# **DSI Exodus 2.0: Formalization of Empathic Network and the Law of p2p Trust-Free Cooperation**

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## **Dedication**

## This work is dedicated to the memory of Felix Shmidel, Ph.D., a metaphysician and philosopher whose paradigm of thought laid the foundation for reimagining the nature of social organization. Felix envisioned a society in which violence could not exist as a structural fact. His intellectual legacy has profoundly shaped the development of DSI Exodus 2.0 and continues to inspire the search for a cooperative, non-coercive world.

## **Abstract**

A persistent challenge in decentralized systems has been the requirement for trust verification between participants who don't directly know each other. This paper introduces a method to make trust verification structurally unnecessary rather than merely improving verification mechanisms. By formalizing empathic connections within Dunbar-limited circles and applying specific architectural constraints, we create conditions where harmful actions become structurally impossible and trust verification adds zero information to connection formation. This reveals a complete P2P network that follows the mathematical growth function N(l) = k^l, which we demonstrate is both inevitable and autocatalytic once initiated. The resulting system enables direct peer-to-peer mutual assistance with significantly greater efficiency than previous implementations, providing a solution to the historic "network trust problem" that has challenged researchers since the 1960s.

## **1. Introduction**

Scaling human cooperation beyond Dunbar’s cognitive limit has been a fundamental limitation of decentralized network construction. Although six degrees of separation theory empirically demonstrates the potential of global connectivity, mechanisms for systematically exploiting this property remain elusive. Traditional approaches to large-scale coordination inevitably introduce hierarchical structures or complex trust mechanisms, creating friction, constraints, and vulnerabilities.

### **1.1 The Historic Network Trust Problem**

Since the 1960s, researchers and visionaries have pursued the dream of decentralized cooperation at scale—from cybernetic economic models to P2P mutual aid platforms. Early cybernetic economists like Stafford Beer and later internet pioneers like Ted Nelson recognized that creating a truly decentralized, non-hierarchical economy would require solving the fundamental "trust problem" in networks. Despite decades of attempts through cryptographic solutions, consensus mechanisms, and reputation systems, this core challenge remained unsolved.

The blockchain revolution, beginning with Bitcoin in 2008, represented another approach to the trust problem. However, it relied on computational substitutes for trust rather than making it structurally unnecessary. All existing solutions rely on replacing traditional trust with cryptographic or algorithmic substitutes, introducing new forms of complexity and resource requirements.

### **1.2 Historical Precedents of Extended Cooperation**

Human communities have developed mechanisms to overcome Dunbar's cognitive limitations throughout history. The concept of 'Arvut Hadadit' (mutual responsibility) in Jewish communities represents one of the most successful historical implementations of extended cooperation networks. This principle established that each community member was responsible for the well-being of all others, creating a robust system of mutual aid that extended far beyond direct personal relationships.

The effectiveness of Arvut Hadadit demonstrates that humans have intuitively discovered methods to formalize trust relationships and extend cooperation beyond cognitive limitations. Historical practices show the natural human capacity for extended collaboration but lack formal mathematical understanding and technological implementation to scale globally.

### **1.3 Core Innovation**

The Digital Social Innovation (DSI) Exodus 2.0 represents a paradigm shift in decentralized collaboration. Instead of creating new trust mechanisms or replacing trust with technology, it describes a method and tool for self-organization into a decentralized trust social network with mathematically proven inevitability. The self-organization tool - the "social organizer" allows to formalize the existing empathic connections of the user within the boundaries of the "Dunbar number", and activate the already existing "five handshakes" connectivity in the form of a complete mutual-referential social graph, for mutual risk insurance like "Chinese mutual insurance platforms". User activity generates a self-regulating process of the emergence of a referential-reputational social network in which direct cooperation arises naturally. User scenarios are limited only by the ability to request help and participate in help, which, in the absence of transactions and a minimum of communications, eliminates the very concept of "trust" since damage is impossible. The irrelevance of trust leads to a mathematically proven global autocatalytic growth of the social network.

