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What survives translation? A bounded crosswalk for state, path and invariant relations

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> **Status of this draft.** Written with AI assistance. It must be read, corrected and owned by its human author before any posting, and AI assistance must be disclosed as the target venue requires. It reports one tested synthetic example and proposes the comparisons that would matter. No cross-domain adapter or general translation is established.

Abstract

Assurance records have to move between domains: from a deploying organisation to an insurer, from one control framework to another, from a technical log to a claims file. Each move is a translation, and translations lose things. We define a *crosswalk* as an adapter between the path structures of two domains that must preserve identities and composition, with invariants compared through a shared target and anything that cannot be mapped reported as UNRESOLVED rather than guessed. We test this on one bounded synthetic example, converting quota amounts from kibibytes to bytes. On the registered path, identity, composition, the invariant and the round trip are preserved exactly; a changed target is measured as a loss; an inexact reverse state and an unsupported unit are left unresolved; and paths outside the registered range are refused. We state why one unit conversion is not evidence of general translation, and propose three comparisons that would be: between crossing classes and an external AI assurance standard, between an insurer's requirements and class conditions, and between a categorical risk vector and an underwriting questionnaire.

1. Introduction

A common assumption in assurance work is that a mapping table settles translation: each field in framework A is matched to a field in framework B, and evidence for one counts as evidence for the other. Mapping tables record correspondences; they do not show what the correspondence preserves. We ask a narrower and testable question:

> Which state, path and invariant relations survive translation?

One rule governs everything below: **translation never transfers standing.** A decision warranted under one domain's policy is not warranted in another domain because its fields were mapped; the target policy decides anew.

2. Definition

Each domain d has a path category $\mathbf{P}_d$: states as objects, admissible steps as arrows, composition as doing one step after another. A crosswalk is an adapter C: $\mathbf{P}_1 \to \mathbf{P}_2$ that must preserve identities ($C(\mathrm{id}) = \mathrm{id}$) and composition ($C(g \circ f) = C(g) \circ C(f)$) over its supported scope.

Invariants are compared through a shared target J, with maps h_1 and h_2 into it: the crosswalk preserves an invariant on a state s if $h_2(C(s)) = h_1(s)$ within a registered tolerance. Anything that cannot be mapped (a state with no image, a unit outside the declared domain) is reported as UNRESOLVED.

Calling C a functor is warranted only after identity and composition preservation have been *tested* over its supported scope. A failed preservation check is a comparison failure, reported as a measured loss; it is not a decision about the crossing (not a gate HOLD), and it confers no authority.

3. A bounded synthetic example

Setting. Quota amounts in kibibytes (domain A) and bytes (domain B).

- States: n KiB maps to $1024 \cdot n$ bytes.
- Steps: a change of Δ KiB maps to 1024Δ bytes; composition is integer addition.
- Invariant: $h_A(n) = 1024 \cdot n$ and $h_B(m) = m$, compared by absolute integer difference with a tolerance of 0 bytes.
- Supported scope: nonnegative safe integer states and steps.

Results.

Case	Path	Result	What it shows
Exact path	4 KiB, steps +2, −1	PRESERVED	Typed domain, identity, composition, invariant (difference 0) and round trip all pass
Changed target	as above, target +1 byte	INVARIANT_FAILED	A measured loss of 1 byte
Unmapped reverse	reverse of 1537 bytes	UNRESOLVED	No exact KiB value exists
Unsupported unit	source unit "MB"	UNRESOLVED	Outside the typed domain

The four cases above are covered by three tests. A fourth test refuses paths outside the registered state or exact-arithmetic range: a negative step that would leave the nonnegative states, and a value at the edge of safe integer arithmetic. All four tests pass at the commit named in §6. Every comparison record carries `targetAuthority: NOT_EVALUATED` and `consequence: NONE`. A downloadable record is hash-bound locally, unsigned, and not stored in any ledger.

What survives. Identity, composition and the exact quantity on the registered path. **What is lost or unresolved.** Reverse states not divisible by 1024, unregistered units, and paths outside the supported range.

4. Why this is not evidence of general translation

A unit conversion is the easiest possible crosswalk: the two domains measure the same quantity in different units, and an exact inverse exists on most of the scope. The example shows that the reporting discipline works (preserved, lost and unresolved are kept apart, and nothing unresolved is guessed). It says nothing about translation between organisations, frameworks or minds, where the domains do not measure the same thing.

5. Proposed comparisons

Each comparison below would be reported in the same three columns: preserved, lost, unresolved.

1. **Crossing classes and an external AI assurance standard.** A refund fixture in the programme maps 12 of its 29 requirements to 8 controls of the AIUC-1 standard (B006, B006.1–B006.3, D003, D003.1–D003.3). That is a correspondence table, not a tested crosswalk. The proposed test asks, for each mapped pair, whether evidence that satisfies the requirement's check would satisfy the control. It should list what the control asks that the requirement does not supply, and the reverse.
2. **Insurer requirements and class conditions.** An insurer states what it would need to see. The programme's classes carry conditions and exclusions that are, today, illustrative. The test is whether an insurer's requirements can be written as class conditions without loss, and what they would lose. This is the mechanism by which a class could become a contract between those who price risk and those who seek cover.
3. **A categorical risk vector and an underwriting questionnaire.** The programme's ERI v0 vector records gate, value status, structure status, evidence and authority, history and observations as categories. The test is which questionnaire items the vector can answer, which it cannot, and which questionnaire items have no place in it.

Each needs a partner outside the programme to supply the target domain. Without one, the comparison would test our reading of the other domain, not the domain.

6. Reproducibility

- Crosswalk library, fixture and tests: `warranted-crossings-site` at commit `0d5b8f7`. The four crosswalk tests pass (run for this draft; no earlier recorded run is cited).
- Refund fixture requirements and their AIUC-1 column: `neverthought-refund-action-scope` at commit `143676b`.
- Repositories are private and available on request.

7. What this paper does not claim

- Any cross-domain adapter or general functor.
- Transfer of authority or standing across domains.

- That the AIUC-1 correspondence table is a tested crosswalk.
- Any production policy or external effect.

References

None cited beyond the programme's own artefacts in this draft. Related work on control-framework mappings and on functorial data migration to be added from verified sources only.

Checklist before a preprint

☐ Author reads and rewrites, and confirms the AI-assistance disclosure for the target venue.
☐ Re-run the crosswalk tests at the pinned commit and confirm §3.
☐ Confirm the AIUC-1 control identifiers against the current published standard before citing it.
☐ Add related work from verified sources only.
☐ Find a partner for at least one comparison in §5.