Philosophy of Discrete Being: Foundations and Structural Architecture

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Abstract

The Philosophy of Discrete Being (FDB) is a meta-ontological framework that models reality as a system of coherence-preserving localities updated through discrete transitions driven by a universal non-metric ordering source. Rather than assuming geometric continuity, FDB treats coherence, synchronization, and ontic-distance constraints as the primary structural conditions enabling persistence, identity, and interaction in distributed systems.

The framework introduces four foundational components: (1) localities as minimal self-consistent units governed by internal metamodels; (2) the Global Tick Generator (GTG) as a universal discrete ordering mechanism independent of physical time; (3) ontic distance as a structural measure of compatibility between localities; and (4) acts of coherence as synchronization events aligning invariants and reducing structural divergence across GTG updates.

This article provides a systematic overview of the structural architecture of FDB, including the emergence of temporal order, the dynamics of distributed coherence, and the formation of multi-local configurations. Connections to Coherent Observational Epistemology (COE) are clarified, showing how FDB supplies the ontological substrate while COE provides the epistemic constraints for inference across heterogeneous observational domains.

The goal of this overview is not to establish a physical theory, but to outline the structural foundations of discrete ontology and to present FDB as a unifying framework for analyzing coherence-based organization in physical, informational, biological, and socio-technical systems.

Keywords: discrete ontology; coherence; localities; GTG; ontic distance; synchronization; FDB; distributed systems; structural ontology.

Contents

1 Introduction

Contemporary ontological and physical models typically presuppose continuity: geometric manifolds, differentiable fields, smooth causal structures, and metric time. These assumptions provide effective descriptive tools, yet they obscure a deeper structural question: *What minimal conditions must hold for a system to exist as a coherent entity?*

The Philosophy of Discrete Being (FDB) approaches this question by replacing continuity with discreteness and by treating coherencenot geometry or physical durationas the fundamental organizing principle of existence. In FDB, reality consists of *localities*: self-sustaining units whose internal state, invariants, and metamodels remain stable across discrete updates. These updates are not generated internally but are triggered by an abstract, universal ordering mechanism: the *Global Tick Generator* (GTG). GTG does not define metric time; it merely imposes a sequence of structural transitions to which localities respond.

Temporal order, in this framework, becomes an emergent phenomenon arising from patterns of synchronization among localities. Spatial, causal, and dynamical relations emerge from constraints on ontic distance, coherence alignment, and the stability of interactions across GTG updates. Multi-local structures form when sets of localities maintain compatibility under repeated acts of coherence, preserving shared invariants despite discrete progression.

FDB does not propose a physical theory in competition with standard field-based or geometric approaches. Rather, it provides a meta-ontological foundation for analyzing how distributed systemsphysical, biological, informational, or socio-technicalmaintain identity, stability, and coordinated behavior. It seeks to reveal the structural architecture underlying coherence itself, and to identify the minimal discrete conditions enabling persistent being.

2 Core Concepts

FDB introduces a set of structural primitives that replace continuous geometric assumptions. These primitives define how discrete entities maintain coherence, interact, and form higher-order configurations.

2.1 Localities

A locality L_i is a minimal self-sustaining unit of discrete being. It is defined by:

- an internal state governed by a locality-specific metamodel,
- a coherence boundary separating stable and unstable configurations,

- a set of invariants preserved across updates,
- responsiveness to the universal ordering imposed by GTG.

A locality remains viable when the structural drift of its internal state remains within a coherence threshold:

$$D(L_i) = \|I_{L_i} - I\|_P \leq D_{\text{crit}},$$

where I_{L_i} is the localitys internal invariant structure and I is the reference invariant pattern defined by its metamodel.

2.2 Global Tick Generator (GTG)

The Global Tick Generator is a universal, non-physical source of discrete progression. It establishes the transition:

$$L_i(t) \to L_i(t+1),$$

without prescribing duration or geometry. Localities do not generate ticks; they *respond* to them. What is observed as time emerges from synchronization patterns among locality-specific update sequences relative to the GTG ordering.

2.3 Ontic Distance

Ontic distance $D_{ont}(i,j)$ is a structural measure of compatibility between localities L_i and L_j. It quantifies the minimal adjustment needed for two localities to achieve coherence. Ontic distance evolves according to:

$$\Delta D_{ont}(t+\delta) = (1-\lambda)\, \Delta D_{ont}(t) + \xi(t),$$

where λ expresses coherence retention and $\xi(t)$ expresses structural drift.

Ontic distance provides structure without assuming geometry. Low D_{ont} indicates high compatibility; large D_{ont} indicates incompatibility.