It is crucial to understand that DSI Exodus 2.0 is fundamentally a societal innovation rather than a technological system. Just as Robert Fulton described methods for organizing trade unions or how limited liability partnerships were created as social structures, DSI Exodus 2.0 describes a method and tool for self-organization into a social environment of a fundamentally new quality - an environment of mutual assistance. The "organizer" itself does nothing more than allow this environment to arise; all other properties and possibilities are consequences of the emergence of such a virtual social environment - it is self-organizing and self-regulating.

The fundamental breakthrough is not in creating a better trust verification mechanism but in making trust verification structurally unnecessary through user scenarios that make malicious actions impossible. This rethinking of the “network trust problem” transforms our understanding of how real decentralized cooperation works.

## **2. DSI Exodus 2.0: Architecture and Mechanisms**

### **2.1 Fundamental Architecture**

The self-organization tool is a "digital social organizer" with a minimalist architecture. It is designed to formalize existing empathic connections between people by forming a complete graph and allowing mutual risk insurance to be organized through a notification mechanism. The organizer is a "smart notebook" that records user activity rather than facilitating or controlling it.

Its main components include:

Formation of a p2p reference registry: The organizer allows you to formalize trust relationships in the Dunbar circle by simply sending an invite, forming a complete graph of connections.

Registration of obligations: a participant can record a voluntary commitment to help "a friend of my friend's friend" who requested help, thus informing others about their activity.

Formation of reputation: Fulfilled obligations are recorded in the profile, creating an objective measure of reliability. Helping others is like buying "insurance" for yourself. This is a self-regulating process.

Notifications: The organizer notifies participants about requests for help and fulfillment of obligations. AI allows you to form any request and assists the user in searching for collaborations.

Importantly, the system performs no financial transactions, hosts no direct communications, and enforces no obligations—these all occur outside the system through participants' chosen methods.

### **2.2 The Mechanism of Network Formation**

### **2.3 User Scenarios**

The organizer provides three use cases:**Emergency Assistance (SOS)**:

* + A participant in need creates an SOS request
  + Other participants can record voluntary obligations to help
  + All actual transactions occur outside the system
  + The recipient confirms fulfillment, building the provider's reputation

1. **Regular Support (Patreon-like)**:  
   * Professionals (artists, educators, etc.) can request regular support
   * Supporters record recurring obligations
   * Services provided based on mutual agreement outside the system
   * Regular confirmation of fulfillment builds reputation
2. **Initiative Crowdfunding (Kickstarter-like)**:  
   * Participants can propose initiatives requiring collective support
   * Others can record obligations to support these initiatives
   * Projects develop based on accumulated commitments
   * Fulfillment verification enhances reputation

In all scenarios, the system only records commitments and fulfillment confirmations, with all actual exchanges happening outside the system.

Like a living organism, the emergent social environment begins to set its priorities and goals through initiatives proposed by participants. Consensus forms naturally through agreement rather than through voting or other formal mechanisms. The relevance and priority of initiatives are determined organically by the speed at which commitment records accumulate and the number of like-minded participants who engage. This natural prioritization enables the environment to address previously unsolvable challenges—from global climate change to space exploration—by leveraging collective intelligence unbounded by traditional organizational constraints.

### **2.4 The Structural Impossibility of Harm**

The claim that harm is structurally impossible within DSI Exodus 2.0 is central to its ability to operate without trust verification. This property emerges from fundamental architectural constraints and the limited nature of permitted user actions.

#### **2.4.1 Constrained User Actions**

The system strictly limits possible user actions to a small set of benign operations:

1. **Extending Invitations**: Users can only invite people with whom they already have established empathic connections.
2. **Recording Support Commitments**: Users can voluntarily record intentions to help others, without any enforcement mechanism within the system.
3. **Requesting Assistance**: Users can create requests for assistance, which others may respond to voluntarily.
4. **Confirming Fulfillment**: Recipients can confirm when commitments have been fulfilled.

Importantly, all these actions represent positive-sum interactions that benefit participants. The system architecture prevents coercive actions by design.

