ED and Global Constraints: The Architecture of Possible Worlds

Abstract

This paper develops the global constraint set that defines the space of possible ED worlds. In the ED ontology, stability, temporal asymmetry, horizon structure, and agency are not independent engineering domains but **globally bounded architectural regimes**. Each regime has a minimum threshold below which structure cannot form and a maximum threshold beyond which coherence fails. These limits arise not from external laws but from the internal logic of event density itself. We show that the Stability Constraint bounds persistence between dissolution and rigidity; the Temporal Constraint bounds becoming between stagnation and blowout; the Horizon Constraint bounds asymmetry between symmetry and fracture; and the Agency Constraint bounds autonomy between non-agency and coherence failure. These constraints form a **coupled manifold** in which each limit co-shapes the others, defining the structured region of possibility space within which ED universes can exist. We analyze the cosmological implications of this manifold, including the emergence of participation domains, stability basins, temporal rivers, and agent-driven architectural effects. Finally, we develop the dynamics of the constraint set itself, showing how global limits evolve, cascade, stabilize, and catastrophically fail. This paper completes the ED-Core sequence by establishing the global architectural envelope within which all motifs, horizons, agents, and cosmological structures must exist, and provides the foundation for the ED-Applications series.

1. Introduction — Constraints as the Architecture of ED Spacetime

ED spacetime is not an unbounded field of possibilities. It is a **constrained architecture**: a structured substrate whose global properties limit what motifs can exist, how they can evolve, and which engineering regimes are possible. These constraints are not imposed from outside the universe; they arise from the internal logic of event density itself. The ED substrate is self-limiting. Its global structure defines the space of possible worlds.

Every engineering regime developed in Papers A–E—computation, temporal engineering, stability engineering, horizon engineering, and agency—operates within a **finite architectural envelope**. Stability cannot increase without bound; temporal asymmetry cannot exceed certain gradients; horizons cannot form arbitrarily; agency cannot scale indefinitely. These limits are not engineering inconveniences. They are **ontological boundaries**: the structural constraints that define what an ED universe can be.

This paper develops the **global constraint set** that governs the ED substrate. These constraints shape:

- the persistence and collapse of stability cores
- the formation and fracture of temporal gradients
- the emergence and failure of horizon networks
- the density and complexity of agents
- the large-scale architecture of participation domains

Local motifs obey local rules. But the universe as a whole obeys **global constraints** that determine which local configurations are possible, stable, or forbidden. These constraints define the **constraint manifold**: the multidimensional space of all allowed ED worlds.

The purpose of this paper is to articulate these constraints, show how they interact, and demonstrate how they shape the global architecture of ED spacetime. This is the capstone of the ED-Core sequence. It reveals that the ED universe is not arbitrary, not accidental, and not unconstrained. It is a **structured possibility space** whose boundaries are written into the substrate itself.

Paper F therefore completes the foundational ontology of ED physics. It establishes the global limits within which all motifs, horizons, agents, and cosmological structures must exist. It is the architectural closure of the ED-Core series and the conceptual foundation for the ED-Applications series that follows.

2. The Nature of Global Constraints

Global constraints in ED are not external laws imposed on the substrate. They are **architectural necessities**: structural limits that arise from the internal logic of event density. Every motif, horizon, and agent exists within these limits, and every engineering regime developed in Papers A–E operates inside the envelope they define.

Global constraints determine which configurations of becoming are possible, which are stable, and which are forbidden. They are the **boundary conditions of the ED universe**.
This section develops the ontology of global constraints: what they are, how they differ from local rules, and why they define the space of possible ED worlds.

2.1 Local vs. Global Constraints

Local constraints govern **motifs**. They determine how a given structure can reorganize, stabilize, or interact with its immediate environment. Local constraints are the domain of engineering: they shape devices, horizons, agents, and participation networks.

Global constraints govern **the substrate itself**. They determine:

- which motifs can exist at all
- which gradients can form
- which horizons can stabilize
- which agents can persist
- which cosmological structures are possible

Local constraints shape behavior.
Global constraints shape **possibility**.

In ED terms:
Local constraints govern motifs; global constraints govern worlds.

2.2 Constraints as Architectural Necessities

Global constraints are not arbitrary. They arise from the **mathematical structure of event density**. The substrate cannot support:

- infinite stability
- unbounded temporal asymmetry
- arbitrarily steep gradients
- unlimited horizon networks
- unbounded agency complexity

These are not engineering limitations. They are **architectural necessities**: the substrate cannot be otherwise.

In ED terms:
A global constraint is a structural necessity of the substrate's architecture.

