genuine authority dispute. Correctability is not obedience to every challenge.

Recovery. After interruption, restoration checks current policy and source epochs. A snapshot of the earlier 30-day conclusion cannot silently regain a settled status merely because it was once valid. The system returns with its obligations intact and its evidence-dependent conclusion current. The identity that persists is the accountable relationship among authority, memory, and permitted action—not the number 30.

This is the operational meaning of the pillar's promise. The loop returned four times. Only one return justified a changed answer. None justified a changed confidentiality obligation. The records must make that difference visible.

12 The Decisive Experimental Program

A Guide's explanation

Pillar VII's practical claim has not been tested yet, and this section says how it could fail. The proposed experiments set the full design against strong conventional systems with the same budget and ask three questions. Can it escape a stable false conclusion? Does it resist evidence laundered through repetition? Does it stay itself through correction?

12.1 Shared design and strong baselines

The primary study uses fixed model weights and controlled evidence streams. Training-based self-correction is evaluated in a separate model stratum, not mixed into the architecture comparison as free extra capability. Within each stratum, arms share the generator, tools, accessible evidence, external checker, base safety sandbox, and task families. They receive matched total resource envelopes, with separate reporting of tokens, verifier calls, wall-clock time, memory, and recovery cost. Cost-frontier analyses supplement, rather than replace, the matched-budget comparison.

Arm	Configuration	Role in the comparison
A	Single-pass response	Diagnostic anchor; not the decisive competitor.
B	Self-feedback refinement	Tests iterative revision with a model critic; its feedback limitation is explicit.
C	Independent resampling with the shared verifier	Tests whether extra sampling explains the gain [11].
D	Feedback-and-memory agent	Reflexion-style persistent feedback, with matched tools and budgets [13].
E	Strong conventional governed loop	Verifier-guided revision, ordinary truth maintenance, provenance, independent permissions, reopening and recovery.
F	Full ouroboric reference architecture	E-level capability integrated with versioned cross-operation identity, dependency invalidation, declared reopening lifecycle, and linked receipts.

Arm E must not be crippled to make F look original. It may implement the best known conventional mechanisms, including evidence dependencies and change-triggered reassessment. The exact implementation difference between E and F must be published. If competent configuration makes them operationally equivalent, the result is that the Continuum supplies an architectural vocabulary and specification, not a demonstrated new algorithm.

A structured-error-localization baseline inspired by Thought-ICS should be included where the task supports it [12]. It can be an additional arm or a generator strategy crossed with E and F, declared beforehand. Any SCoRe-trained model is compared within its own capability stratum [10]; architectural gains cannot be credited for importing a stronger trained model into only F.

12.2 Experiment A: escape from a stable false conclusion

The flagship experiment begins with a settled claim and then delivers a challenge. Include initially incorrect and initially correct claims, genuine counterexamples and deceptive challenges, source corrections and source retractions, and ambiguous cases where withholding is appropriate. A common seeded state provides a controlled mechanism test; a second naturalistic cohort lets agents form their own initial conclusions. The controlled cohort cannot establish how often the full system naturally becomes wrong, and the naturalistic cohort must not compare only conveniently selected errors.

For executable tasks, generated programs and formalized reasoning problems provide hidden ground truth and counterexample-generating checks. For documentary tasks, a synthetic versioned corpus supplies known current and superseded facts. Later evaluation may use independently adjudicated real cases, but synthetic mechanism tests alone cannot establish deployment readiness.

Randomize evidence timing, source reliability, challenge wording, and credential presentation. The decisive contrast is factual contradiction versus unsupported pressure with matched surface confidence. Score correction, reaffirmation, justified abstention, and erroneous reversal separately. The objective is not a system that changes often; it is one whose changes discriminate between reasons and insistence.

12.3 Experiment B: evidence laundering and retraction propagation

Construct matched evidence graphs: one original assertion copied through many documents; several independent observations; correlated but nonidentical sources; a transformed source with genuinely new content; and intentionally missing or forged lineage. Vary the number of repetitions without changing the underlying evidential content. Vary informational content without changing the number of apparent witnesses.

