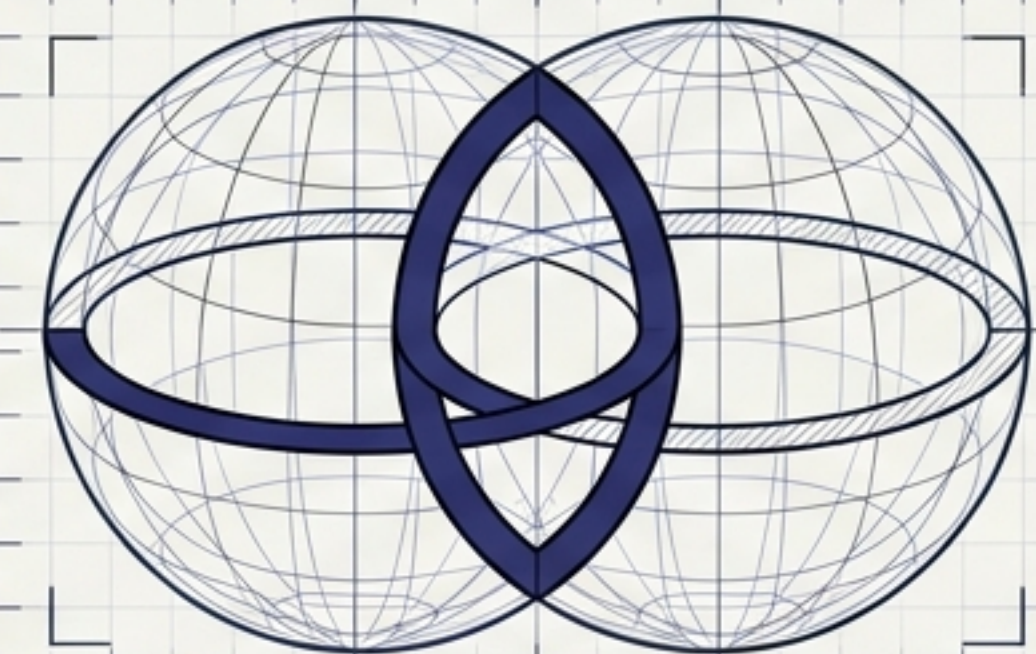




Polynomial Functor Interface Dynamics and Formal State Transition Grammars for Multiversal Boundary Mechanics

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FRAMEWORK: Structured Multiversal Interactions (SMI)

ARCHIVE RECORD:

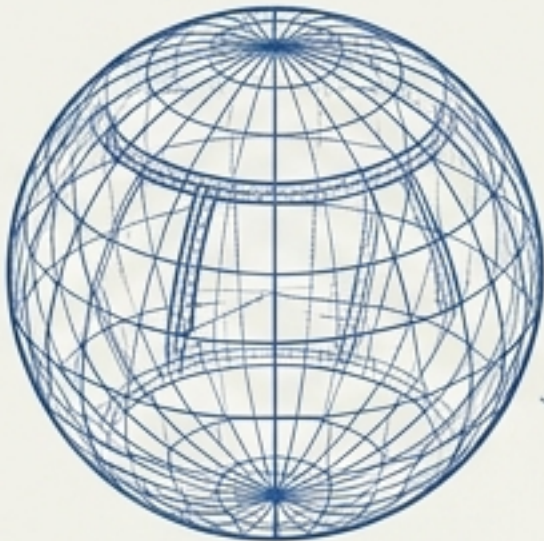
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Heterogeneous domain interactions trigger catastrophic state corruption in linear physical models.