2.3 Constraints as Limits of Becoming

Every engineering regime has a **failure envelope**:

- stability collapses when saturation exceeds its coherence range
- temporal engineering fails when mobility gradients blow out
- horizon engineering fails when asymmetry fractures boundary layers
- agency fails when coherence cannot be maintained

These failures are not accidents. They reveal the **limits of becoming**: the boundaries beyond which the substrate cannot maintain coherent structure.

Global constraints are therefore the **outer envelope** of all possible becoming.

In ED terms:
Global constraints define the maximum allowable gradients of stability, mobility, and asymmetry.

2.4 Constraints as Cosmological Boundary Conditions

Global constraints do not merely limit motifs; they shape the **architecture of ED spacetime**. They determine:

- the size and structure of participation domains
- the distribution of stability basins
- the formation of horizon networks
- the density and complexity of agents
- the large‑scale temporal profile of the universe

These are the **cosmological boundary conditions** of the ED universe. They define the space of possible worlds and determine which universes can exist within the ED ontology.

In ED terms:
Global constraints are the boundary conditions that shape the architecture of ED spacetime.

3. The Stability Constraint

Stability is the foundation of structure in ED. Without sufficient saturation, motifs cannot persist; without limits on saturation, motifs cannot reorganize. The Stability Constraint defines the **global envelope** within which persistence is possible. It determines which motifs can exist, how long they can endure, and how stability cores shape the architecture of ED spacetime. This constraint is not a local engineering limitation; it is a **global boundary condition** that governs the entire substrate.

The Stability Constraint has four components: the minimum saturation required for persistence, the maximum saturation allowed before rigidity, the formation of stability wells that shape global structure, and the possibility of stability collapse as a cosmological event.

3.1 Minimum Saturation for Persistence

A motif cannot persist unless its saturation exceeds a global threshold. Below this threshold, reorganization outpaces coherence, and motifs dissolve into the substrate. This minimum saturation is not a local engineering parameter; it is a **global constant** of the ED universe.

Minimum saturation determines:
- the smallest possible stability core
- the shortest possible persistence timescale
- the minimum density of motifs in any region
- the lower bound on identity formation

If saturation falls below this threshold anywhere in the universe, that region becomes a **persistence void**: a domain where motifs cannot endure long enough to form structure.

In ED terms:
The universe imposes a minimum saturation below which persistence is impossible.

3.2 Maximum Saturation Before Rigidity
Saturation cannot increase without bound. Above a global maximum, motifs become too rigid to reorganize. They lose the capacity for becoming and collapse into structural dead zones. This maximum saturation is the upper limit of persistence.

Maximum saturation determines:
- the largest possible stability core
- the upper bound on identity density
- the rigidity threshold for motifs
- the limit of stability engineering

Regions that exceed this threshold become **rigidity basins**: zones where becoming is suppressed and motifs cannot adapt or evolve.

In ED terms:
The universe imposes a maximum saturation above which becoming is impossible.

3.3 Stability Wells and Global Structure
Between the minimum and maximum saturation thresholds, stability gradients form **stability wells**: regions where persistent motifs cluster, reinforce one another, and shape the local architecture of ED spacetime.

Stability wells:
- anchor participation domains
- stabilize temporal profiles
- influence horizon formation
- attract agents and collective motifs

These wells are not local phenomena. They are **global structural features** that shape the large-scale distribution of motifs across the universe.

In ED terms:
Stability wells are global attractors that structure the ED universe.

3.4 Stability Collapse as a Cosmological Event
When saturation falls below the minimum threshold or exceeds the maximum threshold, stability collapses. This

collapse is not a local failure; it is a **cosmological event**. Stability collapse can:

- dissolve entire participation domains
- destabilize horizon networks
- disrupt temporal profiles
- trigger cascades of structural failure

Stability collapse is therefore one of the fundamental global risks in ED cosmology. It marks the boundary between coherent worlds and impossible ones.

In ED terms:
Stability collapse is the global failure mode of persistence in the ED universe.

4. The Temporal Constraint

Temporal structure in ED is not an external dimension or a background parameter. It is a **rate architecture**: the pattern of mobility gradients through which motifs reorganize. Because becoming is the fundamental operation of the substrate, temporal behavior is globally constrained. The universe cannot support arbitrarily slow or arbitrarily fast becoming, nor can it sustain unbounded temporal shear. These limits are not engineering restrictions; they are **global architectural boundaries** that define which temporal profiles are possible in an ED world.

The Temporal Constraint has four components: the minimum mobility required for change, the maximum mobility allowed before runaway, the formation of temporal shear zones that partition spacetime, and the emergence of global temporal profiles.

4.1 Minimum Mobility for Change

Becoming requires motion in event density. If mobility falls below a global minimum, motifs cannot reorganize, gradients cannot propagate, and the substrate enters a state of **temporal stagnation**. This is not a local slowdown; it is a global failure mode in which the universe loses the capacity for change.