2.4 Acts of Coherence

Localities interact through discrete *acts of coherence*: synchronization events that align invariants, stabilize interaction, and reduce ontic distance. An act of coherence establishes a rational update ratio:

$$\nu_i : \nu_j = m : n,$$

linking the internal update rhythms of two interacting localities.

Acts of coherence are the fundamental operations that generate emergent temporal order and form the basis of multi-local structures.

3 Emergence of Time

In the Philosophy of Discrete Being, time is not an independent ontological substrate and not a primitive dimension. Instead, time is an *emergent ordering phenomenon* arising from the synchronization behavior of localities responding to the Global Tick Generator (GTG). GTG imposes only a universal discrete ordering of updates, but it does not prescribe duration, metric intervals, or geometric structure.

3.1 GTG Ordering as Pre-Temporal Structure

GTG establishes the minimal relation:

$$t \prec t+1,$$

which is merely an ordering relation, not a metric increment. Localities do not share a common internal clock; they maintain internal update rhythms that respond to the GTG sequence with locality-specific coherence constraints.

A locality L_i produces an observable change when its internal update counter advances from k to $k+1$ in response to the GTG tick. The effective temporal behavior is therefore a function of:

- the localitys internal coherence rate,
- the stability of its invariants,
- synchronization interactions with other localities.

Thus, GTG ordering provides a *necessary* but not *sufficient* condition for the emergence of a temporal structure.

3.2 Proper Time as Coherence Rate

For each locality, “proper time is defined not as duration but as the localitys coherence rate relative to GTG updates. Let ν_i denote the number of internal updates sustained by locality L_i per GTG tick under stable operation. Then the localitys proper-time increment is proportional to ν_i:

$$\Delta\tau_i \propto \nu_i.$$

A locality with higher coherence rate experiences a “denser sequence of internal updates, while a locality with lower coherence rate produces fewer stable transitions per GTG cycle. Proper time is therefore an emergent, locality-specific quantity reflecting the structure of coherence rather than the flow of a background temporal medium.

3.3 Synchronization and Multi-Local Temporal Order

When two localities interact, stable synchronization requires establishing a rational update ratio:

$$\nu_i : \nu_j = m : n,$$

which allows their internal progression to remain compatible across GTG cycles. Differences in coherence rates produce observable temporal asymmetries analogous to relative temporal flow, but without any geometric or metric assumptions.

A set of localities $\{L_1, \ldots, L_n\}$ forms a coherent multi-local temporal structure when all pairwise synchronization constraints remain within viability bounds:

$$D_{ont}(i, j) \leq D_{\text{crit}} \quad \text{for all interacting pairs.}$$

Temporal order at the multi-local level is thus an emergent property derived from synchronization across discrete update rhythms, not from a pre-existing global time.

3.4 Global Time as Coherence-Consistent Reconstruction

Global time appears only when a sufficiently large set of localities maintains stable multi-local synchronization across many GTG cycles. In this regime, the collective structure can reconstruct a consistent temporal ordering compatible with all coherence constraints:

$$T = \text{Reconstruct}(\{\tau_i\}, \{\nu_i\}, \text{sync constraints}).$$

This reconstructed global time is not fundamental; it is a coherence-consistent abstraction that emerges when distributed structures maintain stable inter-local relations.

Thus, in FDB, time is neither a primitive nor an independent dimension: it is a second-order effect arising from the discrete synchronization architecture of coherent localities.

4 Distributed Coherence and Interaction Dynamics

In FDB, interaction among localities does not arise from geometric proximity, signal propagation, or continuous fields. Instead, interaction is a structural phenomenon determined by the evolving compatibility of locality-specific invariants across GTG updates. This compatibility is encoded in the notion of *ontic distance*, and interaction takes the form of coherence-preserving adjustments that stabilize multi-local configurations.

4.1 Ontic Distance as Interaction Substrate

For two localities L_i and L_j, ontic distance $D_{ont}(i,j)$ measures the minimal adjustment required for their internal states, invariants, and update rhythms to remain mutually coherent. It is defined not spatially but structurally:

$$D_{ont}(i,j) = \|I_{L_i} - I_{L_j}\|_P,$$

where $\|\cdot\|_P$ is a locality-dependent structural norm.

Ontic distance evolves under the combined influence of:

- *drift*: divergence resulting from independent locality updates,
- *alignment*: reductions produced by acts of coherence.