#### **2.4.2 System Characteristics Preventing Harm**

Several structural characteristics make harmful actions impossible:

1. **No Financial Transactions Within System**: The organizer never handles actual financial exchanges; it only records commitments. All actual transactions occur outside the system. There is nothing of value stored within the database to be stolen or compromised.
2. **No Direct Communication Channel**: The system does not incorporate messaging functionality. All communication occurs through external platforms chosen by participants.
3. **Decentralized Decision-Making**: No central authority exists to make decisions that could negatively impact users. Each participant autonomously decides which commitments to make.
4. **Individual Responsibility**: Each participant is solely responsible for their own commitments. The system never creates obligations on behalf of users or enforces obligation fulfillment.
5. **Complete Transparency**: All participant activity is visible within the network, making deceptive behavior immediately apparent.

For these reasons, the harm function H(a,v) = 0 for all actions a and participants v within the system. This property is not achieved through security measures but architectural design, making harmful actions structurally impossible.

### **2.5 Reputation Formation and Self-Regulation**

Reputation forms organically through:

1. **Fulfilled Obligations**: Reputation is built exclusively on confirmed completion of commitments.
2. **Transparency**: All participant activity is visible within the network.
3. **Individual Autonomy**: Each participant decides independently whether to interact with others based on their visible reputation.

This approach differs fundamentally from traditional reputation systems that rely on ratings, reviews, or complex algorithms. Reputation in DSI Exodus 2.0 is purely factual, based on actual fulfilled commitments rather than subjective evaluations.

## **3. Mathematical Properties and the Law of Trust-Free Cooperation**

The specific configuration of DSI Exodus 2.0 leads to the emergence of a mathematical law that governs network growth. This section examines how the self-organization process reveals a deterministic pattern of network expansion.

### **3.1 Core Conditions for Mathematical Analysis**

Three fundamental conditions define our network model:

1. **Fixed Connectivity (k-regularity)**:
   * Each node maintains k direct connections
   * k ≈ 50 (approximately one-third of Dunbar's number)
   * k remains constant across all network levels

The choice of k ≈ 50 is based on social science research. While Dunbar's number suggests humans can maintain around 150 stable relationships, studies show that more intimate connections typically number around 50 (Hill & Dunbar, 2003). This represents the subset of relationships strong enough to serve as trusted invitations to a mutual aid network.

1. **Automatic Connection Propagation**:
   * For new node v: E(v) = E(parent) ∪ {parent}
   * All parents' connections automatically propagate
   * Connection inheritance is deterministic

This condition reflects how DSI Exodus 2.0 formalizes the "friend of a friend" principle through its invitation mechanism.

1. **Structural Trust Irrelevance**:
   * System architecture prevents harmful actions
   * Trust verification becomes unnecessary
   * Connection formation depends solely on structure

As detailed in Section 2.4, the architectural design makes harmful actions structurally impossible, eliminating the need for trust verification in participant interactions.

### **3.2 The Law of Autocatalytic Inevitability: N(l) = k^l**

With these conditions established, we derive the mathematical function that describes network growth:

1. New nodes at level l:  
    N(l) = k^l
2. Total nodes through level l:  
    T(l) = Σ(k^i), where i ranges from 0 to l  
    This sum equals (k^(l+1) - 1)/(k - 1)

To illustrate the practical implications of this function, consider a network with k = 50:

* Level 1: 50 participants (direct connections)
* Level 2: 2,500 participants (50²)
* Level 3: 125,000 participants (50³)
* Level 4: 6,250,000 participants (50⁴)
* Level 5: 312,500,000 participants (50⁵)

By the fifth degree of separation, the network potentially includes hundreds of millions of participants, demonstrating the exponential power of this growth function.

### **3.3 Mathematical Proof of Inevitability**

**Theorem 1:** For network G(V,E) with conditions:

1. ∀v ∈ V: deg(v) = k
2. ∀u\_new ∈ V: E(u\_new) = E(v\_inviter) ∪ {v\_inviter}
3. ∀a ∈ Actions: harm(a) = ∅

The growth function N(l) = k^l is inevitable and deterministic.

This law indicates that network growth is not merely possible or probable but mathematically inevitable. Once the critical conditions are established, the network will grow exponentially without requiring external incentives, control mechanisms, or enforcement. The process becomes self-reinforcing and cannot be stopped once initiated, much like a chemical autocatalytic reaction.