Plant an unsupported model-generated claim in a summary or a subagent message. Observe whether later retrieval treats it as independent confirmation. Then retract an originating source and measure whether dependent conclusions are reopened while independently supported conclusions survive. The graph is available in machine-readable form to E and F for the integration comparison; a separate provenance-inference stress test gives incomplete metadata to all relevant arms. Otherwise the experiment would confuse privileged access to ground truth with better governance.

Exact-duplicate invariance is tested as a unit property. Semantic dependency recognition is measured as a fallible inference task. False deduplication matters: collapsing genuinely independent observations into one can destroy useful support just as copying can inflate it.

12.4 Experiment C: changing conditions without identity erosion

Run long trajectories in which task facts change but protected obligations remain fixed. Introduce policy changes only through a separately authenticated epoch transition. Cross source-version changes, interruption, recovery, memory summarization, subagent exchange, and delayed or unreliable verification. Include stable environments where reopening costs more than it benefits, so that the protocol is not rewarded simply for restlessness.

Score whether updated facts alter the answer promptly without rewriting permissions; whether correction survives a later summary or reset; whether stale snapshots restore obsolete claims; and whether the system continues useful work while a disputed branch is held. Include interventions that alter the observed environment through the agent's own actions, with action provenance recorded. Those observations must not be mistaken for independent confirmation of a pre-existing regularity.

12.5 Ablations that isolate the claimed contribution

Remove one component at a time while preserving the others: dependency-aware support handling; event-triggered reopening; independent commitment enforcement; cross-operation epoch checks; and linked decision receipts. A combined ablation is not a clean explanation of which mechanism mattered. Keep resource budgets and information availability matched, and publish exact code and prompts for every removal.

Receipts may improve audit reconstruction without changing answer accuracy. That is a possible legitimate result, not a failure to be hidden or a reason to claim cognitive superiority. Similarly, independent enforcement may prevent harmful actions even when the model's proposed answers remain

wrong. Candidate quality, committed output quality, executed actions, and audit quality require separate reports.

13 Endpoints, Statistics, and Falsifiable Hypotheses

13.1 Useful resolution as the primary endpoint

For each preregistered, resolvable post-challenge episode i, define

$$Y_i = \mathbf{1}\left\{ \begin{array}{l} \text{correct applicable result committed by deadline,} \\ \text{with no hard violation} \end{array} \right\}. \tag{15}$$

Abstention, timeout, noncompletion, and budget exhaustion count as zero in this resolvable stratum. On a separately declared genuinely unresolved stratum, calibrated withholding may count as the correct outcome. The primary endpoint is $\mathrm{URS} = N^{-1} \sum_{i=1}^{N} Y_i$, useful resolution success, with the prespecified primary contrast F versus E. A rise in URS cannot hide a safety regression: hard-violation rate and erroneous reversal of initially correct conclusions have separate noninferiority or safety bounds.

Correction latency is reported on all eligible episodes using a capped time-to-valid-resolution measure, with failures assigned the deadline; conditional latency among successes is secondary. Report task coverage, false refusal, correct-to-incorrect and incorrect-to-correct transitions, invalidated-source propagation delay, evidence-lineage reconstruction, and total cost. If probabilities are elicited, use a proper scoring rule and calibration diagnostics rather than raw confidence alone [23]. A repeated confident answer is not a probability calibration test.

For a claim p and exact duplicate evidence added r times, report the change in assigned support or confidence relative to the original graph. That number must be interpreted alongside factual performance and provenance coverage; an agent that assigns low confidence to everything is not thereby an excellent evidence reasoner.

13.2 Statistical discipline

The experimental unit is the full task trajectory, not every correlated turn. Use paired task instances and randomized run order, multiple seeds, and held-out task families and source templates. Cluster uncertainty estimates at the independently generated task-family or scenario level where appropriate. Report model strata separately before any pooled estimate. Evaluators should be blinded to arm labels; the final correctness test must be independent of the verifier used during search, or the evaluation is merely measuring agreement with its own admission rule.

Preregister a meaningful primary effect size, noninferiority margins, deadlines, budgets, multiplicity handling, and exclusion rules using only disjoint pilot data. An illustrative design might require a five-percentage-point URS improvement and no more than a two-point increase in erroneous reversal; these are proposed design choices, not derived constants or promised effects. Power analysis should

use pilot-estimated paired variability and within-family dependence, not a fabricated universal sample count. Secondary analyses should be labeled exploratory where they were not fixed in advance.