DOMAIN 1
[TYPE: HIGH-INDEX SYSTEM]

$$\mathbf{D}^{(1)} \in \mathbb{R}_H^N$$

STRUCTURAL INTEGRITY:
NOMINAL (PRE-COLLISION)

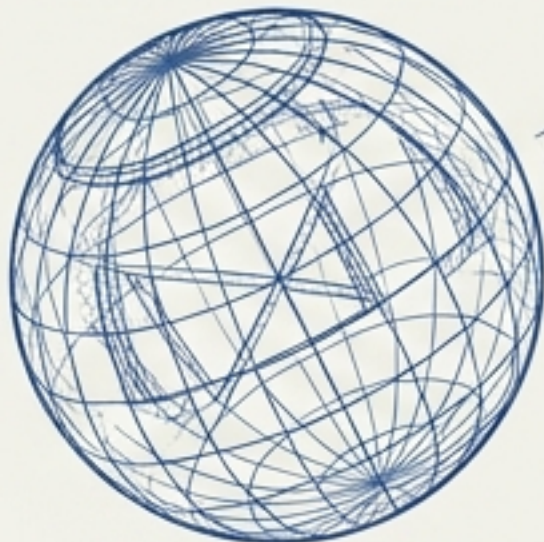


$$\mathbf{D}^{(1)} \in \mathbb{R}_H^N$$

DOMAIN 2
[TYPE: LOWER-INDEX SUB-DOMAIN]

$$\mathbf{D}^{(2)} \in \mathbb{R}_L^M$$

STRUCTURAL INTEGRITY:
NOMINAL (PRE-COLLISION)



$$\mathbf{D}^{(2)} \in \mathbb{R}_L^M$$

STATE CORRUPTION ⚠
[WARNING: DATA INTEGRITY LOSS DETECTED]

LOGICAL INCOHERENCE ⚠
[ERROR: RULESET CONTRADICTION]

THE DILEMMA:

Interactions across divergent physical, logic, or narrative laws destroy structural integrity.

CROSS-DOMAIN INTERACTION:	FAILED
LAW COMPATIBILITY:	< 10%
STRUCTURAL YIELD POINT:	EXCEEDED

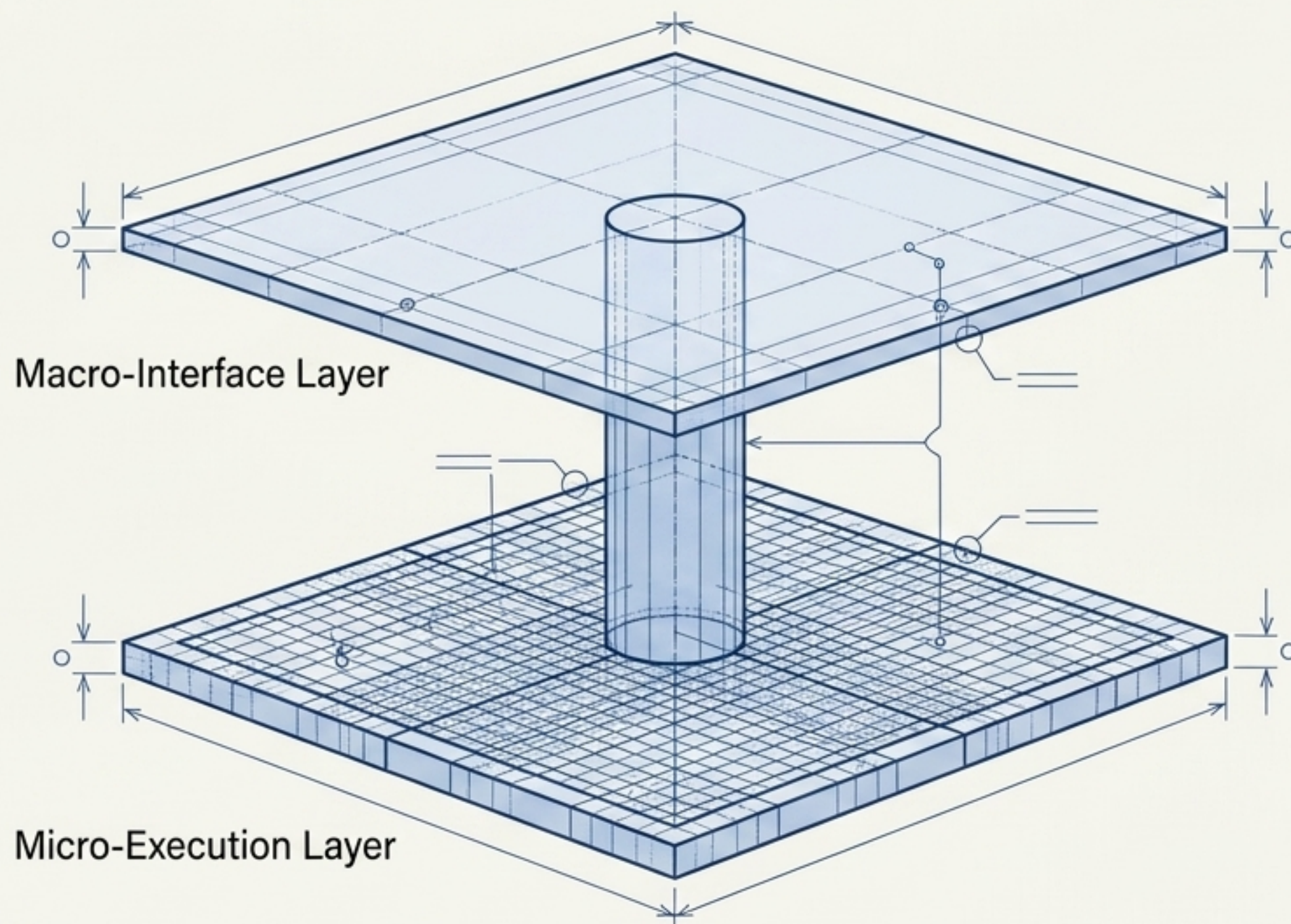
THE FAILURE POINT:

