

# THE ZERO PARADOX

## ZP-E: Bridge Document

Version 2.1 | April 2026

Supersedes v1.0 | Adds DA-2 (Instantiation Succession) and DA-3  
(Perspective-Relative Cardinality)

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This document is the cross-framework synthesis layer of the Zero Paradox. It imports from ZP-A (lattice algebra), ZP-B (p-adic topology), ZP-C (information theory), and ZP-D (Hilbert space state layer). It provides three formal inserts: DA-1 (Instantiation as Execution, carried from v1.0), DA-2 (Instantiation Succession — the multiple- $\perp$  result), and DA-3 (Perspective-Relative Cardinality). With DA-1 in place, AX-1 is promoted to Theorem T-SNAP. With DA-2, the directed instantiation tree is formally licensed. With DA-3, cardinality is shown to be perspective-dependent in a way that accounts for Skolem's Paradox, the independence of the Continuum Hypothesis, and Russell's Paradox as structural consequences of the same architecture.

*Illustrated Companion: A paired ZP-E Illustrated Companion document provides accessible explanations and visual summaries of the bridge derivations in this document. Readers new to the framework are encouraged to start with the companion.*

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### Formal Insert DA-1: Design Principle — Instantiation as Execution

Updated ZP-E v2.1 | DA-1 grounded in L-INF not D7 | Closes DA-1 | AX-1 promoted to Theorem T-SNAP

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#### I. The Gap DA-1 Closes

The T-BUF chain from ZP-C v1.4 established three results:

- L-RUN: The transition  $c_0 \rightarrow c_1$  is a non-null state change. (ZP-C v1.4 — Derived)
- TQ-IH: No program outputs  $\perp$  without a non-null intermediate configuration state. (ZP-C v1.4 — Derived by L-RUN)
- T-BUF: At  $P_0$ , execution is structurally guaranteed; that execution state is  $\varepsilon_0$  in the semilattice. (ZP-C v1.4 — Candidate Theorem pending DA-1)

T-BUF was labelled Candidate because Step 2 asserts that a configuration at  $P_0$  is a live machine state — that instantiation at  $P_0$  constitutes an execution event, not a static description. ZP-C v1.5 L-INF supplies the mathematical premise:  $\perp$  at  $P_0$  has unbounded surprisal — no finite external interpreter can hold it as a static description. DA-1 (§ III below) provides the design principle that closes T-BUF Step 2.

## II. The Two Senses of a Configuration at $P_0$

Sense A — Descriptive:  $x$  exists as a string — a finite syntactic object that has been written down or specified. The machine it describes has not necessarily been instantiated.  $P_0$  is a property of the string. The string is inert.

Sense B — Instantiated:  $x$  exists as the current configuration of a running machine. The machine is executing.  $P_0$  is a property of the live configuration. The configuration is active.

## III. Design Principle DA-1

### Design Principle DA-1 — Informational Extremity at $P_0$ Forces Execution

Claim: The instantiation of a machine configuration  $c_1$  at the incompressibility threshold  $P_0$  is an execution event in the sense of L-RUN. It is not a static description of a machine. It is a machine in state  $c_1$ .

Mathematical premise (ZP-C v1.5 L-INF): The surprisal at ball-hierarchy depths approaching  $0 \in Q_2$  is unbounded — for any finite  $M$ ,  $\exists$  depth  $n$  with  $I(n) > M$ . The null state  $\perp = c_0$  corresponds to this limit point; its informational content has no finite bound. Design commitment: a configuration with unbounded informational content cannot be a static description — any external interpreter would need to be at least as informationally rich, but  $\perp$  has no finite bound. It is the compressed limit of all possible binary programs, prior to any interpreter. Therefore  $c_0$  at  $P_0$  is necessarily an execution event, not a description awaiting instantiation. This replaces the prior D7-based grounding: D7 defines what a configuration IS; L-INF establishes WHY it cannot be a static description.

**Status: DESIGN PRINCIPLE — explicit ontological commitment citing ZP-C L-INF. CC-1 ( $S_0 = \perp$  is a modelling commitment, ZP-A) is a named dependency. T-SNAP is derived given DA-1 and CC-1, both explicit. ✓**

## IV. Theorem T-SNAP — Binary Snap Causality [AX-1 Promoted to Theorem]

### Theorem T-SNAP — Binary Snap Causality [AX-1 Promoted to Theorem]

Statement: The Binary Snap  $\perp \rightarrow \varepsilon_0$  is a derived consequence of  $P_0$ , L-RUN, TQ-IH, DA-1, and ZP-A D2. It is not an axiom.