A general form capturing this evolution is:

$$\Delta D_{ont}(t+1) = f_{\mathrm{drift}}(L_i, L_j, t) - f_{\mathrm{align}}(L_i, L_j, t),$$

where both terms depend on internal metamodels and the structural compatibility of the localities involved.

4.2 Acts of Coherence as Discrete Interaction Events

An act of coherence is a discrete event in which two localities align their update rhythms and internal invariants to reduce ontic distance. Stability requires establishing a rational synchronization ratio:

$$\nu_i : \nu_j = m : n.$$

If such a ratio cannot be sustained within viability bounds, interaction weakens and ontic distance increases. Acts of coherence therefore serve as the structural analog of interaction events, governing whether localities remain part of a stable multi-local entity.

4.3 Multi-Local Structures and Coherence Pressure

A set of localities $\{L_1, \ldots, L_n\}$ forms a stable multi-local structure when coherence-preserving adjustments outweigh structural divergence:

$$\sum_{i,j} f_{\mathrm{align}}(L_i, L_j) \;\geq\; \sum_{i,j} f_{\mathrm{drift}}(L_i, L_j).$$

This condition expresses stability as an *equilibrium of coherence operations* rather than forces. Multi-local entities are thus emergent configurations maintained through repeated acts of coherence, not through continuous propagation or spatial constraints.

Coherence pressure is the aggregate effect of alignment tendencies across the network:

$$P_{\mathrm{coh}} = \sum_{i,j} f_{\mathrm{align}}(L_i, L_j).$$

When coherence pressure dominates, the structure maintains consistent invariants across GTG cycles; when drift dominates, the configuration dissolves into independent localities.

5 Relation to Coherent Observational Epistemology (COE)

The Philosophy of Discrete Being (FDB) and Coherent Observational Epistemology (COE) address complementary layers of a unified structural program. FDB provides the *ontological* foundations of discrete being, while COE addresses the *epistemological* conditions under which distributed observational data can support valid inference. The two frameworks are distinct yet structurally aligned, with each clarifying a different aspect of coherence in complex systems.

5.1 FDB as Ontological Substrate

FDB concerns the structural architecture of existence. Its primitiveslocalities, ontic distance, GTG ordering, coherence boundaries, and acts of coherencedefine the conditions under which entities persist, interact, and form stable multi-local configurations. These structures operate independently of any observational process.

FDB therefore answers the ontological question:

What structural conditions make coherent being possible?

The answer is expressed in terms of discrete updates, coherence preservation, and synchronization among localities, without reference to measurement, inference, or epistemic agents.

5.2 COE as Epistemic Layer

COE addresses the complementary problem of how observational sequencesoften heterogeneous, distributed, and locally autonomouscan be integrated into a coherent inferential structure. COE describes:

- ordering compatibility between observational streams,

- semantic commensurability of observational categories,
- constraints on global alignment,
- structural incompatibilities limiting inference.

Where FDB examines coherence *among localities*, COE examines coherence *among observations of localities.* Thus COE answers the epistemic question:

Under what structural conditions can distributed observations support reliable inference?

5.3 Structural Alignment Between FDB and COE

FDB provides the ontological *ground* for COEs epistemic requirements. Several correspondences illustrate this alignment:

- **Localities (FDB)** correspond to **observational sites (COE)**, each with its own internal constraints and semantic structures.
- **Ontic distance** has an epistemic analogue in **semantic commensurability**, both expressing compatibility requirements for integration.
- **Acts of coherence** in FDB parallel **alignment operations** in COE that ensure consistency between observational streams.
- **GTG ordering** maps to the epistemic requirement for **ordering compatibility** among distributed observations.
- **Multi-local structures** in FDB correspond to **globally aligned observational sets** in COE.

Although the two frameworks use different primitives and operate at different layers, both rely on the idea that coherenceontological or epistemologicalis a structural phenomenon that constrains how local components can combine into larger, consistent entities.

5.4 Unified Perspective

FDB and COE together form a layered structural architecture:

$$\text{FDB: Ontology of Being} \quad \longrightarrow \quad \text{COE: Epistemology of Observation}$$

FDB clarifies the conditions under which coherent entities exist, while COE clarifies the conditions under which coherent knowledge of such entities can be obtained. Neither reduces to the other; instead, they share a common structural foundation centered on discreteness, coherence, and multi-local organization.

This layered view helps explain how distributed real-world systemsphysical, biological, informational, and socialcan simultaneously exhibit coherent internal dynamics and support coherent external observation.