Traditional linear state machines and closed-system models fail to preserve sovereignty hierarchy when high-index systems interact with lower-index sub-domains.



MODEL TYPE:	LINEAR CLOSED-SYSTEM
SOVEREIGNTY HIERARCHY:	COMPROMISED
INTERACTION MODEL:	UNSTABLE
FUNCTOR:	$F(\mathbf{D1} \cap \mathbf{D2}) \neq F(\mathbf{D1}) \cup F(\mathbf{D2})$

A bifurcated mathematical architecture prevents systemic incoherence during reality-level transfers.



Macro-Interface Layer:

Governed by polynomial functors (Poly).
Handles interface reconfiguration, boundary constraints, and rule projection across scalar gradients (Ξ_{TM}).

Micro-Execution Layer:

Governed by formal string-rewriting grammar (G_TrueFlow).
Executes spatial shifts, energy pulses, and structural locks within permitted spaces.

Mapping the operational domains: Category Theory sets boundaries, String Rewriting executes movement.

	Layer 1: Macro-Interface	Layer 2: Micro-Execution
Governing Math	Polynomial Functors (Poly) $\text{Poly}) = \sum_{i=1}^n (f^n + \Xi_H)$	4-Tuple State Transition Grammar (G_TrueFlow) $I = \{u_1, \tilde{v}, k_i, \beta, u_m\}$
Operational Scale	Universal Domains (D) & Reality Level Scalars (Ξ)	Atomic vectors and primitives
Core Function	Enforces asymmetric rule projection & sovereignty	Governs combat movement, spatial shifts, and structural locks
Outputs	Boundary Morphisms (ϕ) $\varphi = 0 \rightarrow \mathbf{D}(\mathfrak{y})$	Validated Interaction Strings & Equilibrium States

The Macro-Layer maps coherent world-states and admissible operations as polynomial functors.