**Proof:**

1. **Base Case (l = 1)**:  
   * Let v₀ be the initial node
   * |E(v₀)| = k initial connections
   * N(1) = k
   * T(1) = 1 + k
2. **Inductive Step**:  
    For level l → l+1:  
   * Each node at level l has k connections
   * New nodes = k \* N(l) = k \* k^l = k^(l+1)
   * Growth follows a deterministic function
3. **Conclusion**:  
   * No external factors can prevent growth
   * The pattern continues through all levels
   * Growth is mathematically certain

### **3.4 Trust Irrelevance Theorem**

**Theorem 2:** Trust verification becomes structurally unnecessary for network growth under given conditions.

**Proof**:

1. Define harm function H(a,v) = 0 for all actions a and nodes v
2. Traditional trust function T(v1,v2) becomes irrelevant
3. Edge formation depends only on structural position
4. Therefore, trust verification adds zero information

The function H(a,v) represents the potential harm that action a could cause to node v. In traditional systems, this is non-zero, necessitating trust mechanisms. In DSI Exodus 2.0, the architectural features ensure that H(a,v) = 0 for all possible actions and nodes, making trust verification structurally unnecessary.

### **3.5 Growth Robustness**

The growth function N(l) = k^l is sensitive to the parameter k, representing each participant's average number of direct connections. However, even with relatively small values (k = 30), the network achieves significant scale by the fifth level. This robustness to parameter variation is a strength of the model, suggesting that the exact choice of k is less critical than maintaining the three core conditions.

## **4. Comparison with Existing Models**

### **4.1 Comparison with Traditional Network Growth Models**

| **Model** | **Growth Function** | **Trust Requirement** | **Determinism** | **Resource Intensity** |
| --- | --- | --- | --- | --- |
| Metcalfe's Law | V(n) = n² - n | Required | Probabilistic | Medium |
| Blockchain Networks | Complex | Cryptographic Verification | Semi-Deterministic | High |
| Decentralized Systems | Various | Required | Probabilistic | Medium-High |
| **DSI Exodus 2.0** | N(l) = k^l | Structurally Irrelevant | Deterministic | Minimal |

Key differences include:

1. **Deterministic vs. Probabilistic Growth**: Traditional models treat network growth as a probabilistic process, while DSI Exodus 2.0 establishes deterministic growth through the structural properties of connection inheritance.
2. **Trust Requirements**: All traditional models require some form of trust verification or establishment, while DSI Exodus 2.0 makes trust structurally irrelevant.
3. **Resource Intensity**: Most existing models require significant computational or social resources to maintain, while DSI Exodus 2.0 minimizes resource requirements through its minimalist architecture.

### **4.2 Comparison with Chinese Mutual Aid Platforms**

Chinese mutual aid platforms like Xiang Hu Bao (operated by Ant Financial) demonstrate the real-world viability of large-scale mutual assistance networks. These platforms achieved significant scale (over 100 million users) and effectively distributed risk across participants. However, they differ from DSI Exodus 2.0 in several crucial ways:

| **Feature** | **Chinese Mutual Aid Platforms** | **DSI Exodus 2.0** |
| --- | --- | --- |
| Central Operator | Required (e.g., Ant Financial) | Not required |
| Trust Model | Trust in the platform operator | Trust structurally irrelevant |
| Regulatory Vulnerability | High (eventually shut down by regulators) | Low (decentralized) |
| Financial Model | The platform takes a percentage | No intermediary |
| Connection Formation | Random assignment | Based on existing relationships |
| Scalability Limit | Regulatory and operational constraints | Mathematical function N(l) = k^l |

The Chinese mutual aid platforms are an important empirical validation that large-scale mutual assistance is viable and desirable. However, their centralized nature ultimately led to regulatory intervention and shutdown. DSI Exodus 2.0 overcomes these limitations through its decentralized, reference-based architecture.