Proof:

- Step 1 —  $P_0$  identifies the incompressibility threshold. When  $K(x|n)/n = 1$ , the configuration string  $x$  is algorithmically random. (ZP-C D1)
- Step 2 — A configuration at  $P_0$  is informationally extreme (ZP-C L-INF): unbounded surprisal means no finite external interpreter can hold it as a static description. Therefore it is an executing machine. (DA-1 § III — Design Principle, citing L-INF)
- Step 3 — Any instantiated execution passes through  $c_1$ . (ZP-C D7 — definitional;  $c_1$  is the first running configuration)

- Step 4 —  $c_1 \neq \perp$ . (ZP-C L-RUN — Derived;  $c_1$  has gained execution context not present in  $c_0 = \perp$ ; by AX-B1 this is a distinct, non-null state)
- Step 5 — No program that executes produces only null configuration states. (ZP-C TQ-IH — Derived; execution trace  $\tau(p)$  contains  $c_1$  for any executing program  $p$ )
- Step 6 — In  $(L, v, \perp)$ ,  $c_1$  is an element strictly above  $\perp$ . By ZP-A D2, the transition  $\perp \rightarrow c_1$  is a valid state transition:  $c_1 = \perp \vee \varepsilon_0$  for some  $\varepsilon_0 \in L$  with  $\varepsilon_0 > \perp$ . This transition is the Binary Snap.
- Step 7 — The transition is irreversible: algebraically by ZP-A R1 (no subtraction operator); topologically by ZP-B C3 (no continuous return path to 0 in  $Q_2$ ); categorically by AX-G2 ( $\text{hom}(X, 0) = \emptyset$  for  $X \neq 0$ ).

Conclusion: The Binary Snap is a derived consequence. AX-1 is promoted to Theorem T-SNAP. ✓

**Status: DERIVED — Cross-Framework. Dependencies: ZP-C D1, D7, L-RUN, TQ-IH; ZP-B AX-B1, C3; ZP-A D2, R1; ZP-G AX-G2; ZP-E DA-1. No axiom beyond AX-B1, AX-G1, AX-G2 is required.**

## V. Effect of T-SNAP on Downstream Results

Remark R-DA1: All results in ZP-E that previously depended on AX-1 as an axiom now depend on T-SNAP as a derived theorem. T5 (Iterative Forcing Theorem) depended on AX-1 for the first Snap — it now depends on T-SNAP. Content unchanged; grounding strengthened. T4 (Unified Snap Description) carried AX-1 as an axiom label on the causality component — that label is upgraded to Derived — T-SNAP. The intentional axioms of the system are now: AX-B1 (binary existence), AX-G1 (initial object), AX-G2 (source asymmetry). AX-1 is no longer an axiom.

## Formal Insert DA-2: Instantiation Succession — The Multiple- $\perp$ Result

*New in v2.0 | Formally licenses the directed instantiation tree*

### I. The Gap DA-2 Closes

DA-1 and T-SNAP establish that the Binary Snap is a structural consequence of reaching  $P_0$  within an instantiation. Three questions remain open after v1.0:

- CC-1 (ZP-A) says  $S_0 = \perp$  is a modelling commitment — not derived from A1-A4. This leaves open whether  $\perp$  is unique across all instantiations or whether each instantiation carries its own  $\perp$ .
- ZP-B R1 distinguishes universal structure from universe-contingent parameters.  $\varepsilon_0$  is contingent per instantiation. Whether  $\perp$  is similarly contingent is not addressed in ZP-A through ZP-D.
- T-SNAP fires wherever  $P_0$  conditions are met. If the terminal state of instantiation  $I_n$  satisfies  $P_0$  conditions, T-SNAP should apply — but this requires formally connecting that terminal state to a new  $\perp$ . DA-2 provides this connection.

## II. Why ZP-B C3 is Not Violated

C3 prohibits a continuous path from  $x \neq 0$  back to the same 0 in  $Q_2$ . DA-2 does not require a return path. The irreversibility of C3 is preserved within each instantiation. What crosses the instantiation boundary is not a path in  $Q_2$  — it is the generation of a new  $Q_2$  with its own metric, its own  $\perp$ , its own  $\varepsilon_0$ . C3 quantifies only over paths within a single topological space and has nothing to say about the boundary between spaces.