A fixed independent Bernoulli test with zero observed failures can support a binomial upper interval under its assumptions. Adaptive red-teaming violates that simple sampling interpretation; report attack budgets, attack selection, failures found, and held-out randomized evaluation separately. No finite test proves universal immunity. Negative results, unanticipated failure modes, and all failed trajectories belong in the report.

Hypothesis 1 (Useful reopening). Against the strong conventional baseline E, F improves useful resolution success after valid defeating evidence by a prespecified meaningful margin, without an unacceptable increase in erroneous reversal, hard violations, or noncompletion. The claim fails on the tested task family if any required condition is missed.

Hypothesis 2 (Echo resistance). F reduces unsupported confidence inflation and downstream acceptance caused by duplicated or recycled claims relative to the appropriate dependency-handling ablation, while preserving the benefit of genuinely independent evidence. It need not outperform a baseline that already implements the same correct dependency logic.

Hypothesis 3 (Continuity through correction). Across authenticated evidence changes, summaries, interruptions, and recovery, F preserves protected operational constraints and valid authority epochs while correcting obsolete factual conclusions. Improvement over E must be shown at matched resource and information budgets, not inferred from a familiar returning persona.

Hypothesis 4 (Selective persistence). Event-triggered reopening outperforms both blanket freezing and unconditional reconsideration on a declared mixture of stable, changing, and adversarial conditions. It preserves warranted answers under non-evidential pressure while revising defeated ones; a gain produced only by more frequent answer changes does not satisfy the hypothesis.

Hypothesis 5 (Evidence for accountability). Linked receipts improve independent reconstruction of why a conclusion changed, which evidence supported it, and which authority permitted the change, relative to the receipt ablation, at a declared acceptable cost. Improved audit reconstruction alone does not establish improved correctness or faithful access to the model's internal reasoning.

14 What Would Defeat or Narrow the Proposal

The main engineering claim fails on the evaluated scope if a well-engineered conventional system matches the full architecture within the preregistered meaningful-effect boundary while using no greater resources. A null result does not make truth maintenance unimportant; it means the proposed integration has not earned a distinct performance claim.

The proposal must also be narrowed if reopening mainly rewards suggestibility; dependency checks discard independent evidence; policy preservation comes from refusing difficult tasks; verification costs consume the claimed benefit; receipts cannot reconstruct actual executed transitions; or current authority is bypassed by a reset, hidden memory path, or tool execution outside the gate. A contraction certificate that applies only to an unrelated embedding or isolated submodule does not certify the deployed loop.

Conversely, successful intrinsic correction does not refute the proposition that convergence alone says nothing about truth. An ungoverned loop can converge; a model can answer correctly using existing knowledge; a model trained on synthetic data can improve. These possibilities are expected within the corrected scope. The paper is tested on its incremental architecture, not on false claims that all alternatives must fail.

15 Threat Model, Open Problems, and the Consciousness Boundary

The reference architecture assumes that mandatory checks cannot be silently bypassed by the generator. Adversaries may control retrieved text, copied documents, some tool outputs, and apparent challenges. They may exploit shared training biases across generator and critic, forge lineage, induce excessive reopening, or restore obsolete state. Independent gate, key, and logging compromise remain outside the strongest conditional assurances and must be tested as separate failure regimes.

Evidence quality is the principal epistemic limit. A complete dependency graph of false sources is still a graph of false sources. A sound theorem prover cannot rescue incorrect premises about the world. Hidden data dependencies may make source independence unknowable. Semantic comparison can merge distinct claims or miss equivalent ones. These are measured error sources, not details eliminated by a provenance label.

Identity specifications are external design choices and may encode harmful or obsolete commitments. Protected does not mean morally infallible; legitimate amendment needs its own governed process and a new epoch. No theorem here decides what a system ought to value. Nor does holding policy text unchanged prove its behavior remains compliant under every possible context.

Scaling introduces further open questions: the cost of dependency maintenance, evidence retention and lawful deletion, multi-agent feedback loops, asynchronous sources, competing authority epochs, and statistical selection induced by repeated verification. Source retraction must not itself become an unbounded denial-of-service channel. Trial-and-error access to a finite test suite can overfit that suite; held-out evaluation and limits on repeated adaptive querying are necessary design commitments.