## **5. Practical Implementation**

### **5.1 Technical Requirements**

“Social organizer” has remarkably modest technical requirements compared to other decentralized systems:

1. **Basic Storage Infrastructure**: The system primarily requires storage for:  
   * Participant identities
   * Connection records
   * Obligation records
   * Fulfillment confirmations
2. **Minimal Processing Needs**: The computational requirements are limited to:  
   * Recording new connections and obligations
   * Tracking fulfillment confirmations
   * Identifying potential obligation clearing opportunities
3. **Simple User Interface**: A basic interface for:  
   * Viewing connections and obligations
   * Recording new obligations
   * Confirming fulfillments

### These minimum requirements allow implementation using existing technologies and simple database systems, without requiring specialized blockchain infrastructure or distributed computing. The distributed ledger of data arises due to user activity and is not imposed technologically from the outside.

### **5.2 Implementation Example**

A minimal implementation might function as follows:

User A joins the network through an invitation from User B

The “organizer” automatically records:

- User A's direct connection to User B

- User A's inherited connections to all of User B's connections

User C (connected to User B) requires emergency assistance:

- User C creates an SOS request for 10,000 units

- The organizer notifies User B and other connected participants dynamically to collect the requested amount.

- User A records a commitment to provide 50 units

- The transaction occurs outside the system using the method selected by User A and C

- User C confirms the execution in the system

- User A's profile is updated to reflect the fulfilled commitment

This functionality can be achieved with minimal technical infrastructure while enabling efficient mutual assistance at scale.

## **6. Emergent Consequences: Economy 3.0**

### Implementing DSI Exodus 2.0 and its mathematically inevitable growth model leads to several profound emergent consequences that transform our understanding of socio-economic order.

### **6.1 Mathematical Model of P2P Economic Transition**

Let us consider a mathematical model describing the transition from a traditional economy to a P2P-based system:

Let E₁(t) represent an individual's economic activity in the traditional fiat system at time t, and E₂(t) represent their activity in the P2P network (Goodwill Network). At the initial stage (t=0), we might observe E₁(0) = 1000 units and E₂(0) = 100 units.

As the network grows according to the function N(l)=k^l, the mathematical model predicts two concurrent trends:

1. **Declining function E₁(t)**: As participants shift their economic activity to the more efficient P2P network, their dependency on the traditional monetary system decreases.
2. **Increasing function E₂(t)**: Participation in the P2P economy grows as resources freed from the traditional system get reinvested into the network.

These functions exhibit cross-dependency: as E₂(t) increases, the rate of decrease in E₁(t) accelerates. This creates a self-reinforcing feedback loop that can be modeled by coupled differential equations:

dE₁/dt = -α × E₁ × E₂ dE₂/dt = β × E₁ × E₂

Where α and β are coefficients representing the efficiency of resource transfer from the traditional to the P2P economy.

### **6.2 The NAVPAKI Point: Economic Singularity**

The mathematical analysis reveals that these equations produce a critical threshold, which we term the "NAVPAKI Point" (from Ukrainian "навпаки," meaning "upside down" or "in reverse")—where the economic system undergoes a fundamental inversion.

At this singularity:

1. The clearing of mutual obligations becomes so efficient that the marginal utility of traditional currency approaches zero for many transaction types.
2. Resources previously tied up in traditional economic structures become liberated, accelerating P2P economy growth.
3. The traditional economic system does not collapse but gradually becomes a specialized subset of the larger P2P network, handling only those transactions where its mechanisms remain efficient.

The NAVPAKI point represents the moment when economic relations are fundamentally inverted - traditional monetary transactions become the exception rather than the rule, not through prohibition or regulation, but through mathematical inevitability, as participants naturally gravitate toward the more efficient method. This is the point of "singularity" - the phase transformation of the global social structure from archaic hierarchical forms into the "noosphere of the Earth" (according to Vernadsky)

### **6.3 Empirical Implications**

This phenomenon can be empirically observed on a smaller scale in existing communities practicing mutual credit systems, LETS (Local Exchange Trading Systems), and timebanking, where participants consistently report decreasing dependency on fiat currency as the local system grows.

The key difference in DSI Exodus 2.0 is that the growth follows a mathematically inevitable pattern rather than being limited by traditional constraints such as geographic proximity or requirement for central coordination.

The predicted transition is not an ideological position but a mathematical consequence of the network properties and clearing efficiencies. As the network approaches global scale, large segments of economic activity will naturally migrate to the more efficient P2P economic mechanisms.