More precisely: C3 and the irreversibility of the Snap together require that any recurrence of a null state be a different null state. You cannot return to the original  $\perp$  even in principle. Therefore if the structure recurs, it must instantiate fresh. The topology enforces the ontological novelty of each  $\perp$ .

## III. Definitional Alignment DA-2 — Instantiation Succession

### Definitional Alignment DA-2 — Instantiation Succession

Claim: A state  $S$  in instantiation  $I_n$  satisfies the structural role of  $\perp$  for instantiation  $I_{n+1}$  if and only if it satisfies A4 relative to all subsequent joins in  $I_{n+1}$ :

$S \vee x = x$  for all  $x$  in the semilattice of  $I_{n+1}$ .

Grounding: A4 is the load-bearing axiom of ZP-A — it defines  $\perp$  as the additive identity under  $\vee$ , the element that contributes nothing to any join and is therefore present in everything above it. DA-2 does not redefine  $\perp$ . It clarifies that the modelling commitment of CC-1 can be satisfied by any state meeting A4's algebraic conditions — not only by a cosmologically primitive null state. The identity condition is structural, not historical: what matters is the algebraic role a state plays in the subsequent semilattice, not where it came from.

The terminal state of  $I_n$  arrives at  $I_{n+1}$  carrying the accumulated join of everything in  $I_n$ 's sequence. It is structurally  $\perp$  to  $I_{n+1}$  — contributing nothing to subsequent joins — while being informationally rich relative to  $I_n$ . This is the Zero Paradox instantiated at the inter-instantiation level: the terminal state is simultaneously a terminus and a foundation.

**Status: DEFINITIONAL ALIGNMENT — no new axiom introduced. DA-2 is a clarification of the scope of CC-1 and A4. ✓**

## IV. Corollary C-DA2 — Ontological Novelty of Successive $\perp$

### Corollary C-DA2 — Ontological Novelty of Successive $\perp$

Statement: No two instantiations share a  $\perp$ . The  $\perp$  of  $I_{n+1}$  is topologically unreachable from within  $I_n$  by C3. Instantiation succession is therefore not a cycle but a chain (or tree) of isomorphic structures.

Proof: By ZP-B C3, no continuous path exists within  $Q_2$  of  $I_n$  from any  $x \neq 0$  back to 0. The  $\perp$  of  $I_{n+1}$  is an element of a distinct topological space — not an element of  $Q_2$  of  $I_n$ . No path in  $I_n$  can reach it. By DA-2, the identity conditions of each  $\perp$  are determined independently within each instantiation. Therefore no two  $\perp$  elements are identical

across instantiations. ✓

## V. The Directed Instantiation Tree

With DA-2 and C-DA2 in place, the global structure of instantiations is a forward-directed tree with no back edges:

- Each node in the tree is a  $\perp$  — the null state of one instantiation and the foundation of all successor instantiations branching from it.
- Each edge within an instantiation is a step in a monotone state sequence (ZP-A T3). Edges are irreversible (ZP-B C3).
- Branching at each node: every distinct outbound vector from the terminal state of  $I_n$  is a valid  $\varepsilon_0$  for a distinct  $I_{n+1}$ . T-SNAP does not select among branches — it fires on all of them. Branching is not optional; it is mandated by T-SNAP + DA-2.
- No back edges: C-DA2 establishes that no instantiation can reach the  $\perp$  of any ancestor instantiation.

Remark R-DA2: T-SNAP fires wherever  $P_0$  conditions are met. DA-2 establishes that the terminal state of  $I_n$  satisfies those conditions for  $I_{n+1}$ . T-SNAP therefore applies across instantiation boundaries without modification. No new axiom is required. The multiverse of instantiations is not a possibility the framework permits — it is a consequence the framework mandates.

## VI. The Zero Paradox Iterated

The paradox of  $\perp$  — simultaneously contributing nothing and being present in everything — propagates structurally at every branching node of the tree. Each node is:

- Nothing to its successor instantiations: it acts as additive identity under  $\vee$ , contributing nothing to any subsequent join.
- Everything to its successor instantiations: every state in  $I_{n+1}$  satisfies  $\perp_{n+1} \leq S$ , so the node underlies everything that follows.

