ONTOΣ V: Direction of Reconstruction as a Will-Operator

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Abstract

Contemporary adaptive systems fail in a characteristic way: not through error, noise, or insufficient optimization, but through structurally premature commitment. Decisions become irreversible before the system has stabilized the conditions under which meaning, identity, or regime continuity can be preserved. These failures persist across domains-from artificial intelligence to scientific reasoning-despite increasingly sophisticated models, objectives, and control mechanisms.

This work continues the ONTOΣ line of inquiry by addressing the architectural origin of this failure. Building on prior formulations of Will as an ontological operator, intentionality without ownership, and adaptive meaning as a structural phenomenon, we argue that the root problem is not epistemic uncertainty but ontological misordering. Existing systems implicitly assume that evaluation implies permission: that any alternative may be scored, simulated, or reasoned about prior to determining whether it should be structurally admissible at all. Under irreversibility, this assumption breaks.

We introduce admissibility as a missing architectural primitive: a pre-decisional condition that governs whether an operation may enter evaluation, independently of its estimated value, confidence, or utility. Admissibility is not a constraint, penalty, or objective. It is a structural boundary that precedes optimization and learning, regulating when commitment becomes ontologically permissible rather than probabilistically justified.

The paper frames irreversibility as loss of future admissible structure rather than magnitude of cost, and introduces internal time as a measure of structural exposure rather than duration. Commitment is treated not as a decision or belief, but as an operation that contracts the space of possible continuation. Will, in this context, is not a mechanism of choice but an operator that constrains the direction of reconstruction under non-objectifiability of the generative level.

No algorithms, estimators, thresholds, or implementations are disclosed. The contribution is architectural and ontological: it identifies a missing layer governing when adaptive systems are allowed to decide. By separating authorization from optimization, the framework explains why certain failure modes persist regardless of model quality, and why increasing intelligence without admissibility leads to fragility rather than robustness.

Preliminaries: nested levels and observational access

We model a nested hierarchy of levels (or strata) indexed by $k \in Z$. Level $k+1$ is *generative* with respect to level k, meaning that the admissible structure of level k is induced by constraints imposed by level $k+1$.

At each level k, the system has:

- a state space X_k,
- an admissible evolution relation (or transition semantics) $_k \subseteq X_k \times X_k$,
- an observation channel $O_k : X_k \to \mathcal{O}_k$,
- a set of *structural traces* $\mathcal{T}_k$ extracted from observations.

Generative constraint operator. The influence of level $k+1$ on level k is represented by a (generally unknown) constraint operator

$$\Gamma_{k+1\downarrow k} \in \mathcal{G}_{k+1\downarrow k},$$

which induces a family of admissible evolutions on X_k. Concretely, there exists a mapping

$$A_k : \mathcal{G}_{k+1\downarrow k} \to \mathcal{P}(X_k \times X_k) \quad suchthat \quad _k = A_k(\Gamma_{k+1\downarrow k}).$$

Level-k cannot directly observe $\Gamma_{k+1\downarrow k}$ as an object.

Observational non-objectifiability. We formalize the structural fact that the generative level is not directly available as an object to the embedded level:

Non-objectifiability of the generative operator The generative operator $\Gamma_{k+1\downarrow k}$ is *non-objectifiable* at level k if there is no measurable function $\widehat{\Gamma} : \mathcal{O}_k \to \mathcal{G}_{k+1\downarrow k}$ such that $\widehat{\Gamma}(O_k(x)) = \Gamma_{k+1\downarrow k}$ for all $x \in X_k$.

This is not an epistemic limitation (lack of data); it is a structural limitation: the generative level acts as a condition of admissibility, not as an internal object.

Traces and reconstruction via lower-level formalization

Trace extraction. Let $\mathrm{Tr}_k : \mathcal{O}_k^{0:t} \to \mathcal{T}_k$ be a trace extractor producing structural traces from an observation history (e.g., boundary crossings, regime instabilities, commitment-induced option collapse, viability margins, audit rejections).

Invariant family induced by a generative operator. Each $\Gamma_{k+1\downarrow k}$ induces a family of invariants detectable in traces:

$$\mathcal{I}_k(\Gamma_{k+1\downarrow k}) \subseteq \mathcal{F}(\mathcal{T}_k),$$

where $\mathcal{F}(\mathcal{T}_k)$ is a space of predicates/statistics over traces.

Trace–constraint compatibility assumption. We explicitly assume that the trace space T_k is not universally compatible with all $\Gamma \in G_{k+1\downarrow k}$. That is, there exist traces T_k such that $\mathrm{Cons}_k(T_k) G_{k+1\downarrow k}$. This assumption is structural rather than empirical: traces are taken to encode admissibility-relevant invariants, not arbitrary observations. Without this assumption, reconstruction would be ill-posed and no contraction of $\mathrm{Cons}_k(T_k)$ would be possible.