Minimum mobility determines:

- the slowest possible rate of becoming
- the minimum temporal resolution of motifs
- the lower bound on temporal engineering
- the threshold below which identity cannot adapt

Regions that fall below this threshold become **temporal dead zones**: domains where motifs persist without evolving, unable to reorganize or respond to gradients.

In ED terms:
The universe imposes a minimum mobility below which becoming is impossible.

4.2 Maximum Mobility Before Runaway

Mobility cannot increase without bound. Above a global maximum, motifs reorganize faster than coherence can be maintained. Temporal regulators fail, stability cores destabilize, and horizons fracture. This is **temporal runaway** at cosmological scale.

Maximum mobility determines:

- the fastest possible rate of becoming
- the upper bound on temporal acceleration
- the limit of temporal engineering
- the threshold beyond which motifs lose coherence

Regions that exceed this threshold become **temporal blowout zones**: domains where becoming outruns structure, dissolving motifs into incoherent flux.

In ED terms:
The universe imposes a maximum mobility above which coherence is impossible.

4.3 Temporal Shear as a Global Phenomenon

Between the minimum and maximum mobility thresholds, mobility gradients form **temporal shear zones**: regions where differences in rate-of-becoming become so steep that motifs cannot maintain coherence across the boundary.

Temporal shear zones:
- partition participation domains
- generate horizon-like asymmetries
- shape the flow of influence
- create large-scale temporal boundaries

These zones are not local artifacts. They are **global structural features** that shape the architecture of ED spacetime.

In ED terms:
Temporal shear is a global partitioning mechanism that structures the ED universe.

4.4 Global Temporal Profiles

The ED universe does not have a single rate of becoming. It has a **global temporal profile**: a large-scale pattern of mobility gradients shaped by stability wells, horizon networks, and the distribution of agents.

Global temporal profiles determine:
- the large-scale "flow" of becoming
- the temporal topology of participation domains
- the synchronization or desynchronization of regions
- the cosmological evolution of the substrate

These profiles are not imposed; they **emerge** from the interplay of global constraints.

In ED terms:
Global temporal profiles are the large-scale rate structures that shape ED cosmology.

5. The Horizon Constraint

Horizons are the architectural expression of **asymmetry** in ED. They enforce one-way participation, protect internal structure, and partition the substrate into distinct participation domains. But horizons cannot form arbitrarily, cannot steepen without limit, and cannot proliferate without destabilizing the substrate. The Horizon Constraint defines the **global envelope** within which directional participation is possible. It determines which horizons can exist, how they can interlock, and when they must collapse.

The Horizon Constraint has four components: the minimum gradient required for horizon formation, the maximum gradient allowed before blowout, the emergence of horizon networks, and the possibility of horizon collapse as a structural failure.

5.1 Minimum Gradient for Horizon Formation

A horizon cannot form unless the substrate supports a **minimum asymmetry** in mobility and saturation. Below this threshold, participation remains symmetric, influence flows freely in both directions, and no boundary layer can stabilize.

Minimum asymmetry determines:

- the smallest possible horizon
- the minimum directional bias in participation
- the lower bound on self‑protection
- the threshold for agent autonomy

Regions that fall below this threshold become **horizon‑free zones**: domains where motifs cannot protect themselves from external reorganization.

In ED terms:
The universe imposes a minimum asymmetry below which horizons cannot form.

5.2 Maximum Gradient Before Blowout

Asymmetry cannot increase without bound. Above a global maximum, boundary layers fracture, directional participation fails, and horizons “blow out” into unstable discontinuities. This is the horizon analogue of temporal runaway.

Maximum asymmetry determines:

- the steepest possible horizon
- the upper bound on directional participation
- the limit of horizon engineering
- the threshold beyond which boundary layers cannot cohere

Regions that exceed this threshold become **asymmetry fracture zones**: domains where horizons cannot stabilize and participation becomes chaotic.

In ED terms:
The universe imposes a maximum asymmetry above which horizons cannot cohere.

5.3 Horizon Networks

Between the minimum and maximum asymmetry thresholds, horizons interlock into **horizon networks**: large‑scale structures that partition ED spacetime into participation domains. These networks are not local artifacts; they are **global architectural features**.

Horizon networks:

- define the topology of participation domains
- regulate influence flow across regions
- shape stability wells and temporal profiles
- constrain the movement and evolution of agents

Horizon networks are the ED analogue of cosmic boundary structures — not imposed, but emergent from the substrate's global constraints.

In ED terms:
Horizon networks are global participation architectures that structure the ED universe.

5.4 Horizon Collapse as a Structural Failure

When asymmetry falls below the minimum threshold or exceeds the maximum threshold, horizons collapse. This collapse is not a local malfunction; it is a **structural failure** that can destabilize entire participation domains.