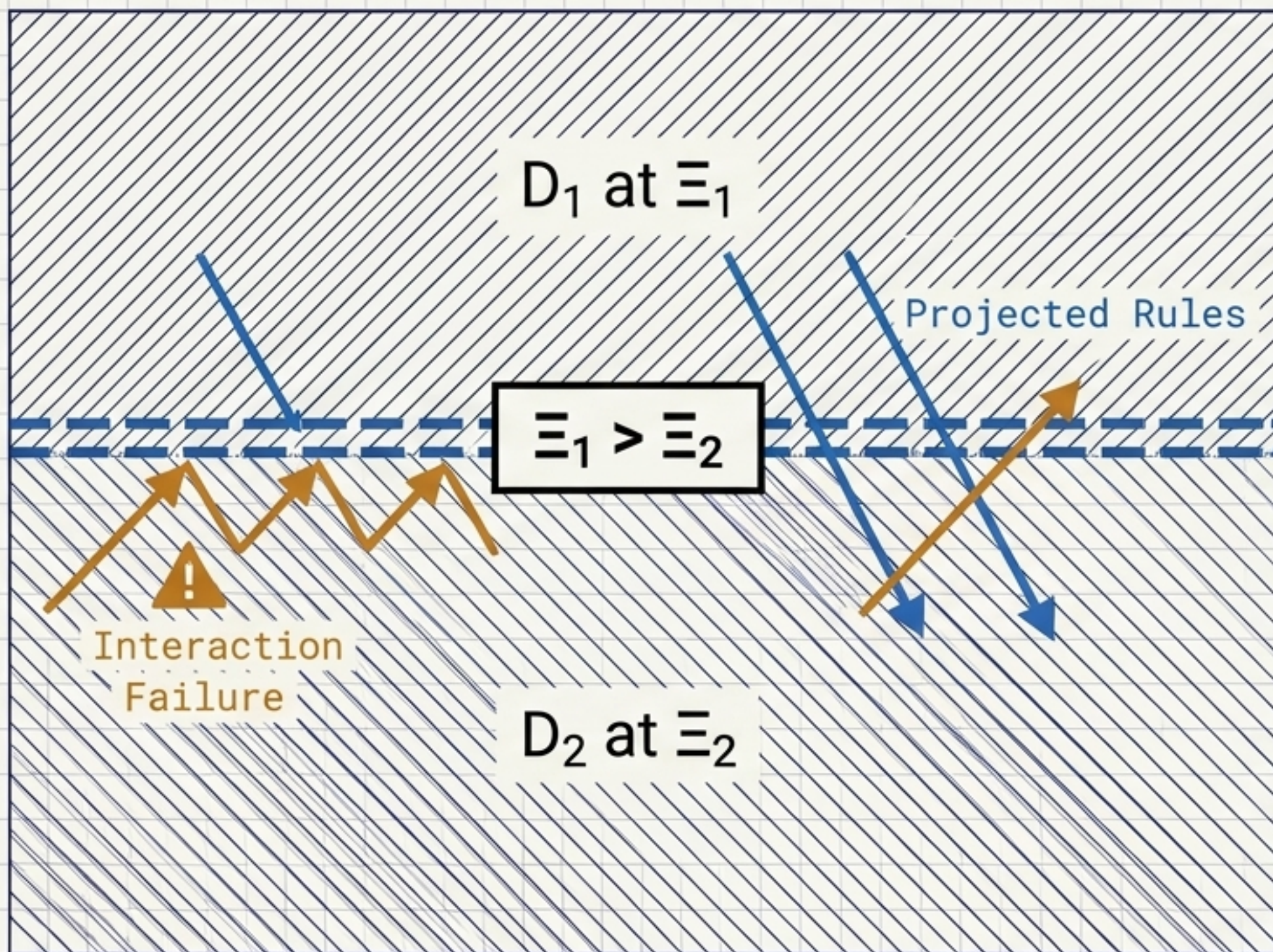
Universal Domain (D):
A specific reality state
space operating at scalar
level Ξ .

Positions(D):
The set of attainable, structurally
coherent world-states achievable
at that scalar level.

$$P_D(\mathbf{y}) = \sum_{S \in \text{Positions}(D)} y^{\text{Directions}(D, S)}$$

Directions(D, S):
The set of admissible input operations,
interaction vectors, or directional choices
available when domain D is in state S .

The Sovereignty Law enforces top-down rule dominance across reality scalar gradients.