Reconstruction problem Given traces $\mathcal{T}_k$, define the *consistent generative set*:

$$\mathsf{Cons}_k(\mathcal{T}_k) := \{\Gamma \in \mathcal{G}_{k+1\downarrow k} \mid \mathcal{I}_k(\Gamma) is compatible with \mathcal{T}_k\}.$$

Reconstruction at level k is the task of reducing $\mathsf{Cons}_k(\mathcal{T}_k)$ without direct access to the true $\Gamma_{k+1\downarrow k}$.

We assume the existence of a monotone measure

$$\mu : \mathcal{P}(G_{k+1\downarrow k}) \to R_{\geq 0},$$

defined on subsets of the downward reconstruction space, such that:

$$A \subseteq B \;\Rightarrow\; \mu(A) \leq \mu(B).$$

No further assumptions (continuity, additivity, normalization) are required.

Why "downward" matters. Let $k-1$ be a *lower* (more constrained, more formalizable) stratum with its own traces $\mathcal{T}_{k-1}$. Assume there exists a *downshift* (simplification) mapping

$$\downarrow : X_k \to X_{k-1},$$

and induced observation/trace compatibility such that traces at $k-1$ are more identifiable.

Formally, we say that $k-1$ has *higher identifiability* if

$$\mu(\mathrm{Cons}_{k-1}(T_{k-1})) \;\ll\; \mu(\mathrm{Cons}_k(T_k)).$$

for matched interaction budgets, meaning that lower-level traces shrink the consistent set faster.

Reconstruction inversion principle If $\Gamma_{k+1\downarrow k}$ is non-objectifiable at level k and there exists a downshift to a more identifiable stratum $k-1$, then reconstruction of $\Gamma_{k+1\downarrow k}$ is structurally forced to proceed via lower-level traces:

$$\mathsf{Cons}_k(\mathcal{T}_k) \;\supseteq\; \Pi(\mathsf{Cons}_{k-1}(\mathcal{T}_{k-1})),$$

where Π is a lifting operator mapping constraints identified at $k-1$ to constraints at k.
Importantly, downward reconstruction is not claimed to be merely monotone. Under the measure μ, there exist contexts in which the lifted lower-level constraints induce a proper restriction:

$$\mu(\mathrm{Cons}_k(T_k) \cap \Pi(\mathrm{Cons}_{k-1}(T_{k-1}))) < \mu(\mathrm{Cons}_k(T_k)).$$

In such cases, lower-level reconstruction is structurally informative, not because it is epistemically superior, but because it introduces constraints unavailable at the higher level alone.
Downward reconstruction is structurally privileged rather than universally necessary. In architectures satisfying the following condition:

(i) k-level traces alone are insufficient for asymptotic contraction of $\mathrm{Cons}_k(T_k)$ over the relevant internal-time horizon (i.e., without invoking a downshift, the consistent set cannot be driven below a nontrivial residual uncertainty),

downward reconstruction becomes structurally privileged in the following sense: any reconstruction policy that achieves asymptotic contraction of $\mathrm{Cons}_k(T_k)$ must assign nonzero measure to downward reconstruction moves $W_{\downarrow,k}$. This is a structural necessity under condition (i), not a claim that every downshift is informative or that every downward reconstruction succeeds.

Interpretation: the "lower" stratum can become the effective key to the "higher" one, not by ontological priority, but by identifiability of trace-induced invariants.

Limits of downward reconstruction. The claim is not that any downward move yields a correct or unique reconstruction. Lower-level traces may be noisy, misleading, or insufficient, and reconstruction may overfit local regularities. The structural claim is weaker and directional: under non-objectifiability of the generative level, any reconstruction process that succeeds in contracting the consistent set must rely on more identifiable strata. Success is not guaranteed; the direction is structurally forced.

Will as a reconstruction-direction operator

We introduce a new component of the Will operator: not Will as action selection, but Will as control of reconstruction direction.
Will is introduced as a structural primitive governing the direction of reconstruction, not as a mechanism, optimizer, or measurable quantity. No claim is made that Will is computable, learnable, or reducible to attention, inference, or optimization dynamics.

Non-reduction of Will. The Will operator introduced here is not an optimization objective, an attention mechanism, an inference rule, or a decision policy. It does not rank alternatives, estimate values, or select actions for execution. Instead, it specifies a structural constraint on the *direction* of admissible reconstruction moves under non-objectifiability of the generative level. Will is treated as a primitive architectural principle governing which forms of reconstruction are permitted, not as a mechanism to be optimized or learned.