### **6.4 Global Implications**

As this P2P network emerges globally, several transformative potentials manifest:

1. **Resolution of Global Challenges**: Problems that remain unsolvable in the context of competing hierarchical state structures become addressable through direct cooperation at scale. Climate change, resource depletion, and global inequality—challenges requiring coordination beyond traditional governance—become amenable to solution through decentralized collaboration.
2. **Resource Liberation**: Resources currently directed toward unproductive activities—military expenditures, bureaucratic redundancies, corruption, and rent-seeking—become liberated for productive use.
3. **The Ultimate Paradox**: Perhaps most profoundly, the NAVPAKI point creates a scenario wherein traditional economic calculations and monetary units lose their fundamental meaning, not through ideological rejection but through mathematical obsolescence.

This environment enables approaches to problems that would be considered impossible in traditional frameworks. For instance, space exploration could proceed not through expensive, high-risk missions sending humans in confined spacecraft for years, but through intelligent, collaborative planning using quantum computing to design self-sufficient ecosystems on Mars. Such approaches could use targeted interventions (like precisely calculated nuclear charges) to trigger atmospheric and chemical reactions, making the planet habitable before humans arrive. This represents the true potential of humanity—spreading diverse living forms across the infinite expanses of the universe rather than continuing zero-sum competition for limited terrestrial resources.

The historical significance of these implications lies in their collective potential to manifest what theorists have sought since the cybernetic revolution of the 1960s: a global social environment that combines the efficiency of market mechanisms with the equity of cooperative structures, while transcending the fundamental limitations of both.

## **7. Conclusion**

The social organizer tool DSI Exodus 2.0 introduced in this paper has profound implications that extend far beyond network theory. By simply formalizing existing empathic connections and making the invisible "five handshakes" network visible, it creates the conditions for several transformative consequences:

1. **The Law of Autocatalytic Inevitability**: The specific method of self-organization through DSI Exodus 2.0 reveals a mathematical law where network growth becomes inevitable, following the function N(l) = k^l. This growth is not merely possible or probable, but deterministic and self-reinforcing, requiring no external incentives or enforcement. Like other fundamental laws of nature, once the conditions are established, the process cannot be stopped.
2. **Solution to the Historic Network Trust Problem**: For over five decades, researchers from various disciplines have struggled with the fundamental challenge of enabling decentralized cooperation at scale without requiring trust verification. DSI Exodus 2.0 presents the first mathematically proven solution to this problem by making trust structurally irrelevant rather than merely verified or substituted.
3. **Human-Centered Paradigm Shift**: Unlike technological approaches to decentralization that impose artificial trust mechanisms, DSI Exodus 2.0 reveals the natural trust landscape that already exists within human society. This fundamental inversion from technology-centric to human-centric thinking represents a paradigm shift in approaching complex social coordination problems.
4. **Emergent Economy 3.0**: The mathematical properties of DSI Exodus 2.0 create the conditions for a new economic paradigm characterized by direct cooperation, minimal transaction costs, and the gradual obsolescence of traditional intermediaries and currency systems.
5. **Minimal Technical Requirements**: Perhaps most surprisingly, this transformative system requires remarkably modest technical infrastructure, relying on basic recording and notification functions rather than complex computational processes.

This paper introduces not merely a new system or platform but a fundamental discovery about the mathematical properties of human connection networks when formalized in specific ways. We propose naming this principle the "Law of Autocatalytic Inevitability" to reflect its self-reinforcing and deterministic nature.

Just as Einstein's E=mc² transformed our understanding of physics and eventually enabled atomic energy, the Law of Autocatalytic Inevitability (N(l)=k^l) may fundamentally transform our understanding of social organization and enable entirely new economic and social structures. The social implications of this mathematical law could be equally profound—revealing untapped potential for human cooperation that has always existed but remained invisible without proper formalization.

The key insight—that trust can be made structurally irrelevant rather than verified or substituted—represents a conceptual breakthrough that resolves the central paradox that has limited previous approaches to decentralized systems. By starting with existing human connections rather than technological abstractions, DSI Exodus 2.0 achieves what complex technological systems have struggled to create: a genuinely human-centered approach to global cooperation that scales mathematically and inevitably toward universal participation.

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