

Myceloom: The Coalition Substrate

Protocol Specification — The Political Architecture of Networked Solidarity

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Abstract

Myceloom defines a network protocol adapting the evolutionary dynamics of fungal networks to solve the political problem of collective action. Distributed systems require such infrastructure to align divergent interests and sustain multi-stakeholder alliances. Prior scholarship addresses philosophical foundations and technical architecture but leaves the political economy of coalition unexamined. Heterogeneous actors must find common ground to overcome free-rider problems. Sustaining such cooperation depends on specific political structures. Mancur Olson's logic of collective action and William Riker's formation theory provide the central analytical framework. Robert Axelrod's evolution of cooperation offers additional grounding alongside biological market theory. Platform cooperativism and federated governance innovations complete the model. The specification defines the political architecture enabling multi-stakeholder alliances and constitutes the Coalition layer of the Myceloom Protocol.

I. Introduction: The Coalition Problem

Digital centralization reflects a political failure rather than a technical limitation. Distributed networks currently lack the capacity to form durable coalitions against extractive incumbents. Mancur Olson's logic of collective action explains this deficit. Rational individuals rarely organize to achieve common goals when they can benefit from the effort of others without contributing. Platform monopolies sustain themselves because the cost of building alternatives falls on a few while benefits diffuse across many.

Myceloom offers a structural response to this coordination deficit. The term itself integrates three distinct pillars: the distributed intelligence of *mycelium*, the intentional craft of the *loom*, and the generational value of the *heirloom*. It defines a pattern for "living infrastructure" where distinct nodes maintain total sovereignty while remaining deeply woven into a reciprocal whole. Technical connectivity alone cannot align heterogeneous interests. True multi-stakeholder alliances require this form of *symbiotic sovereignty*—structures where cooperation remains rational even when defection offers short-term gain.

The Myceloom Protocol adapts these evolutionary dynamics to solve the problem of digital collective action. Mycorrhizal principles create a "coalition substrate" that supports distinct political economies. The resulting architecture synthesizes political science and biological market theory to serve participants rather than shareholders.

II. The Logic of Collective Action: Olson's Problem and Myceloom's Response

Mancur Olson establishes the theoretical foundation for understanding why groups with common interests systematically fail to pursue collective action. His central insight challenges the assumption that groups act like individuals. Rational actors will not act to achieve group interests unless forced or incentivized because they benefit from collective goods regardless of their personal contribution. Incentives to defect intensify as group size increases. Individual contributions matter less while costs remain constant, resulting in the systematic underproduction of collective goods and the overrepresentation of concentrated interests.

Current digital platforms exemplify this dynamic. Users share diffuse interests in privacy and democratic governance but lose consistently to concentrated owner interests. Free-rider problems operate at a massive scale because individual decisions to switch alternatives impose high personal costs while providing negligible collective benefit. Olson identifies two mechanisms for overcoming this trap: small groups succeed where social pressure operates effectively, and organizations provide "selective incentives" through private goods available only to contributors.

The Myceloom Protocol embeds these mechanisms directly into network architecture. Nested scale enables coalitions at multiple levels by supporting groups from intimate teams to federated networks. Nodes remain small enough for social pressure to function while distinct "selective incentives" reward participation. Nodes withdrawing from reciprocal exchange lose access to the collective intelligence and resource flows that the network provides. Transparency makes contributions visible and defection reputationally costly, creating a structure where cooperation becomes individually rational without requiring continuous altruism.

III. Coalition Formation: From Minimum Winning to Maximum Sustaining

William Riker examines how coalitions form, proposing that a "size principle" shapes political dynamics where participants create coalitions just large enough to ensure winning. Coalition members must share the spoils of victory, so adding unnecessary members dilutes individual shares. Rational coalition builders therefore seek "minimum winning coalitions"—groups large enough to prevail but no larger. Platform owners mirror this logic through vertical integration, maintaining relationships only to capture value and absorbing functions that partners might otherwise perform to avoid sharing decision-making power.

However, Riker's analysis applies primarily to zero-sum situations where winners' gains equal losers' losses. Digital infrastructure is not inherently zero-sum; network effects mean larger networks generate more value. To capture these positive-sum possibilities, Myceloom employs a "maximum sustaining coalitions" logic. This approach mimics how mycorrhizal networks form alliances connecting multiple plant species. Fungal partners thrive by maintaining broad, inclusive coalitions that provide resilience and access to diverse resources.

Common mycorrhizal networks sustain these coalitions through reciprocity-based resource distribution that prevents free-riding. Fungi allocate nutrients to plant partners based on their carbon contribution, yet even those contributing less receive support to maintain network breadth. *Myceloom* translates these fungal principles into political architecture. Coalition membership remains open to all participants who accept the protocols, and benefits flow preferentially—but not exclusively—to contributors. This graduated structure ensures that maximum sustaining coalitions result, maintaining the inclusive scale necessary for resilience while preventing exploitation.