Reconstruction actions. Let $\mathcal{U}_k$ be a set of *reconstruction moves* available at level k, such as selecting probes, choosing simplifications, allocating attention, restricting hypothesis classes, or selecting which strata to instrument.

A reconstruction move $u \in \mathcal{U}_k$ induces an intervention on the trace process:

$$\mathcal{T}_k \;\mapsto\; \mathcal{T}_k(u), \quad \textit{hence} \quad \mathsf{Cons}_k(\mathcal{T}_k) \;\mapsto\; \mathsf{Cons}_k(\mathcal{T}_k(u)).$$

Will-as-Reconstruction operator W^R

I model Will at stratum k not as a single computable mechanism, but as a structural admissibility constraint over a nonempty class of reconstruction-selection operators. Concretely, let

$$\mathcal{W}_k^R \;\neq$$

denote a class of admissible selection operators. Any particular admissible selector $w_k^R \in \mathcal{W}_k^R$ is an operator of the form

$$w_k^R : \ (x_k,\, h_k,\, \tau_k) \ \mapsto \ u_k \ \in \ U_k.$$

This representation fixes the type-theoretic role of Will (as a constraint over admissible operators) without asserting that Will is reducible to optimization, attention, inference, or any specific computable estimator. Formally, W_k^R specifies a constraint on the space of admissible reconstruction-selection functions, rather than denoting a single computable function.

Objective of reconstruction (not utility). The target is not reward maximization but *consistent-set contraction*:

$$\Delta\mathrm{Cons}(u) \ := \ \mu(\mathrm{Cons}_k(T_k)) \ - \ \mu(\mathrm{Cons}_k(T_k(u))),$$

A move is reconstruction-effective if $\Delta\mathsf{Cons}(u) > 0$.

Structural safety of reconstruction. Reconstruction moves must preserve identity continuity and avoid irreversible semantic commitment under uncertainty. This directly couples W^R to admissibility and GAG-like constraints.

Downward reconstruction subspace

Downward reconstruction subspace. Let $\mathcal{W}_k$ denote the space of Will-acts at level k. Define the downward reconstruction subspace $\mathcal{W}_{\downarrow,k} \subseteq \mathcal{W}_k$ by:

$$u \in \mathcal{W}_{\downarrow,k} \quad \Longleftrightarrow \quad \exists \downarrow u : \mathcal{X}_k \to \mathcal{X}_{k-1} \ s.t. \ \mu(\mathrm{Cons}_{k-1}(T_{k-1}(\downarrow u))) \ll \mu(\mathrm{Cons}_k(T_k))\,,$$

under comparable interaction budgets.

Non-membership criteria. A Will-act is *not* in $\mathcal{W}_{\downarrow,k}$ if it attempts direct objectification of $\Gamma_{k+1\downarrow k}$ (forbidden by non-objectifiability), or if it collapses alternatives through irreversible commitment rather than contracting the consistent set via trace evidence.

Downward reconstruction is structurally privileged if the generative operator is non-objectifiable, identifiability strictly improves under some downshift, and (i) level-k traces alone are insufficient for asymptotic contraction of Cons_k. Under these conditions, any reconstruction policy that asymptotically contracts Cons_k must place nonzero measure on $\mathcal{W}_{\downarrow,k}$.

Architectural consequences: admissibility, commitment, internal time, ASC, and GAG

Admissibility as protection against premature closure. Let Commit_k denote a class of irreversible semantic commitments at level k (i.e., operations that collapse future option sets). Reconstruction requires maintaining multiplicity until the consistent set has contracted enough.

Thus, admissibility must gate commitments as a function of reconstruction maturity. Irreversibility and admissibility are evaluated in a stratified manner. At each cycle, irreversibility is assessed relative to the current admissible dynamics, without retroactive reclassification. This stratification is intended to yield a well-defined (non-retroactive) semantics and to avoid circular dependence; in embodiments where the associated update operator is monotone over the chosen order, a fixed point exists by standard lattice arguments.

[Reconstruction maturity functional] Define a reconstruction maturity functional

$$M_k \ := \ 1 \ - \ \frac{\mu(\mathrm{Cons}_k(T_k))}{\mu(\mathrm{Cons}_k(T_k^{\mathrm{prior}}))}.$$

where $\mathcal{T}_k^{\mathrm{prior}}$ is a baseline trace set (e.g., start of the episode/regime). Higher M_k indicates stronger contraction of the consistent set. Here M_k is a functional of T_k; dependence on τ_k enters only through the thresholding function $\theta_M(\tau_k)$ used in the ASC condition.