Horizon collapse can:

- merge previously separated domains
- expose stability cores to external gradients
- disrupt temporal profiles
- trigger cascades of structural failure

Horizon collapse is therefore one of the fundamental global risks in ED cosmology. It marks the boundary between coherent participation structure and impossible worlds.

In ED terms:
Horizon collapse is the global failure mode of directional participation in the ED universe.

6. The Agency Constraint

Agency is the most complex architecture the ED substrate can support. It integrates stability, temporal regulation, and horizon structure into a coherent, self-modifying, self-protecting system. But this integration cannot scale indefinitely. The substrate imposes **global limits** on how much autonomy, complexity, and density of agents an ED universe can sustain. These limits are not psychological, biological, or computational; they are **ontological boundaries** arising from the structure of event density itself.

The Agency Constraint has four components: the minimum architecture required for autonomous becoming, the maximum complexity allowed before coherence failure, the influence of agent density on global structure, and the emergence of collective agency as a cosmological actor.

6.1 Minimum Architecture for Autonomous Becoming

An agent cannot exist unless the substrate supports a **minimum structural configuration**:

- a stability core
- temporal regulators
- internal horizons
- coherence architecture

Below this threshold, motifs cannot maintain identity, regulate their own becoming, or protect themselves from external reorganization. They remain **non-autonomous motifs**, fully shaped by external gradients.
Minimum agency architecture determines:

- the simplest possible agent
- the lower bound on autonomy
- the minimum complexity of self-protection
- the threshold for identity persistence

Regions that fall below this threshold become **agency-free zones**: domains where motifs can exist but cannot become agents.

In ED terms:
The universe imposes a minimum architecture below which agency cannot arise.

6.2 Maximum Complexity Before Coherence Failure

Agency cannot increase in complexity without bound. Above a global maximum, the internal architecture becomes too intricate to maintain coherence. Stability cores fragment, temporal regulators desynchronize, and horizon structures collapse under their own asymmetry.

Maximum agency complexity determines:

- the upper bound on agent size
- the limit of internal modularity
- the maximum number of coordinated subsystems
- the threshold beyond which identity cannot be maintained

Agents that exceed this threshold undergo **coherence failure**: a structural collapse in which the agent loses autonomy and dissolves into simpler motifs.

In ED terms:
The universe imposes a maximum complexity above which agency cannot cohere.

6.3 Agency Density and Global Structure

Agents are not isolated. They generate gradients, sculpt horizons, and stabilize regions. When many agents coexist, their collective influence reshapes the substrate. But the universe cannot support an arbitrarily high **density of agents**. Above a global limit, their gradients interfere, horizon networks destabilize, and participation domains collapse.

Agency density determines:

- the maximum number of agents in a region
- the stability of participation networks
- the coherence of horizon structures
- the large-scale temporal profile of the universe

Regions that exceed this density become **agency saturation zones**: domains where agents destabilize one another and collapse into simpler motifs.

In ED terms:

The universe imposes a maximum density of agents beyond which global structure fails.

6.4 Collective Agency as a Global Actor

When agents align their stability cores, synchronize their temporal regulators, and interlock their horizon structures, they can form **collective agents**: higher-order motifs with their own identity, autonomy, and participation boundaries. But collective agency is also globally constrained. The substrate limits:

- the size of collective stability cores
- the depth of temporal synchronization
- the complexity of interlocking horizons
- the scale of collective participation domains

Collective agents cannot grow indefinitely. Beyond a global threshold, they undergo **collective coherence failure**, fragmenting into smaller agents or dissolving entirely.

In ED terms:
The universe imposes global limits on the scale and coherence of collective agency.

7. Constraint Interactions

Global constraints in ED do not operate in isolation. Stability, temporal asymmetry, horizon structure, and agency are not independent dimensions of the substrate; they are **coupled architectural regimes**. A change in one constraint alters the feasible range of the others. The ED universe is therefore governed not by four separate limits, but by a **constraint network**: a system of interdependent boundaries that define the space of possible worlds.

This section develops the four primary interactions among the global constraints. These interactions reveal that the ED substrate is not a collection of independent engineering domains, but a **coherent architectural manifold** in which every structural limit shapes every other.

7.1 Stability–Temporal Coupling

Stability and time are inseparable. Saturation determines how quickly a motif can reorganize without losing coherence, and mobility determines how much saturation is required to maintain identity across change. The Stability Constraint and the Temporal Constraint therefore **co-limit** one another.

Stability–temporal coupling determines:

- the maximum rate of becoming compatible with persistence
- the minimum saturation required for temporal coherence
- the formation of stability wells shaped by temporal gradients
- the emergence of temporal shear zones shaped by stability collapse

If stability decreases, the allowable mobility range narrows.
If mobility increases, the required stability threshold rises.