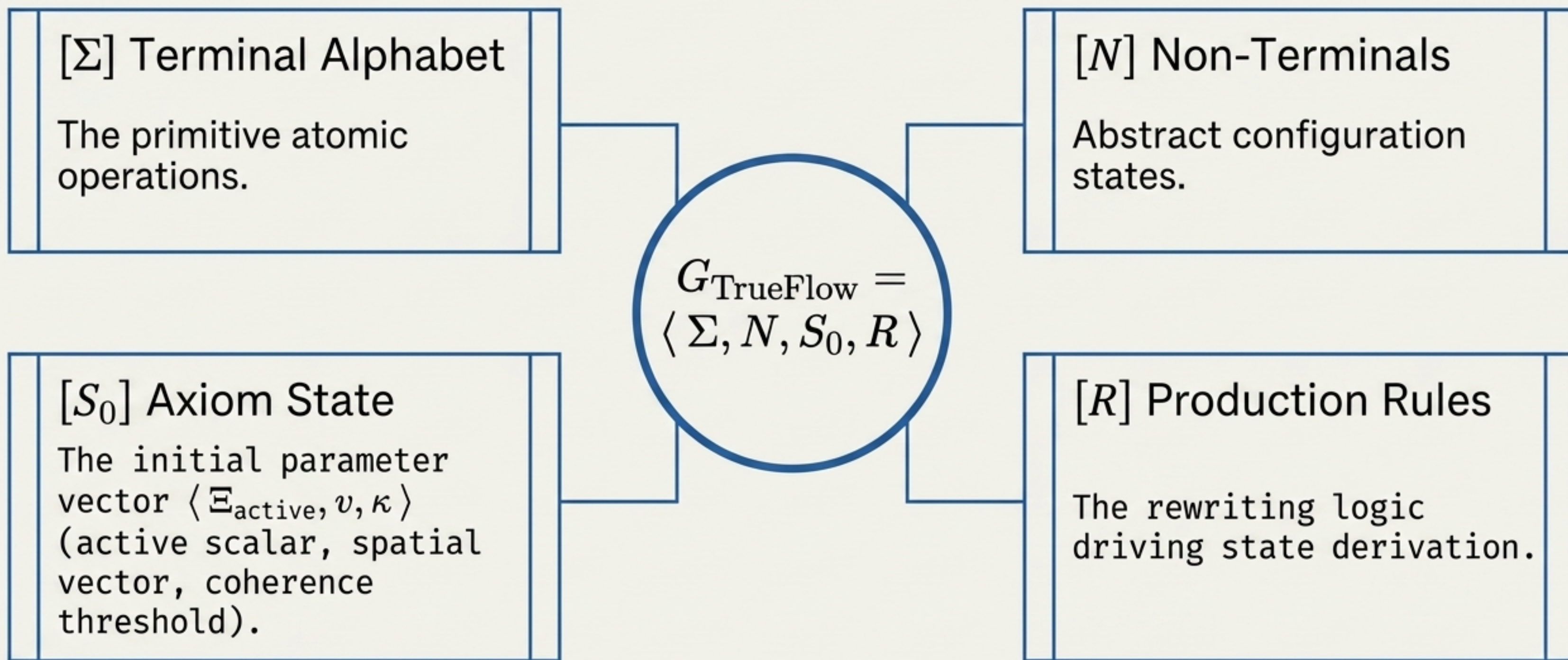


Boundary Morphisms: Interaction is modeled as $\varphi: \mathbb{P}_{D_1} \rightarrow \mathbb{P}_{D_2}$.