Internal time as stabilization budget. Internal time τ_k bounds how fast commitments can become admissible. We enforce that maturity cannot be accelerated by purely internal coherence.

Non-causal stabilization constraint There exists a bound $\theta_M(\tau_k)$ such that admissible irreversible commitment requires

$$M_k(T_k) \geq \theta_M(\tau_k),$$

and θ_M is nondecreasing in τ_k (stabilization requires internal-time accumulation).

ASC as pathological closure of reconstruction. Abstraction Self-Closure (ASC) is characterized by internally coherent semantics dominating trace-derived constraints, causing spurious contraction of Cons_k without genuine evidence.

ASC in reconstruction terms Novelty is treated as a structural functional over traces. Let $\mathcal{T}_k$ denote the space of admissible traces at level k, equipped with a metric or pseudometric d_k. Novelty(T_k) quantifies the minimal distance between newly observed traces and the span of previously accumulated traces. No specific metric or estimator is assumed.

ASC holds over an interval if the system exhibits apparent maturity increase $\Delta\mathsf{M}_k > 0$ while external trace novelty remains below a threshold:

$$\Delta M_k(T_k) > 0 \quad \textit{and} \quad \mathsf{Novelty}(\mathcal{T}_k) < \epsilon.$$

GAG as a necessary gate under ASC. Grounding-Admissibility Gate (GAG) prohibits irreversible commitments when ASC is sustained:

$$\mathrm{ASC} = 1 \ \Rightarrow \ \mathrm{Adm}(\mathrm{Commit}_k) = 0,$$

i.e., authorization is denied regardless of internal coherence.

Necessity of GAG under non-objectifiability If the generative operator is non-objectifiable and internal semantics can self-stabilize without increasing trace novelty, then a non-bypassable gate (GAG) is necessary to prevent irreversible commitments from being triggered by spurious maturity.

The Grounding-Admissibility Gate is architecturally necessary to guarantee non-bypassable prevention of irreversible commitments under ASC. Policy-level prohibitions are insufficient, as they remain subject to optimization-level circumvention.
In particular, a prohibition expressed inside the optimization or learning objective remains part of the objective landscape and can be bypassed by search, gradient pressure, proxy objectives, or auxiliary models. By contrast, a gate implemented as an authorization boundary removes the prohibited operation from the domain of evaluation and therefore cannot be circumvented by optimizing over it. This is the standard policy-versus-mechanism separation: policy may be optimized around, while an external authorization mechanism defines what is not available to optimize.

Information firewall consistency. Since the true generative operator cannot be exposed as an object, the system must restrict access to viability geometry. This is consistent with the above: reconstruction proceeds via traces, not via direct optimization against the gate.

Conclusion

This work has argued that a persistent class of failures in adaptive systems does not originate from insufficient optimization, inaccurate models, or incomplete information, but from a deeper architectural misordering. When systems are allowed to evaluate, simulate, or learn from operations before determining whether those operations are structurally admissible, irreversibility enters the system prematurely. Once this occurs, no subsequent optimization can restore lost futures, regimes, or identity continuity.

By treating admissibility as an architectural primitive rather than a derivative of scoring, confidence, or constraint satisfaction, the framework repositions decision-making within a broader ontological context. Authorization is shown to be prior to choice, and commitment prior to belief. Irreversibility is reframed not as extreme cost, but as the contraction of future admissible structure. Internal time is not a metric of duration, but a measure of structural exposure and readiness for commitment.

Crucially, the contribution of this work is not procedural. It does not propose new algorithms, estimators, or control laws. Instead, it identifies a missing layer that governs when adaptive processes are allowed to operate. This layer is orthogonal to learning, compatible with existing methods, and non-reducible to optimization logic. Its absence explains why increasing intelligence, confidence, or computational power often amplifies fragility rather than robustness in long-horizon systems.

Within the ONTOΣ trajectory, this paper completes a transition from Will as an ontological operator to admissibility as its architectural consequence. Will does not select outcomes; it constrains the direction in which reconstruction is possible under non-objectifiability of the generative level. Admissibility, in turn, is the structural manifestation of that constraint: a boundary that preserves coherence by regulating when irreversibility may occur.

The result is not a solution, but a clarification. It establishes why certain questions cannot be answered by better optimization, and why certain failures cannot be repaired after the fact.

By making authorization explicit and prior to evaluation, the framework closes a conceptual gap that has long been obscured by conflating choice with permission.

The contribution is architectural, not algorithmic; ontological, not procedural. It does not prescribe how systems should decide, but when they are allowed to do so.

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https://doi.org/10.5281/zenodo.18444733
https://github.com/petronushowcore-mx/ONTO-V-Direction-of-Reconstruction-as-a-Will-Operator