In ED terms:
Stability and time form a coupled constraint: persistence limits rate, and rate limits persistence.

7.2 Temporal–Horizon Coupling

Horizons require asymmetry, and asymmetry requires temporal gradients. A horizon cannot form without a minimum difference in rate‑of‑becoming across a boundary layer. Conversely, excessive temporal shear fractures horizons. The Temporal Constraint and the Horizon Constraint therefore **co‑shape** one another.

Temporal–horizon coupling determines:

- the minimum temporal gradient required for horizon formation
- the maximum temporal shear horizons can withstand
- the structure of horizon networks shaped by global temporal profiles
- the partitioning of participation domains by temporal boundaries

If temporal gradients flatten, horizons dissolve.
If temporal gradients steepen beyond the global maximum, horizons blow out.

In ED terms:
Temporal structure and horizon structure are co‑dependent: asymmetry requires rate differences, and rate differences require stable asymmetry.

7.3 Horizon–Agency Coupling

Agency requires internal horizons to protect identity and enforce one‑way participation. But horizons themselves depend on global asymmetry limits. The Horizon Constraint therefore bounds the Agency Constraint, and agency density feeds back into horizon networks.

Horizon–agency coupling determines:

- the minimum horizon strength required for autonomy
- the maximum horizon complexity agents can sustain
- the stability of participation networks shaped by agent interactions
- the emergence of collective agents through horizon interlocking

If horizons weaken, agency collapses.
If agency density increases, horizon networks must reorganize.

In ED terms:
Horizon structure and agency co‑limit one another: autonomy requires asymmetry, and asymmetry is shaped by autonomous motifs.

7.4 Stability–Agency Coupling

Agents maintain stability cores, and stability cores act as anchors in the substrate. But agents also reorganize themselves, generate gradients, and reshape local stability wells. The Stability Constraint therefore bounds the Agency Constraint, and agency feeds back into global stability structure.

Stability–agency coupling determines:

- the minimum stability required for identity
- the maximum stability before agency becomes rigid
- the formation of stability wells around persistent agents
- the emergence of collective stability architectures

If stability collapses, agency dissolves.

If agency becomes too complex, stability cores fragment.

In ED terms:
Stability and agency co-shape one another: identity requires persistence, and persistence is reshaped by identity-bearing motifs.

Constraint interactions reveal that the ED universe is not governed by four independent limits. It is governed by a **single, coupled constraint manifold** in which stability, time, horizons, and agency co-determine the space of possible worlds. This manifold is developed explicitly in Section 8.

8. The Global Constraint Set

The global constraints developed in Sections 3–6 do not form a list of independent limits. They form a **single architectural structure**: the global constraint set. This set defines the multidimensional space of all possible ED universes. Every ED world is a point in this space; every impossible world lies outside it. The constraint set is therefore the **ontological boundary** of ED cosmology — the structure that determines which universes can exist, which cannot, and how the substrate organizes itself at the largest scales.

The global constraint set has four components: the constraint manifold, the forbidden regions it excludes, the boundary conditions that define its shape, and the placement of our universe within this space.

8.1 The Constraint Manifold

The constraint manifold is the **mathematical space** defined by the global limits on:

- stability
- mobility (temporal rate)
- asymmetry (horizon structure)
- agency complexity and density

Each dimension is bounded above and below by the global constraints. The manifold is therefore a **finite, structured region** of possibility space. Every point within it corresponds to a coherent ED universe; every point outside corresponds to an impossible world.

The manifold is not a simple hypercube. The constraints are **coupled** (Section 7), so the manifold has curvature, folds, and boundary interactions. Increasing stability narrows the allowable range of mobility; increasing agency density restricts horizon asymmetry; steepening temporal gradients constrains stability.

In ED terms:
The constraint manifold is the structured space of all possible ED worlds.

8.2 Forbidden Regions

Outside the constraint manifold lie the **forbidden regions**: configurations the ED substrate cannot support. These are not merely unstable worlds; they are **architecturally impossible**.

Forbidden regions include:

- **sub-saturation worlds**
    - no persistence, no motifs, no structure
- **super-saturation worlds**

    - rigidity basins where becoming is impossible
- **sub‑mobility worlds**
    - temporal stagnation, no change
- **super‑mobility worlds**
    - temporal blowout, no coherence
- **sub‑asymmetry worlds**
    - no horizons, no autonomy
- **super‑asymmetry worlds**
    - asymmetry fracture, no boundary layers
- **super‑agency worlds**
    - coherence failure from excessive complexity or density

These regions are not exotic or hypothetical. They are **mathematically excluded** by the architecture of event density.

In ED terms:
Forbidden regions are the architecturally impossible configurations of the ED substrate.