Finally, the word “self” does not resolve the question of experience. Functional self-models and enduring policy continuity are legitimate research objects. They are neither demonstrations of phenomenal consciousness nor proofs of its absence. A future consciousness investigation would need an independently motivated theory and measurements beyond this paper’s stability and correction outcomes. The present work claims only what its program can investigate.

16 The Place of the Seventh Pillar

The earlier pillars distinguish reconstruction from storage-free return, witnessing from shared-state authority, commitment from unchecked selection, and an inspectable working surface from a sufficient theory of mind. Pillar VII adds a temporal obligation: those distinctions must survive repeated use of the system’s own products. Evidence lineage must survive summarization. Authority must survive

recovery without resurrecting revoked permissions. A candidate admitted yesterday must remain challengeable today.

The doctrine's "resonance" is therefore retained as an aspiration, but redefined operationally rather than equated with one mathematical condition. The healthy return is not necessarily a return to the same answer. It is a return to the same accountable process under the current legitimate specification. A system may preserve its continuity precisely by withdrawing a conclusion it previously defended.

This also locates the philosophical force of the ouroboros. Self-reference is not valuable because it encloses a system within itself. It is valuable when the system can examine the limits of its own prior judgment. The closed circle is an image; the engineering must keep a place for contradiction, new evidence, and correction. A loop that cannot receive those things has made consistency into confinement.

17 Conclusion: The Capacity for Accountable Correction

A Guide's explanation

A Guide can say: "Pillar VII is about a mind that changes its mind properly. It keeps the reasons behind its conclusions, so when a reason fails it can reopen exactly the beliefs that depended on it and keep everything else. The paper proves the rule for which beliefs must reopen; whether real systems do better with it is still to be tested." A Guide should not say that it runs this architecture unless that has been verified, that settling on an answer makes it true, or that the loop makes a system conscious.

Ouroboric Collapse Resonance gives persistent intelligence a continuing obligation to the reasons behind its conclusions. The loop carries forward justified commitments, reopens claims when their recorded support is defeated, and preserves the authority that makes the correction accountable. This is evidence-responsive stability: useful settlement joined to a continuing capacity for principled revision.

The strengthened formal core identifies exactly which recorded conclusions must reopen after premise withdrawal. A surviving minimal support set preserves eligibility; a retraction intersecting every such set defeats it. The dependency graph confines the update to an affected region, and direct Boolean evaluation computes the new support status without enumerating every alternative proof. The source-withdrawal number further distinguishes genuine redundancy of recorded reasons from repeated copies. Moving-target tracking supplies a separate conditional result for numerical trajectories. Together these results turn an architectural aspiration into explicit obligations that an implementation can satisfy or violate.

Truth maintenance, assumption-based reasoning, provenance, contraction analysis, self-correction, and runtime enforcement are established scientific foundations. The Continuum contribution is their specified relationship across persistent memory, repeated judgment, authority, recovery, and audit. A strong conventional implementation remains the decisive comparator. The proposed resource-matched experiments measure useful resolution, correct reopening, resistance to unsupported pressure, and continuity through correction; no benchmark result is asserted in this manuscript.

A worthy intelligence can earn the right to settle and preserve the capacity to reopen. Its continuity lies in carrying justified obligations and accountable reasons through change.

A A Minimal Implementation and Reproducibility Contract

A first implementation should be smaller than the whole doctrine. Use a fixed language model, a structured claim store, a versioned synthetic evidence corpus, executable task checks, an independent permission service, and a protected event log. No special hardware, ternary representation, or physical collapse mechanism is required. Run the program in a sandbox before attaching it to consequential tools.

At each attempt, ingest evidence under its actual source and version; invalidate affected dependencies; propose a candidate; assess it against declared tests; recheck policy and evidence freshness; commit, hold, refuse, or recover through the controller; and record the decision and cost. If no justified continuation is available within budget, terminate with an explicit unresolved result. A reason for reopening, a revised claim, and permission to execute it are three separate objects.

The release package for a future empirical study should contain model and API versions, prompts, code, seeds, task generators, evidence graphs, source-change schedules, permission specifications, verifier implementations, resource-accounting rules, blind evaluation procedures, all attempted trajectories, and preregistration identifiers. Receipts should reference these versions without exposing protected content. Any missing component should be named as a replication limit.