6 Applications

Although FDB is a meta-ontological framework rather than a domain-specific model, its structural primitiveslocalities, coherence, ontic distance, synchronization, and multi-local stabilitygeneralize across a wide variety of complex systems. FDB provides a unifying vocabulary for describing how distributed entities maintain identity and coordinated behavior under discrete, heterogeneous, and partially independent dynamics.

6.1 Distributed Physical and Information Systems

In systems composed of semi-autonomous componentssensors, agents, subsystems, network nodesthe persistence of global behavior depends on maintaining structural compatibility across local update cycles. FDB captures this via coherence constraints and synchronization ratios.

Applications include:

- distributed sensing networks,
- multi-agent technical systems,
- heterogeneous observational infrastructures,
- cyberphysical architectures with asynchronous local controllers.

FDB clarifies the conditions under which such systems preserve stable global organization despite relying on discrete, locally governed update processes.

6.2 Biological and Cognitive Systems

Biological systems often consist of interacting components with local regulatory rules and discrete state transitions. Coherence is required for:

- maintaining organism-level invariants,
- coordinating distributed regulatory subsystems,
- synchronizing multi-scale processes with heterogeneous rhythms.

FDBs primitives align naturally with biological regulation: localities correspond to regulatory modules, coherence to functional integration, and ontic distance to compatibility of regulatory states.

Cognitive systems likewise display discrete update dynamics, multi-level modularity, and coherence-preserving integration across diverse subsystemsconditions directly captured by the FDB metamodel.

6.3 Socio-Technical and Organizational Systems

Organizations, institutions, and social structures consist of semi-independent localities: departments, agents, roles, communities, information channels. Coherence is required for:

- coordinated decision-making,
- maintaining stable institutional identity,
- integrating heterogeneous informational flows,
- forming durable multi-agent structures.

FDB provides a vocabulary for analyzing why certain socio-technical architectures are stable, why others remain fragile, and which patterns of synchronization produce robust multi-local coordination.

6.4 Complex IT Architectures

FDB applies particularly well to IT systems, where distributed components maintain local invariants while participating in global behavior.

Localities correspond to:

- services,
- databases,
- integration nodes,
- domain modules,
- independently governed subsystems.

Ontic distance captures:

- contract compatibility,
- schema divergences,

- service-level mismatches,
- interface evolution and drift.

Acts of coherence correspond to:

- integration events,
- schema alignment,
- reconciliation cycles,
- synchronization protocols.

FDB therefore supports a principled view of multi-service architectures, distributed databases, asynchronous domain systems, and complex integration landscapes.

6.5 Unified Perspective

Across these diverse domains, the same structural principles appear: discrete update processes, local identities governed by metamodels, ontic-distance constraints, and coherence operations enabling persistent multi-local organization.

FDB thus provides a general structural lens for understanding how distributed systemswhether physical, biological, cognitive, social, or computationalmaintain coherence in the absence of continuous substrates or global control.

7 Conclusion

The Philosophy of Discrete Being (FDB) offers a structural ontology grounded not in continuity, geometry, or metric time, but in discreteness, coherence, and the stability of localities under GTG-driven updates. Its primitiveslocalities, ontic distance, coherence boundaries, synchronization ratios, and multi-local configurationsdefine the minimal conditions under which persistent entities can exist in distributed settings.

FDB does not aim to replace established theoretical frameworks; rather, it provides a meta-ontological foundation that clarifies how coherent structures emerge, interact, and maintain identity across discrete transitions. The framework generalizes across domains: physical architectures, information systems, biological regulation, cognitive processes, and socio-technical organizations. In each case, coherent global behavior arises not from continuous propagation or centralized control, but from structural compatibility and repeated coherence-preserving interactions among semi-autonomous localities.

The connection to Coherent Observational Epistemology (COE) further demonstrates that ontological coherence (existence) and epistemic coherence (observation, inference) are two layers of a unified structural program. FDB provides the ontology of discrete being; COE provides the epistemology of distributed observation.

Together, these frameworks show that coherencewhether ontological or epistemological is a universal organizing principle underlying the persistence, integration, and stability of complex multi-local systems. FDB thus establishes a general foundation for analyzing discrete architectures across scientific and technological domains, and offers a pathway toward unified structural theories of distributed organization.

8 Future Directions

The present work establishes the structural foundations of the Philosophy of Discrete Being (FDB). Several major developments remain open for future elaboration and will constitute the next stages of the FDB program.

8.1 Axiomatic Formalization

Although this article outlines the core primitives of FDB, a fully axiomatic presentation remains to be constructed. Such a formalization would specify:

- the minimal set of axioms governing localities, invariants, and coherence;
- the structural rules for ontic-distance evolution;
- the algebra of acts of coherence and synchronization ratios;
- the conditions for generating, maintaining, and dissolving multi-local structures.