8.3 Boundary Conditions
The edges of the constraint manifold are the **boundary conditions** of ED cosmology. These boundaries define the transitions between possible and impossible worlds. They are not sharp walls; they are **structural thresholds** where motifs, horizons, or agents undergo catastrophic failure.

Boundary conditions include:
- the stability threshold where motifs dissolve
- the mobility threshold where coherence fails
- the asymmetry threshold where horizons collapse
- the agency threshold where identity fragments

These boundaries shape:
- the size of participation domains
- the distribution of stability wells
- the topology of horizon networks
- the density and complexity of agents
- the global temporal profile of the universe

In ED terms:
Boundary conditions are the structural thresholds that define the edges of possible ED worlds.

8.4 The ED Universe as a Point in Constraint Space
Our universe is not arbitrary. It is a **specific point** in the constraint manifold — a configuration of stability, mobility, asymmetry, and agency that lies within the allowed region. Its large‑scale structure is therefore not accidental; it is a consequence of its position in constraint space.

This position determines:
- the strength and distribution of stability wells
- the steepness of temporal gradients

- the structure of horizon networks
- the density and complexity of agents
- the global architecture of participation domains

Cosmology in ED is therefore the study of **where our universe sits** in the constraint manifold and how its position evolves over time.

In ED terms:
The ED universe is a realized point in the global constraint manifold.

9. Cosmological Implications

The global constraint set is not merely a mathematical boundary around the space of possible ED worlds. It is a **cosmological architect**: the structure that determines how the universe organizes itself, how motifs distribute, how horizons interlock, how agents cluster, and how becoming flows across the substrate. Cosmology in ED is therefore not driven by external laws or initial conditions; it is driven by the **interplay of global constraints**. The universe is shaped from within.

This section develops the four major cosmological implications of the global constraint set: the formation of large-scale participation domains, the emergence of stability basins, the flow of becoming through temporal rivers, and the role of agents as contributors to cosmic architecture.

9.1 Large-Scale Participation Domains

Horizon networks (Section 5.3) partition the ED substrate into **participation domains**: large-scale regions within which influence flows freely and across which influence is directionally constrained. These domains are not arbitrary; they are shaped by the global constraint manifold.

Participation domains emerge when:
- temporal shear zones align with horizon networks
- stability wells reinforce boundary layers
- agency density shapes local asymmetry
- global mobility profiles partition the substrate

These domains are the ED analogue of cosmic regions: not imposed, but **architecturally emergent**.

Participation domains determine:
- where motifs can persist
- how agents interact
- how influence propagates
- how collective structures form

In ED terms:
Participation domains are the large-scale regions carved out by the global constraint set.

9.2 Stability Basins

Stability wells (Section 3.3) scale up into **stability basins**: cosmological-scale attractors where persistent motifs cluster, reinforce one another, and shape the global architecture of the universe. These basins are the backbone of

ED cosmology.

Stability basins:

- anchor participation domains
- regulate temporal gradients
- influence horizon formation
- attract agents and collective motifs

They are not gravitational wells; they are **persistence wells** — regions where the substrate supports long-lived structure.

In ED terms:
Stability basins are cosmological attractors that organize the ED universe.

9.3 Temporal Rivers

Mobility gradients (Section 4) scale up into **temporal rivers**: large-scale flows of becoming that channel the reorganization of motifs across the substrate. These rivers are shaped by the global temporal profile and constrained by stability basins and horizon networks.

Temporal rivers:

- guide the evolution of motifs
- shape the direction of influence flow
- regulate the formation of horizon boundaries
- determine the large-scale "arrow" of becoming

They are not time in the classical sense; they are **flows of reorganization** that structure the universe.

In ED terms:
Temporal rivers are the cosmological flows of becoming shaped by global mobility constraints.

9.4 Agent-Driven Cosmology

Agents are not passive inhabitants of the ED universe. They are **cosmological participants**. Their stability cores, temporal regulators, and horizon structures generate gradients that reshape the substrate. When many agents coexist, their collective influence becomes a **cosmic-scale architectural force**.

Agent-driven cosmology includes:

- the formation of agent-stabilized regions
- the emergence of collective agents that shape participation domains
- the restructuring of horizon networks through cooperative or competitive dynamics
- the modulation of global temporal profiles through distributed rate control

Agents therefore contribute to the **large-scale architecture** of the universe. Their density, complexity, and distribution are cosmological variables.

In ED terms:
Agents help shape the cosmic structure of ED spacetime through their gradients, horizons, and stability cores.

10. Constraint Dynamics

The global constraint set is not a fixed container around the ED universe. It is a **dynamic architecture**: a system of evolving boundaries shaped by the distribution of motifs, the formation of horizons, the flow of becoming, and the density of agents. As motifs reorganize, as horizons form or collapse, as agents emerge or dissolve, the constraint manifold itself shifts. Cosmology in ED is therefore not the study of static limits, but the study of **constraint dynamics** — how the global boundaries of possibility evolve over time.