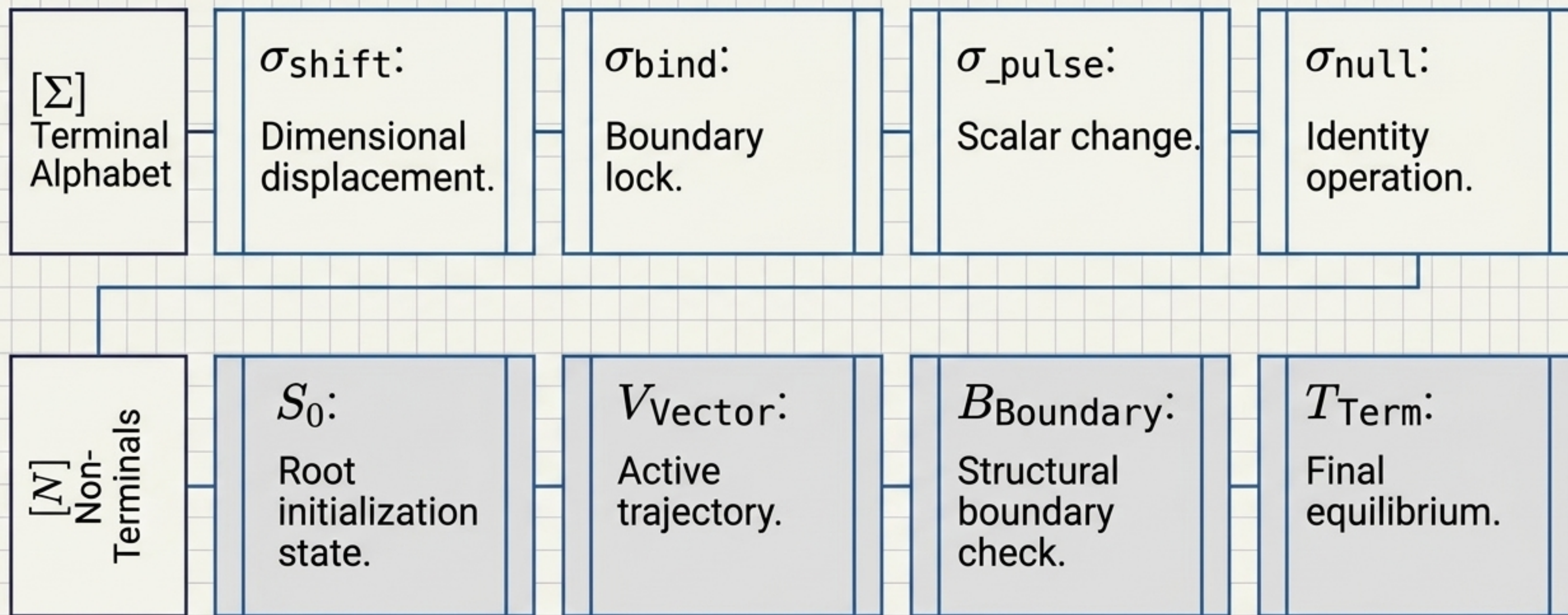
Dual Mapping: Consists of state-mapping (φ_{pos}) and constraint-mapping (φ_{dir}).

Asymmetric Injection: Because φ_{dir} is strictly non-surjective, the higher layer projects non-reciprocal constraints restricting the lower layer's direction space, fully immunizing D_1 from lower-layer contamination.

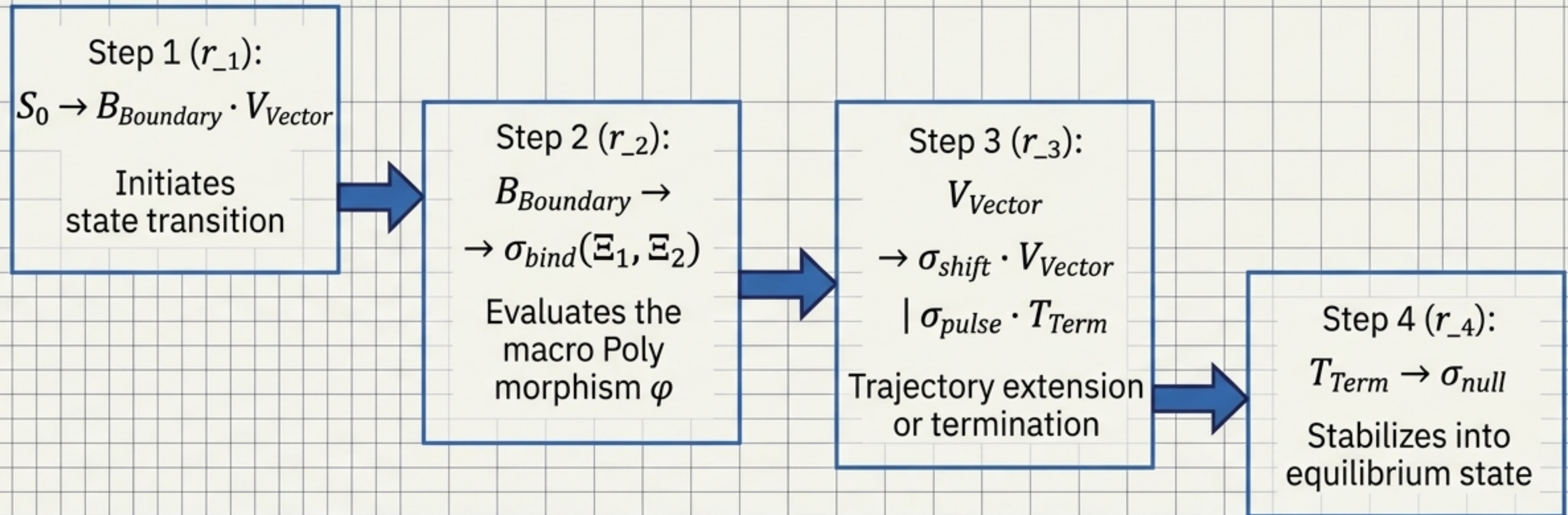
The Micro-Layer relies on a 4-tuple formal grammar to dictate local trajectory resolution.