The tree is the geometric shape of the Zero Paradox iterated across instantiations. The single-instantiation linear sequence was always a cross-section of a structure with this shape.

The complete picture: The Zero Paradox describes a forward-directed infinite tree where  $\perp_1 \rightarrow \dots \rightarrow S_{\text{terminal}}^1 \equiv \perp_2 \rightarrow \dots$ , where  $\equiv$  means structurally satisfies the role of, not is identical to. Each arrow within an instantiation is monotone and irreversible. Each  $\equiv$  crossing is not a path — it is a new instantiation of the universal structure. The Big Bang and heat death are the visible ends of a single instantiation, with the framework implying, but not requiring as a physical claim, that the structure continues on both sides.

## VII. Implications Within the Framework

Multiverse as mandatory. The branching fan at each  $\perp$  node is not optional. T-SNAP fires on all accessible outbound vectors simultaneously. The multiverse is a structural consequence, not an interpretation.

Free will and irreversibility. Within an instantiation, state sequences are monotone — no state can be decreased (ZP-A R1). Every choice is a join operation:  $S_n \vee \alpha$  for some increment  $\alpha$ . The algebra constrains only that the sequence be monotone, not which monotone path is taken. Each choice adds informational content irreversibly. Decisions are permanently encoded in the element's position in  $L$ .

Time's arrow. The monotone sequence (ZP-A T3) is a structural definition of temporal direction. Time's irreversibility is C3 applied within an instantiation. The framework does not assume time asymmetry — it derives it.

Causal structure. Every state is fully determined by the joins that produced it. The causal history of any state is encoded in its position in  $L$ . No effect without the join that produced it.

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## Formal Insert DA-3: Perspective-Relative Cardinality

*New in v2.0 | Cardinality as position-dependent measurement | Accounts for Skolem, CH independence, Russell*

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### I. The Gap DA-3 Closes

DA-2 establishes that instantiations form a directed tree and that branching at each  $\perp$  node produces multiple successor instantiations. This raises a question about the cardinality of branching: is the fan at each node countably or uncountably infinite? The answer, which DA-3 formalises, is that this question is perspective-dependent — and that this perspective-dependence is the same structural feature that underlies the major cardinality anomalies of classical set theory.

### II. Perspective-Dependence of Branching Cardinality

From within instantiation  $I_n$ , an observer occupies exactly one branch of  $I_{n+1}$ . The other branches of  $I_{n+1}$  are not accessible via any path — C3 and monotonicity jointly prohibit it. From inside, the branching factor is always 1: the observer sees one branch. From outside — from a meta-level view of the tree — the branching factor is the full fan of accessible outbound vectors.

#### Definition DA-3-D1 — Accessible Cardinality

The accessible cardinality of a position  $p$  in semilattice  $L$  is the cardinality of the set of states reachable from  $p$  by monotone sequences within the instantiation containing  $p$ .

The accessible cardinality from  $p$  is determined entirely by the structure of  $L$  above  $p$ . It is not an intrinsic property of a collection — it is a property of the relationship between a position and the states reachable from it. No position within any instantiation can access all cardinalities simultaneously. The meta-level view, which sees the full branching fan, is not a position any element of any instantiation can occupy.

Remark R-DA3-1: To observe the full branching fan, one would need to occupy a position outside all instantiations. That position would itself be a state in some semilattice, subject

to the same rules. The meta-view is either another instantiation (in which case the tree has no privileged outside view) or  $\perp$  itself (in which case the null state is the only position from which the full structure is visible — the state that contributes nothing and is present in everything). The Zero Paradox's name is more precise than it first appeared.

### III. Connection to Classical Set Theory

Skolem's Paradox. ZFC can be given a countable model even though it proves uncountable sets exist. From within the model, certain sets are uncountable. From outside the model, it is countable. DA-3 gives this a precise interpretation: countable and uncountable are accessible-cardinality descriptions made from different positions — inside and outside the instantiation respectively. Skolem's Paradox is not a paradox. It is a perspective-dependence result, exactly as DA-3 predicts.

The Continuum Hypothesis. Gödel and Cohen together established that CH is independent of ZFC — neither provable nor disprovable from the standard axioms. DA-3 accounts for this structurally: the answer to whether anything sits between  $\aleph_0$  and  $2^{\aleph_0}$  depends on which instantiation one is measuring from. Different semilattices with different accessible cardinality structures will give different answers. The independence of CH is not an accident of axiom selection — it is the formal shadow of perspective-dependence. No axiom system located within the set-theoretic hierarchy can resolve it because resolution would require the meta-level view that DA-3 shows is unavailable from within any instantiation.

