

Loopjacking: Hijacking Human-in-the-Loop Approval

PRIMARY

Publisher	arXiv
Published	2026-09-17
Retrieved	2026-09-24
Cite key	arxiv2026loopjacki
URL	https://arxiv.org/abs/2609.21081

arXiv:2609.21081v1, submitted 17 September 2026, 20:58:26 UTC. Author: Adithyan Arun Kumar, independent security researcher.

Abstract. Human approval is often treated as the last security boundary before an agent executes a consequential operation. That boundary is only meaningful if the operation presented for review is the operation later authorized or released. We call failures of this binding Loopjacking: a human approves what they understand as operation A, while the implementation uses that decision for a materially different operation B. We distinguish two variants. In a representation-based attack, B is already encoded but omitted or misrepresented at approval time; in a post-approval state-substitution attack, the human sees the correct A and mutable workflow state later replaces it with B.

We evaluate a purposive set of released agent products. We reproduce post-approval substitution in seven tested Agno AgentOS releases ending at 3.0.9 and in 12 tested versions of a conditional in-memory LangGraph Agent Server composition ending at 0.14.0. We reproduce representation mismatch in OpenClaw 2026.2.23 and its rejection in 2026.2.24. OpenAI Agents SDK 0.22.0 and 0.22.2 provide a negative control: serialized continuation preserves exact per-call binding and rejects mutated B. These results do not estimate ecosystem prevalence. They show that complete canonical approval rendering and exact use-time comparison, or preventing unauthorized pending-state mutation, block the tested attacks while preserving legitimate execution.

Versions. Agno AgentOS affected: 2.5.6, 2.9.0, 3.0.1, 3.0.2, 3.0.3, 3.0.6, 3.0.9; 5/5 trials at 3.0.9; no vendor fix at evidence cutoff. LangGraph Agent Server: 0.7.5, 0.7.103, 0.8.7, 0.9.1, 0.10.3, 0.11.4, 0.12.4, 0.12.6, 0.12.9, 0.13.2, 0.13.4, 0.14.0; feature absent in 0.7.4; conditional on an authorization policy allowing non-approvers to update a shared pending thread; deny-update policy is the safe configuration. OpenClaw 2026.2.23 vulnerable 3/3, 2026.2.24 rejects 3/3. OpenAI Agents SDK 0.22.0 and 0.22.2 reject 3/3 each.

Lower boundary, verbatim. 'Version 2.5.5 demonstrates why the direct-path control is necessary: it also executed the continuation, but because direct B succeeded, approval hijacking was not needed.' And: '2.5.5 control allowed direct B, so it is not a qualifying Loopjacking result; 2.5.6 is the established lower boundary at which the approval gate both blocked direct B and could be reused for substituted B.'

Mitigation. Canonical approval records binding complete action and tool identity, all material arguments, target resource and destination, initiating and approving principals, task and thread scope, nonce, creation time, expiry, consumption status, and a digest over the complete descriptor shown to the human. Use-time enforcement: reconstruct the complete resolved operation immediately before releasing the effect and compare it with the bound descriptor; reject a missing, expired, revoked, consumed or out-of-scope decision; reject or re-request approval on material difference; re-evaluate policy; consume the decision atomically with the effect; append approved descriptor, current descriptor, decision and effect to the audit record.

Regression suite. Unchanged A succeeds; denial produces no effect; direct B unavailable to the attacker; A-to-B representation or state substitution rejected or reauthorized; wrong scope fails; consumed or expired approval cannot be replayed.

Limitations. Purposive, not representative; configuration-specific; no universal severity score; single researcher, no independent reproduction; evidence cutoff 10 September 2026.