IV. The Evolution of Cooperation: Reciprocity, Reputation, and Network Structure

Robert Axelrod demonstrates how cooperative strategies stabilize in populations of self-interested actors. His tournament simulations show that "tit for tat" strategies—which cooperate first and then reciprocate the partner's move—consistently outperform exploitative approaches. He argues that cooperation requires three specific conditions: ongoing relationships with a "shadow of the future," identifiable partners, and interactions frequent enough for reciprocity to operate. When these conditions hold, cooperation emerges without central authority. Extractive platforms systematically undermine these prerequisites by intermediating relationships and obscuring behavior through algorithmic opacity. Users cannot build the direct connections necessary for reciprocity, causing cooperative strategies to fail.

Myceloom reinstates the necessary conditions for cooperation. Persistent identity enables reputation to track across interactions, while transparent protocols make both cooperation and defection visible. Network structures create the ongoing relationships required for reciprocal strategies to thrive. Biological market theory expands this understanding by examining how partner choice disciplines behavior. Ronald Noë and Peter Hammerstein demonstrate that cooperation stabilizes when individuals can choose their partners, as defectors find themselves abandoned. Mycorrhizal networks reveal these dynamics in practice: plants and fungi engage in "biological trade" where exchange rates respond to supply and demand. *Myceloom* implements this market logic by allowing participants to choose among network nodes, service providers, and governance arrangements. This "federated plurality" disciplines providers without central authority, as nodes that fail to serve participants lose members through exit rights.

Simple reciprocity has limitations, as "tit for tat" remains vulnerable to noise where misperceived defection triggers spiraling retaliation. *Myceloom* addresses these complexities through "differentiated reciprocity" and graduated sanctions. Network protocols enable proportional contribution while ensuring that responses to defection scale appropriately—small violations trigger small consequences, while persistent patterns trigger escalation. Finally, network structure shapes the evolution of cooperation by facilitating spatial clustering. Cooperators form clusters that protect themselves from exploitation, allowing cooperative behaviors to expand through success. *Myceloom*'s federated architecture mimics this spatial structure. Individual nodes remain small enough for direct reciprocity, while connections between nodes create an extended network where cooperation propagates.

V. Platform Cooperativism: Toward Democratic Digital Infrastructure

Trebor Scholz challenges extractive platform capitalism through "platform cooperativism," a model proposing cooperatively owned businesses that establish two-sided markets via computing platforms. Driver-owned ride-sharing and worker-owned cleaning platforms demonstrate that digital infrastructure need not concentrate value in shareholder hands. Fundamental questions regarding ownership emerge. Cooperative theory posits that those who

depend on infrastructure should own it, contrasting sharply with venture capital's pursuit of exponential returns. Different ownership models translate into distinct incentive structures and value distributions.

Worker-owners report higher wages, better working conditions, and increased job satisfaction. Users experience aligned incentives while communities benefit from locally-rooted enterprises that circulate value rather than extracting it. Platform cooperativism nevertheless faces significant challenges. Individual cooperatives struggle to generate network effects, and venture-backed competitors sustain losses indefinitely to capture markets.

Myceloom addresses these scale limitations through federation. Massive centralized platforms are not the goal. Cooperative networks achieve collective scale while maintaining local ownership. The Mondragon cooperative federation demonstrates this physical model, growing from a single cooperative in 1956 to a network of over 100 enterprises employing 80,000 workers. Myceloom protocols extend the Mondragon model to digital infrastructure. Individual nodes govern themselves while federated networks provide shared services and interoperable protocols enable coordination. Common protocols enable interoperability without merger. Participants move among nodes while keeping data and reputation portable. Digital infrastructure shapes the possibilities for expression and collective action. Infrastructure owned by dependents supports democratic participation, making the choice between models fundamentally political.

VI. Federated Governance: Multi-Stakeholder Coordination at Scale

The Fediverse demonstrates the practical possibilities for federated governance, where thousands of independent servers establish rules while maintaining network-wide interoperability. Each instance represents a distinct community that chooses its federation partners, distributing power without dissolving it. Defederation mechanisms discipline behavior, as servers disconnect from instances that violate community standards. Successful instances combine clear guidelines with active moderation and transparent decision-making. Accountability emerges without central authority, as instances failing to address harmful content risk losing their connections to the broader network.

Challenges nevertheless persist within this model. Moderation burdens fall heavily on volunteers, and scaling governance to larger instances proves difficult. Myceloom builds on these foundations while addressing their limitations by treating federation as political infrastructure rather than purely technical interoperability. Effective governance must represent diverse stakeholder interests—balancing the distinct needs of workers, users, and community members rather than privileging single groups.