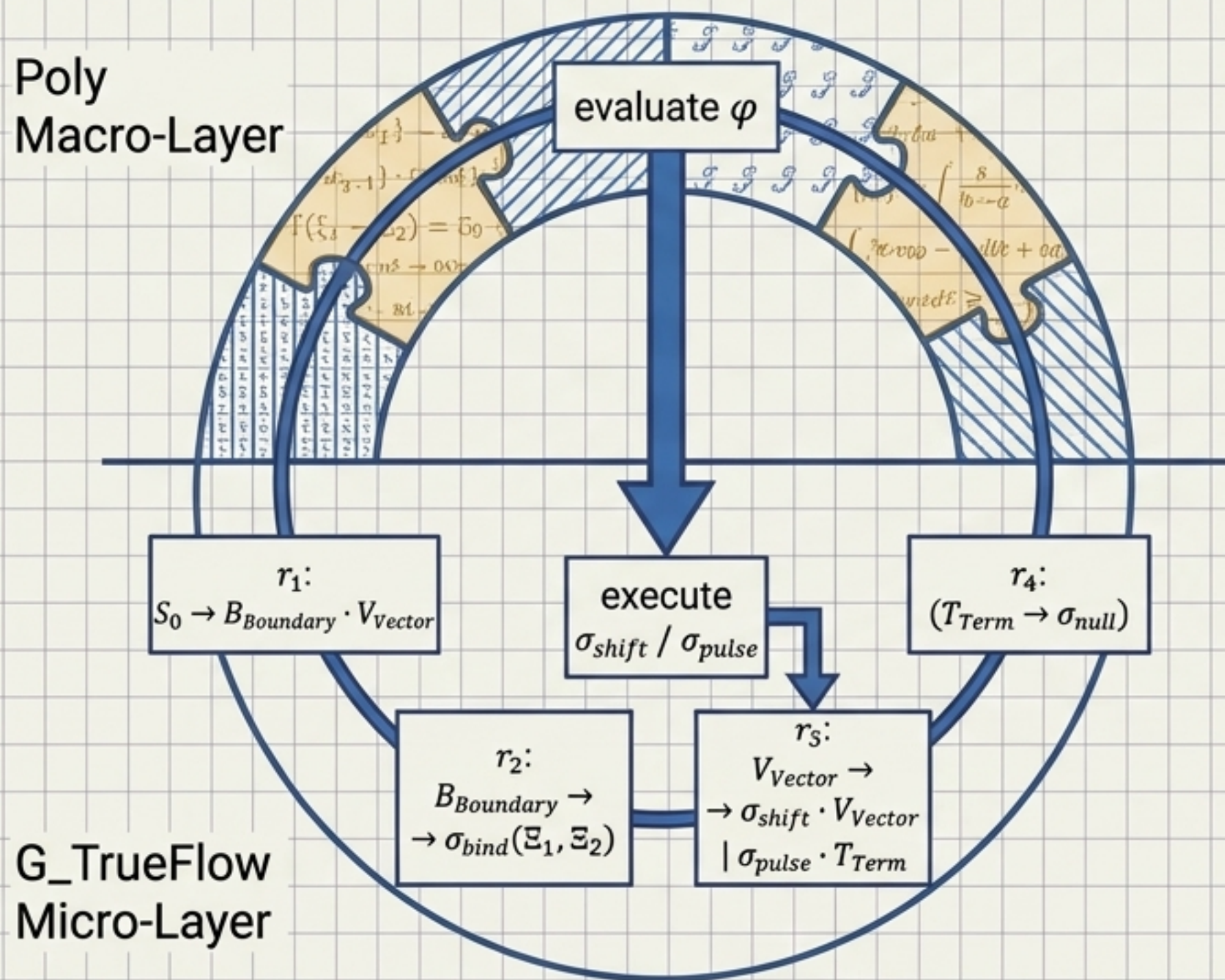
Primitives and configuration states form the atomic toolkit for spatial and scalar manipulation.