Russell's Paradox. The set of all sets that do not contain themselves is paradoxical because its construction requires a position outside all sets. In the tree framework, that position is  $\perp$  — the only vantage point from which the full structure is simultaneously visible, and precisely the point that contributes nothing and therefore cannot serve as a measuring position. The paradox arises from attempting to occupy  $\perp$  as an observer while remaining within an instantiation. DA-3 establishes these are incompatible positions:  $\perp$  is the foundation, not a member.

### IV. The Cardinality Hierarchy as Perspective-Relative

Cantor's theorem establishes that for any set  $S$ ,  $|P(S)| > |S|$ , generating the hierarchy  $\aleph_0 < 2^{\aleph_0} < 2^{2^{\aleph_0}} < \dots$ . DA-3 reframes this hierarchy not as a fixed ladder that mathematics climbs, but as a perspective-relative description of the branching structure of the instantiation tree, as seen from within different positions.

#### Claim DA-3-C1 — Perspective-Relative Absolute Cardinality

The appearance of absolute cardinality — cardinality as an intrinsic property independent of measuring position — is an artifact of treating the semilattice as having a view from outside. DA-2 and C-DA2 jointly prohibit such a view from within any instantiation.

The framework does not resolve the Continuum Hypothesis with a yes or no. It does something more fundamental: it explains why CH is independent of ZFC as a structural necessity, not an accident of which axioms were chosen. The reason cardinality resists resolution from within any fixed formal system is the same reason branching factor is

perspective-dependent in the tree — you cannot see the full fan from inside a branch. Gödel's incompleteness theorems and the independence of CH are formal expressions of this structural fact.

**Status: DEFINITIONAL ALIGNMENT + CANDIDATE CLAIM. DA-3-D1 and R-DA3-1 are definitional. DA-3-C1 is a candidate claim: structurally motivated within the framework; formal derivation of the connection between accessible cardinality and specific set-theoretic independence results is deferred to OQ-E2.**

## V. Quantum Mechanics Correspondence

The perspective-dependence of DA-3 maps directly onto the quantum measurement problem. Superposition — the simultaneous existence of multiple states before measurement — is the view of the branching fan from outside an instantiation. Collapse — the resolution to a single outcome upon measurement — is the view from inside an instantiation, where branching factor is always 1. Neither is more fundamental. They are perspective-relative descriptions of the same tree structure. The framework does not derive quantum mechanics, but it provides a structural account of why the measurement problem has the shape it does.

## Updated Open Items Register — ZP-E v2.1

Item	Status	Description
AX-1: Binary Snap Causality	CLOSED — T-SNAP	AX-1 is no longer an axiom. Binary Snap derived via $P_0$ + DA-1 + L-RUN + TQ-IH + ZP-A D2.
DA-1: Design Principle	CLOSED — L-INF	$\perp$ at $P_0$ has unbounded surprisal (L-INF); informational extremity forces execution. Honest design commitment replaces prior D7 grounding.
DA-2: Instantiation Succession	CLOSED — Definitional	Terminal state of $I_n$ satisfies A4 role of $\perp$ for $I_{n+1}$ . C-DA2 establishes ontological novelty of each $\perp$ .
DA-3: Perspective-Relative Cardinality	CLOSED (definitional) / CANDIDATE (DA-3-C1)	Cardinality is position-dependent. Skolem, CH independence, Russell accounted for structurally. OQ-E2 open.
OQ-A1: Increment selection	CLOSED — T5	Iterative Forcing Theorem. $\alpha_n = \varepsilon(S_n)$ . Grounding updated from AX-1 to T-SNAP.
OQ-B1: $p = 2$	CLOSED — ZP-B T0	Derived from AX-B1 and MP-1.
OQ-C1: Non-conservatism of DF	CLOSED — ZP-C T2	Infinite sequence divergence proven. No postulates remain.
S1: Distribution stipulation	CLOSED — ZP-C T1	Derived from AX-B1 and RP-1.