This section develops the four fundamental modes of constraint dynamics: constraint evolution, constraint cascades, constraint stabilization, and constraint catastrophes.

10.1 How Constraints Evolve

Global constraints evolve because the substrate reorganizes. Stability wells deepen or flatten; temporal gradients steepen or smooth; horizon networks expand or fracture; agents cluster or disperse. These changes alter the feasible ranges of stability, mobility, asymmetry, and agency.

Constraint evolution includes:

- **stability drift**
    - changes in saturation distribution reshape persistence thresholds
- **temporal drift**
    - shifts in mobility gradients alter allowable rate profiles
- **horizon drift**
    - reorganization of asymmetry changes boundary conditions
- **agency drift**
    - changes in agent density reshape global limits

The constraint manifold is therefore **self-modifying**: its shape depends on the structures it governs.

In ED terms:
Constraints evolve because the substrate reorganizes, and the substrate reorganizes within evolving constraints.

10.2 Constraint Cascades

Because the global constraints are coupled (Section 7), a shift in one constraint can propagate through the entire manifold. These propagations are **constraint cascades**: large-scale reorganizations triggered by local or regional changes.

Constraint cascades include:

- **stability-driven cascades**
    - collapse of a stability well destabilizes temporal and horizon structure
- **temporal-driven cascades**
    - temporal blowout fractures horizons and dissolves agents
- **horizon-driven cascades**
    - boundary collapse merges participation domains and destabilizes stability cores
- **agency-driven cascades**
    - excessive agent density destabilizes horizon networks and temporal profiles

Cascades are not anomalies. They are **structural consequences** of the coupling between constraints.

In ED terms:
Constraint cascades are the propagation of structural failure through the coupled constraint manifold.

10.3 Constraint Stabilization

Despite the possibility of cascades, the ED universe does not drift into chaos. The global constraints include **stabilizing feedbacks** that restore coherence when the substrate approaches forbidden regions.

Constraint stabilization includes:

- **stability feedback**
  - saturation redistributes to prevent rigidity or dissolution
- **temporal feedback**
  - mobility gradients smooth to prevent blowout
- **horizon feedback**
  - asymmetry adjusts to maintain boundary coherence
- **agency feedback**
  - agent density self-limits through coherence failure

These feedbacks are not imposed; they are **intrinsic to the substrate**. They ensure that the universe remains within the constraint manifold.

In ED terms:
Constraint stabilization is the substrate's intrinsic tendency to restore coherence when approaching structural limits.

10.4 Constraint Catastrophes

When stabilization fails, the universe undergoes a **constraint catastrophe**: a global structural failure in which one or more constraints are violated, forcing the substrate into a new region of the manifold or collapsing it entirely.

Constraint catastrophes include:

- **global stability collapse**
  - dissolution of large-scale structure
- **global temporal blowout**
  - loss of coherent becoming across regions
- **global horizon collapse**
  - merging of participation domains into undifferentiated flux
- **global agency failure**
  - dissolution of agents and collective motifs

These catastrophes mark the **phase boundaries** of ED cosmology: transitions between qualitatively different universes.

In ED terms:
Constraint catastrophes are global transitions triggered when the substrate crosses structural thresholds.

11. Constraint Dynamics

The global constraint set is not a fixed container around the ED universe. It is a **dynamic architecture**: a system of evolving boundaries shaped by the distribution of motifs, the formation of horizons, the flow of becoming, and the density of agents. As motifs reorganize, as horizons form or collapse, as agents emerge or dissolve, the constraint manifold itself shifts. Cosmology in ED is therefore not the study of static limits, but the study of **constraint dynamics** — how the global boundaries of possibility evolve over time.

This section develops the four fundamental modes of constraint dynamics: constraint evolution, constraint cascades, constraint stabilization, and constraint catastrophes.

11.1 How Constraints Evolve

Global constraints evolve because the substrate reorganizes. Stability wells deepen or flatten; temporal gradients steepen or smooth; horizon networks expand or fracture; agents cluster or disperse. These changes alter the feasible ranges of stability, mobility, asymmetry, and agency.

Constraint evolution includes:

- **stability drift**
  - changes in saturation distribution reshape persistence thresholds
- **temporal drift**
  - shifts in mobility gradients alter allowable rate profiles
- **horizon drift**
  - reorganization of asymmetry changes boundary conditions
- **agency drift**
  - changes in agent density reshape global limits

The constraint manifold is therefore **self-modifying**: its shape depends on the structures it governs.

In ED terms:
Constraints evolve because the substrate reorganizes, and the substrate reorganizes within evolving constraints.