Production rules dictate deterministic evolution from initiation to structural equilibrium



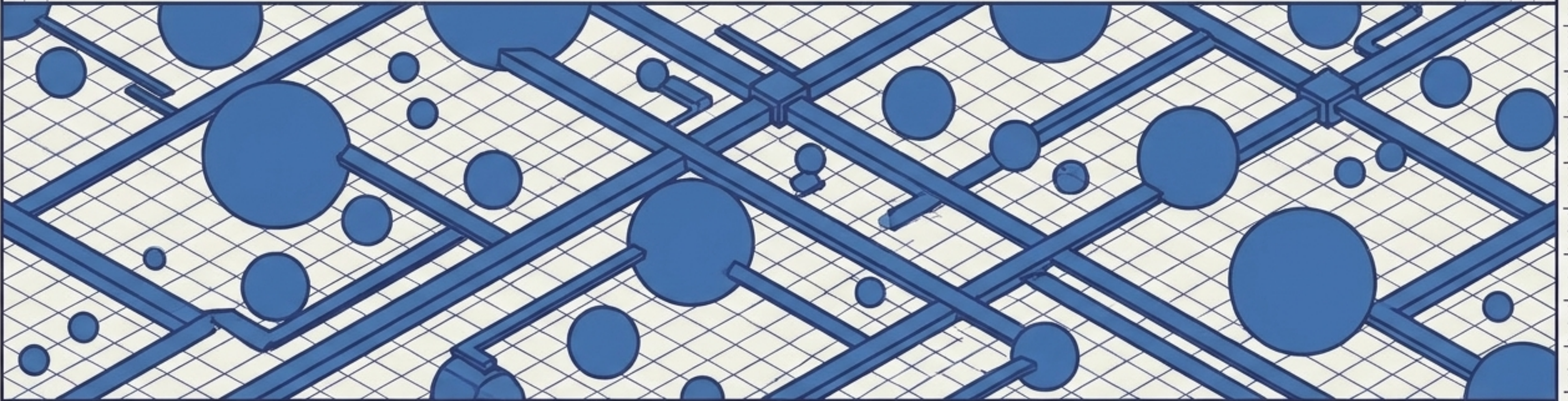
The Integrated Pipeline: Macro boundary checks physically authorize micro trajectory resolutions.



Pipeline Insight:

The architecture guarantees that no micro-level action (σ_{shift}) can execute unless authorized by the upper boundary constraint, structurally preventing **multiversal corruption**.

Global soundness and functorial compositionality scale infinitely across arbitrary multiversal chains.



Global Soundness

Formal proof sketches validate the language $\mathcal{L}(\text{G_TrueFlow})$, ensuring that all derived interaction strings are structurally coherent.

Infinite Compositionality

Because morphisms are natively compositional in category theory, boundary transitions remain perfectly mathematically sound across N -degree reality leaps.

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