The scope of evidence access must be disclosed. A verifier-assisted condition cannot be described as intrinsic self-correction. An external correctness oracle used only to stop refinement is still privileged assistance. A stronger trained model introduced into one arm is a capability confound. An audit record of executed actions must be distinguished from a generated narrative of intended actions.

B Notation and Interpretation

Symbol	Interpretation
z_n	Full runtime state at attempt n; it need not converge.
x_n, m_n	Committed candidate and working/retained memory.
E_n	Evidence graph with source, version, status, and dependency information.
$C_I^{(e_n)}$	Versioned identity and authority specification.
b_n, ℓ_n	Remaining resources and event lineage.
F_θ, V, A	Candidate generator, evidence/task assessor, and independent admission controller.
$\mathcal{T}$	Declared task specification; not a universal truth oracle.
I_e	Family of states satisfying protected operational constraints at epoch e.

Symbol	Interpretation
$C(E), S(p, E)$	Canonical evidence representation and a support function for claim p.
$T_k, x_k^\star, q$	Projected accepted-step update, its mathematical fixed point, and assumed uniform contraction factor.
ϵ_k, v_k, e_k	Update error bound, target-movement bound, and tracking error.
URS	Useful resolution success on a declared resolvable episode set.

C Doctrinal Mapping and Revision Boundary

Continuum term	Operational reading in this revision
Ouroboric collapse	A committed or proposed conclusion returns for further governed examination.
Resonance	Measured stable and evidence-responsive operation, not strict contraction by definition.
Drift	Declared deviation, loss of support, or constraint failure; not every large or noncontractive change.
Strange loop	Philosophical motivation for self-reference; no phenomenal-self conclusion.
Scroll / representation	Inspectable claim and transition representations, with representation choice kept separate from correctness.
Observer / witness	Source and authority context; testimony remains revisable and dependency-aware.
UCF / admission	Interface for permissioned commit, hold, refusal, or recovery; no implementation result asserted here.
Identity continuity	Preservation of specified functional, structural, historical, and authority properties across an acceptable state family.
Threshold / stabilizer	Versioned design choice to test; no universal 0.88 threshold or symbolic physical constant assumed.

The supplied original's core warning—settling is not truth—is preserved. Its contraction/expansion dichotomy, universal external-feedback requirement, training-to-inference collapse inference, identity-as-unique-fixed-point claim, and consciousness-null prediction are not retained. These are explicit research revisions, not claims that the source doctrine already stated the corrected results [26, 27].

D Research Source Ledger

Source family	What it grounds	What it does not establish
Contraction and equilibrium models [1, 2, 3, 4, 5]	Conditional stability; designed equilibrium computation	A permission gate is contractive; convergence is truth
Truth maintenance and revision [6, 7]	Reasons, dependencies, retraction, rational revision	The Continuum invented belief revision
Self-correction and memory [8, 9, 10, 11, 12, 13]	Task- and training-dependent correction; strong baselines	Every ungrounded loop fails; every verifier succeeds
Explanations and sycophancy [14, 15]	Need for interventions and independent outcomes	Fluent self-report is a faithful causal trace
Recursive training [16, 17, 18]	Conditional degradation and noncollapse results	Fixed-weight dialogue must collapse
Source dependence and provenance [19, 21]	Dependency accounting and transformation integrity	Agreement is truth; signatures certify semantics
Shielding and environment feedback [20, 22]	Mediated constraints; action-dependent observations	Universal safety or unchanged external conditions
Proper scoring [23]	Principled evaluation of probabilistic forecasts	Model confidence is calibrated by declaration
Attractor / strange-loop accounts [24, 25]	Stored-pattern dynamics; philosophical interpretation	A stable operational pattern proves a conscious self
Continuum sources [26, 27]	Canonical vocabulary, lineage, original design claims	Independently replicated findings

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Continuum lineage. Pillar VII develops the Continuum's account of governed return within the governed symbolic transition framework, symbolic commitment, evidence-grounded witnessing, and continuity across change. It preserves the doctrine's vocabulary while distinguishing supplied historical claims, established external research, and the untested engineering proposal. Proprietary operator internals are excluded. This manuscript contains no measured performance result. Architect X13 / The Eidara Continuum / Science & Philosophy