

Reversibility-Aware Staged Commitment

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What Reversibility-Aware Commit Specifies

The architecture distinguishes between actuator commands by reversibility: highly-reversible (steering input, throttle modulation, signaling), partially-reversible (brake application, gear engagement, fluid administration), and committed (airbag deployment, surgical incision, weapon engagement, switch closure to a sealed substation). Reversibility classification per actuator type per operating context is governance-credentialed: the relevant authority publishes the classification, the platform consumes it through composite admissibility.

Stage-gated mode commits irreversible authority in successive bounded stages. Each stage is itself a smaller reversible decision; intermediate admissibility re-evaluation happens at every stage boundary. Aircraft landing flares progressively, surgical procedures advance through clinical stages, defensive engagement decomposes into target classification, weapon arming, and engagement commit — each stage is a structurally separate decision with its own admissibility computation.

Why Reversibility Is the Right Architectural Axis

Current autonomous-actuator architectures treat all commands uniformly. The architecture fits reversible commands (continuous control, repeated adjustment) and

forces irreversible commands into the same framework, producing structural mismatch between operational reality and architectural model.

Reversibility-aware commit fits the actual decision structure. Most autonomous decisions are reversible at the contemplation moment but become committed at some point in their execution. Architecturally identifying that point — and restructuring around it — eliminates the failure mode where irreversible decisions are made under architectural assumptions appropriate only for reversible ones.

How Stage-Gated Commit Composes With Mode Selection

When an action is classified as having a commitment point, the mode selection considers stage-gated as a primary candidate. The stage-gated mode decomposes the action into a sequence: stage one is a reversible setup, stage two is a partial commitment with intermediate verification, stage three is the irreversible commit under elevated admissibility.

Each stage is itself a credentialed observation with admissibility evaluation. Between stages, the platform re-evaluates the operating context and may abort the sequence if conditions change. The classification per actuator type per procedure stage is governance-credentialed and updated through credentialed governance updates rather than firmware revision.

What This Enables Across Domains

Aviation autonomous landing systems, autonomous surgical procedure progression, autonomous-defense engagement decomposition, autonomous medical-device dose progression, and autonomous-industrial-equipment commit sequences all benefit from the same architectural primitive. Reversibility classification varies across domains; the architectural mechanism is invariant.

Cross-domain reuse means the primitive applies across the regulatory frameworks each domain operates under (FAA airworthiness, FDA medical-device clearance, ISO industrial safety, DOD autonomous-weapon directives) without domain-specific re-implementation. The patent positions the primitive at the layer above each domain's specific safety logic.