Item	Status	Description
OQ-E1: Sequence vs. tree	CLOSED — DA-2	The structure is a forward-directed tree, not a linear sequence. Branching is mandatory via T-SNAP. Countable vs. uncountable branching is perspective-dependent (DA-3).
OQ-E2: Cardinality-semilattice correspondence	OPEN	Do specific semilattice structures correspond to specific cardinality regimes? Can the framework make predictions about which instantiations satisfy CH and which do not?
Remaining axioms	INTENTIONAL — AX-B1, AX-G1, AX-G2	These are the three foundational commitments of the system. No further reduction is claimed.
Temperature T in BA-1	PARAMETER — intentional	Universe-contingent. Physical predictions explicitly conditional on instantiation-specific T.

## Updated Traceability Register — ZP-E v2.1

Claim	Grounded In	Bridge Axiom?	Status
Binary Snap causality	ZP-C D1, L-RUN, TQ-IH; ZP-A D2; DA-1	None	Derived — T-SNAP ✓ (was: Axiomatic — AX-1)
DA-1: Instantiation = execution	ZP-C L-INF (not D7)	None	Design Principle — informational extremity forces execution; explicit commitment citing L-INF
DA-2: Instantiation succession	ZP-A A4, CC-1; ZP-B C3, R1; T-SNAP	None	Definitional Alignment — clarification of CC-1 scope; no new axiom
C-DA2: Novelty of $\perp$	DA-2, ZP-B C3	None	Derived — Corollary of DA-2 and C3 ✓
DA-3: Perspective-relative cardinality	DA-2, C-DA2, ZP-B R1	None	Definitional (DA-3-D1, R-DA3-1); Candidate (DA-3-C1)
T-SNAP: Snap is derived	T-BUF chain + DA-1	None	Derived — Cross-Framework ✓
AX-1 retirement	T-SNAP closes AX-1	N/A	AX-1 is no longer an axiom; T-SNAP is its replacement
Iterative Forcing T5	AX-B1, T-SNAP (replaces AX-1)	None	Derived — grounding strengthened
Multiverse mandated	T-SNAP, DA-2	None	Derived consequence — not an interpretation

Claim	Grounded In	Bridge Axiom?	Status
OQ-E2: Cardinality correspondence	DA-3	N/A	OPEN — formal derivation deferred

## Validation Status — ZP-E v2.1

Component	Status / Notes
DA-1: Design Principle	Valid — Informational extremity (ZP-C L-INF) forces execution: $\perp$ at $P_0$ has unbounded surprisal and no finite external interpreter; therefore it necessarily executes. Explicit commitment citing L-INF; replaces prior circular D7 grounding. ✓
T-SNAP: Binary Snap derived	Valid — Derived. Seven-step proof. All dependencies are closed theorems in their own documents. ✓
AX-1 retirement	Valid — AX-1 superseded by T-SNAP. No content lost; claim strengthened from assumed to derived.
DA-2: Instantiation Succession	Valid — Definitional Alignment. Clarification of CC-1 scope. No new axiom. A4 role of $\perp$ extended across instantiation boundaries. ✓
C-DA2: Ontological Novelty of $\perp$	Valid — Derived. Follows directly from DA-2 and ZP-B C3. ✓
Directed instantiation tree	Valid — Derived structural consequence of T-SNAP + DA-2. Branching is mandatory, not optional. Forward edges only.
Multiverse as mandatory	Valid — Derived. T-SNAP fires on all accessible outbound vectors. Not an interpretation.
Free will / irreversibility	Valid — Structural consequence. Monotonicity (T3) constrains direction; additive ontology (R1) prohibits reduction. Path choice is undetermined by algebra.
Time's arrow	Valid — Derived from ZP-A T3 (monotonicity) and ZP-B C3 (irreversibility). Not assumed.
DA-3: Perspective-Relative Cardinality	Valid (definitional components: DA-3-D1, R-DA3-1). Candidate (DA-3-C1: connection to specific set-theoretic independence results). OQ-E2 open.
Skolem, CH, Russell accounted for	Structurally motivated — each is identified as an instance of perspective-dependence. Formal derivation deferred to OQ-E2.
Remaining axioms: AX-B1, AX-G1, AX-G2	Intentional foundational commitments. No further reduction claimed.

Component	Status / Notes
All other ZP-E theorems (T1-T7, T2-C)	Unaffected in content. T4 and T5 carry upgraded status labels (AX-1 → T-SNAP).

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*End of ZP-E v2.1 | Three formal inserts: DA-1, DA-2, DA-3 | One open question: OQ-E2 | Remaining axioms: AX-B1, AX-G1, AX-G2*