

Operator Closure Constraint (OCC): The First Principle

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Abstract

Failures in human coordination are commonly attributed to culture, psychology, or management, yet many exhibit the same measurable signature: obligations accumulate faster than they can be settled *durably* under real accountability. The Operator Closure Constraint (OCC) formalizes this as a boundary condition on consequence-bearing systems that require accountable, contestable human determinations. At a declared consequence boundary, durable settlement requires uncertainty reduction through a finite closure channel. When uncertainty-reduction demands persistently outpace effective closure capacity—under drift, opacity, coupling, or required fidelity—the unmet remainder is conserved in boundary accounting and reappears as predictable outputs: thickening delays and tails, increased return-work, displacement of obligations across ledgers or onto clients, degradation of auditability or actuation, and/or hysteresis after saturation. This preprint states the core constraint, the minimal bookkeeping identities required for measurement, and a falsifier. Measurement validity gates, displacement accounting discipline, and tiered claim permissions are specified in the accompanying Formal Specification and Adversarial Test Charter. [1,2,5,11]

1. Scope and boundary

OCC applies only at consequence interfaces where three conditions hold simultaneously: information must be compressed into human-scale representations; accountability requires identifiable human decision-makers who can defend determinations under credible contestability; action requires commitment under consequence. The consequence boundary is the interface where those determinations commit consequence-bearing resources.

2. Minimal objects

Let $(T>0)$ denote the declared reopen horizon used to define durable settlement at the declared consequence boundary. Define: initiation rate $(\lambda_{\text{exo}}(t))$, attempted closure rate $(\mu_a(t))$, return-work rate $(\rho(t;T))$, durable settlement rate $(\mu_d(t;T))$, and total unresolved obligation stock $(L_{\text{tot}}(t))$ at that boundary. Durable means does not reopen within (T) via declared reopen channels.

3. Two bookkeeping invariants

Hinge identity.

$$\begin{aligned} &[\\ &\mu_d(t;T) = \mu_a(t) - \rho(t;T). \\ &] \end{aligned}$$

Boundary conservation.

$$\begin{aligned} &[\\ &\frac{dL_{\text{tot}}}{dt} = \lambda_{\text{exo}}(t) - \mu_d(t;T). \\ &] \end{aligned}$$

These are accounting grammar. If they do not hold, the measurement system is invalid or the boundary is misdeclared. [5–7]

4. The constraint

There exists a finite closure channel ($C(t)$) representing uncertainty-reduction and verification capacity per unit time at the boundary such that durable settlement is bounded by what that channel can support at required fidelity under drift and contestability. This is a bounded-channel constraint claim: the channel is finite and becomes binding under sufficient load, drift, coupling, opacity, and required standard. [1–3]

Latent-channel clause. The first principle does not require direct measurement of ($C(t)$). Claims about changes in effective channel capacity and the evidentiary standards for falsification are defined in the accompanying Charter.

5. Conservation of the unmet remainder

When required uncertainty reduction persistently exceeds the effective closure channel at the declared boundary, durable settlement cannot keep up without cost. The conserved remainder must express as one or more of the following outputs:

Delay. Settlement times and tails thicken.

Return-work. ($\rho(t;T)$) rises and the hinge ($\mu_a - \mu_d$) widens.

Displacement. Obligations shift off-ledger or into adjacent ledgers or client burden without reduction in total debt at the declared boundary.

Auditability or actuation collapse. Accountable execution and defensibility degrade under verification budget gap and opacity. [12]

Hysteresis. Capability and coherence potential degrade under sustained exceedance and do not reset symmetrically when forcing later declines. [11]

6. Falsifier

OCC is falsified at the declared boundary if a sustained regime is observed in which obligations remain contestable and accountability remains real, drift and verification demands are materially

present, and durable settlement improves while return-work and tails do not rise, without displacement or auditability collapse, and without any effective increase in closure channel capacity or reduction in required fidelity or scope sufficient to trivially change the boundary's claim.

7. Notes on evidence

This first-principle statement is a constraint claim intended to be portable across domains. The validity gates for the declared horizon (T), boundary lock discipline, displacement evidence rules, contestability conditioning, channel-capacity proxy standards, and causal attribution standards are defined in the accompanying Formal Specification and Adversarial Test Charter.

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