Developing an axiomatic system would allow:

- precise mapping between FDB and existing formal frameworks;
- identification of independent, dependent, and redundant primitives;
- the derivation of structural theorems about coherence, stability, and identity;
- programmatic integration with distributed-systems theory, systems biology, and theoretical computer science.

This effort forms the conceptual bridge between the foundational ontology and mathematically rigorous structural analysis.

8.2 From Ontology to Civilizational Structures

FDB offers a perspective on how coherence underlies all levels of organizationnot only physical or informational systems, but also social, institutional, and civilizational dynamics. A future monograph will extend the FDB framework to:

- governance of multi-agent systems and decision-localities;
- long-term stability of distributed institutions;
- emergence and collapse of macro-scale socio-technical structures;
- coherence boundaries and identity conditions of civilizations;
- transitions between stable structural regimes under external perturbations.

This extension is not intended as a sociological theory but as a structural analysis of coherence in large-scale distributed systems whose components possess autonomy, local invariants, and interactions governed by discrete update dynamics.

8.3 Integration with Coherent Observational Epistemology

FDB and COE already form a two-layer architecture, but deeper integration remains open. Future work will address:

- structural correspondences between ontic and epistemic boundaries;
- dualities between multi-local being and multi-local observation;
- the unification of coherence-based ontology and coherence-based inference;
- combined frameworks for analyzing distributed scientific and technical systems.

This direction aims at a general structural methodology applicable across scientific domains.

9 Open Problems in Discrete Ontology

Despite establishing the foundational architecture of FDB, several conceptual and technical questions remain open. These questions delineate the frontier of discrete ontology and identify areas where further development is required.

9.1 Minimal Structural Primitives

The present formulation uses localities, invariants, coherence boundaries, ontic distance, and the GTG ordering. It remains open whether:

- this set is minimal,
- some primitives can be derived from others,
- alternative formulations may yield equivalent or richer structures.

Clarifying minimality is essential for constructing a canonical, irreducible ontology of discrete being.

9.2 Uniqueness of Ontic-Distance Dynamics

Ontic distance provides the central compatibility measure in FDB, yet the space of possible evolution laws is large. Open questions include:

- which classes of ontic-distance dynamics preserve global coherence,
- which lead to instability or fragmentation,
- whether there exist universal constraints analogous to conservation laws.

A systematic classification of compatibility dynamics remains an open problem.

9.3 Characterization of Multi-Local Coherence

The transition from pairwise coherence to multi-local structures is only partially understood. Open problems include:

- criteria for the emergence of large-scale coherent structures,
- limits on the size and complexity of stable multi-local configurations,
- classification of possible coherence topologies.

These questions are central to understanding how complex systems exhibit organized behavior.

9.4 Temporal Reconstruction and Uniqueness

Time in FDB is an emergent reconstruction from coherence rates and synchronization relations. Several questions remain open:

- conditions for the existence of a unique global temporal ordering,

- circumstances under which temporal reconstruction becomes non-unique,
- characterization of systems with incompatible local temporal structures.

These issues relate to the fundamental nature of temporal organization in discrete systems.

9.5 Stability of Long-Range Coherence

While local coherence conditions are well characterized, the long-range behavior of distributed coherence remains an open problem:

- how coherence propagates across chains of localities,
- how large-scale coherence decays or stabilizes,
- whether coherence can percolate through heterogeneous networks.

Understanding long-range coherence is essential for analyzing large-scale structures.

9.6 Interactions Between Ontological and Epistemic Coherence

FDB and COE form distinct layers, but their coupling raises open questions:

- whether ontological coherence bounds epistemic coherence,
- whether epistemic constraints can induce emergent ontological patterns,
- whether combined onticepistemic coherence constraints yield new structural invariants.

This line of inquiry is key to unifying being, observation, and inference within a single discrete structural framework.

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References

[1] Nekludoff, Alexey A.
Philosophy of Discrete Being: The Foundational Manifesto.
Zenodo. DOI: 10.5281/zenodo.17599629.

[2] Nekludoff, Alexey A.
Coherent Observational Epistemology: Foundational Principles, Secondary Principles, and Axiomatic System.
Zenodo. DOI: 10.5281/zenodo.17646288.

[3] Nekludoff, Alexey A.
Time Without Time: A Coherence-Rate Field Theory of Gravitation.
Zenodo. DOI: 10.5281/zenodo.17647937.