11.2 Constraint Cascades

Because the global constraints are coupled (Section 7), a shift in one constraint can propagate through the entire manifold. These propagations are **constraint cascades**: large-scale reorganizations triggered by local or regional changes.

Constraint cascades include:

- **stability-driven cascades**
  - collapse of a stability well destabilizes temporal and horizon structure
- **temporal-driven cascades**
  - temporal blowout fractures horizons and dissolves agents
- **horizon-driven cascades**
  - boundary collapse merges participation domains and destabilizes stability cores
- **agency-driven cascades**
  - excessive agent density destabilizes horizon networks and temporal profiles

Cascades are not anomalies. They are **structural consequences** of the coupling between constraints.

In ED terms:
Constraint cascades are the propagation of structural failure through the coupled constraint manifold.

11.3 Constraint Stabilization

Despite the possibility of cascades, the ED universe does not drift into chaos. The global constraints include **stabilizing feedbacks** that restore coherence when the substrate approaches forbidden regions.

Constraint stabilization includes:

- **stability feedback**
  - saturation redistributes to prevent rigidity or dissolution
- **temporal feedback**
  - mobility gradients smooth to prevent blowout
- **horizon feedback**
  - asymmetry adjusts to maintain boundary coherence
- **agency feedback**
  - agent density self-limits through coherence failure

These feedbacks are not imposed; they are **intrinsic to the substrate**. They ensure that the universe remains within the constraint manifold.

In ED terms:
Constraint stabilization is the substrate's intrinsic tendency to restore coherence when approaching structural limits.

11.4 Constraint Catastrophes

When stabilization fails, the universe undergoes a **constraint catastrophe**: a global structural failure in which one or more constraints are violated, forcing the substrate into a new region of the manifold or collapsing it entirely.

Constraint catastrophes include:

- **global stability collapse**
  - dissolution of large-scale structure
- **global temporal blowout**
  - loss of coherent becoming across regions
- **global horizon collapse**
  - merging of participation domains into undifferentiated flux
- **global agency failure**
  - dissolution of agents and collective motifs

These catastrophes mark the **phase boundaries** of ED cosmology: transitions between qualitatively different universes.

In ED terms:
Constraint catastrophes are global transitions triggered when the substrate crosses structural thresholds.

12. Conclusion — The Architecture of Possible ED Worlds

The ED universe is not an unconstrained field of becoming. It is a **structured possibility space** defined by global limits on stability, mobility, asymmetry, and agency. These limits are not external laws imposed on the substrate; they are **architectural necessities** arising from the internal logic of event density. The global constraint set is therefore the ontological boundary of ED cosmology — the structure that determines which worlds can exist, which cannot, and how the substrate organizes itself at every scale.

This paper has shown that each global constraint defines a dimension of the possible:

- The **Stability Constraint** bounds persistence between dissolution and rigidity.
- The **Temporal Constraint** bounds becoming between stagnation and blowout.
- The **Horizon Constraint** bounds asymmetry between symmetry and fracture.
- The **Agency Constraint** bounds autonomy between non-agency and coherence failure.

These constraints do not operate independently. They form a **coupled manifold** in which each limit shapes the others. Stability co-limits mobility; mobility co-limits asymmetry; asymmetry co-limits agency; agency feeds back into stability. The ED universe is therefore governed by a **single, interdependent constraint architecture**.

Within this architecture, the substrate organizes itself into:

- **participation domains** shaped by horizon networks
- **stability basins** shaped by saturation gradients
- **temporal rivers** shaped by mobility profiles
- **agent ecologies** shaped by density and complexity limits

These structures are not imposed; they **emerge** from the interplay of global constraints. Cosmology in ED is therefore the study of how the constraint manifold shapes the universe and how the universe, through its motifs and agents, reshapes the manifold.

Constraint dynamics reveal that the global limits are not static. They evolve as motifs reorganize, as horizons form or collapse, as agents emerge or dissolve. Constraint cascades propagate structural changes across the substrate; constraint stabilization restores coherence when the universe approaches forbidden regions; constraint catastrophes mark transitions between qualitatively different worlds. The ED universe is therefore a **self-modifying architecture** governed by evolving boundaries.

This paper completes the ED-Core sequence. Papers A–E developed the local engineering regimes of computation, time, stability, horizons, and agency. Paper F reveals the **global envelope** within which these regimes operate. Together, these six papers establish the foundational ontology of ED physics: a universe defined not by external laws, but by the internal architecture of event density.

The ED-Applications series will build on this foundation, exploring how the global constraint set shapes specific physical, informational, and cosmological phenomena. But the conceptual closure is here: the ED universe is a **finite, structured, self-constraining manifold of possible worlds**, and every motif, horizon, agent, and cosmological structure exists within its boundaries.