Federated governance utilizes the principle of subsidiarity, ensuring decisions occur at the lowest level capable of action while higher-level coordination addresses collective concerns. Legitimacy depends on both procedural fairness and outcome effectiveness. Internet governance bodies like the IETF and W3C provide precedents for such multi-stakeholder processes, demonstrating that diverse coordination creates robust technical standards without central command. Myceloom extends these precedents to social and economic governance. Protocols enabling interoperability function as social agreements, and the coalition substrate acts as the infrastructure for maintaining these agreements across boundaries.

VII. Social Movement Coalitions: Identity, Strategy, and Sustaining Commitment

Social movements demonstrate that success relies on coalition building, where alliances form among organizations with overlapping but distinct interests. Nella Van Dyke and Bryan Amos identify five key factors driving this formation: social ties, organizational structure, ideological compatibility, institutional environment, and resource availability. Beyond these structural elements, collective identity proves critical. Francesca Polletta and James Jasper argue that when participation becomes central to identity, free-rider problems dissolve because contribution becomes internally motivated rather than purely transactional.

Myceloom supports these dynamics by providing the digital substrate for collective identity formation. Shared vocabulary, common practices, and rituals operate at scale through infrastructure explicitly designed for connection. While coalitions inevitably generate tension between different organizational cultures and strategies, *Myceloom*'s federated structure allows members to maintain distinct identities while cooperating on shared concerns. This architecture mitigates the fear of absorption that often hinders alliance formation, as transparent decision-making and graduated commitment allow participants to engage at levels appropriate to their capacity.

Polletta emphasizes the importance of "free spaces"—settings apart from dominant institutions where movements can build relationships and prepare for action away from adversary surveillance. *Myceloom* nodes function as these autonomous zones. In an era where corporate platforms intermediate communication and possess powerful incentives to suppress disruptive threats, independent ownership becomes a strategic necessity. Coalitions built on "borrowed infrastructure" remain vulnerable to algorithmic suppression and policy shifts. *Myceloom* offers the foundation for independent coalition building, ensuring that political durability does not depend on the whims of extractive intermediaries.

VIII. The Political Economy of Coalition Substrate

Myceloom constitutes the infrastructure for a distinct political economy where organization centers on coalition rather than competition. The concept of "coalition substrate" captures this relationship, describing the foundation upon which alliances form. These foundations remain simultaneously technical and political: protocols and interfaces define the technical capabilities, while governance arrangements and reciprocity norms define the political constraints. Lawrence Lessig argues that "code is law," meaning that technical decisions regarding data ownership, identity management, and algorithmic design function as constitutional choices. *Myceloom* recognizes that protocol design fundamentally shapes the possibilities for democratic governance and collective flourishing.

This substrate allows various coalitions to use common infrastructure for distinct purposes, maintaining neutrality regarding specific goals while embedding values of distributed power and reciprocal exchange. Sustaining such infrastructure requires addressing meta-level collective action problems, as maintenance costs labor and resources. Yochai Benkler demonstrates that commons-based peer production—exemplified by projects like Linux and Wikipedia—coordinates large-scale production through modularity and minimized hierarchy. *Myceloom* embodies these principles by separating node maintenance, code development, and documentation into distinct components that do not require massive capital concentration.

Voluntary contribution nevertheless has limits, as maintainers suffer burnout and projects struggle to fund essential maintenance. A sustainable coalition substrate therefore requires robust compensation mechanisms. Platform cooperativism suggests models where cooperative federations fund shared services through contributions scaled to capacity. Nodes deriving greater value from the network contribute proportionally, ensuring that costs are covered without extraction. Finally, the substrate must address power dynamics that inevitably concentrate around key nodes or

maintenance roles. Myceloom incorporates mechanisms for monitoring leverage and redistributing authority, ensuring that the infrastructure remains a tool for coordination rather than control.

IX. Implementation Principles: Building Coalition Infrastructure

Principle 1: Nested scale for collective action. Coalition infrastructure enables collective action at multiple scales, avoiding premature aggregation. Individual nodes remain small enough for direct reciprocity to function effectively, while federated networks achieve the necessary collective scale for impact.

Principle 2: Selective incentives through participation benefits. Infrastructure provides benefits available exclusively through participation. Access to network resources creates positive incentives, while reputation systems reinforce contribution, ensuring that free-riding becomes self-limiting rather than system-destroying.

Principle 3: Visible contribution and graduated reciprocity. Transparency makes individual contributions observable to the network. Reputation systems reward cooperation, and responses to defection—graduated rather than binary—prevent spiraling conflicts while maintaining accountability.

Principle 4: Maximum sustaining coalitions. Infrastructure aims to form coalitions that include all stakeholders who add value. Open protocols enable broad participation, while graduated membership tiers accommodate different capacities. Exit rights ensure that inclusion does not become entrapment.

Principle 5: Partner choice through federated plurality. Participants choose among multiple nodes with varying governance arrangements. Competition disciplines providers, rendering central authority unnecessary as market dynamics support cooperative behavior.

Principle 6: Multi-stakeholder governance with subsidiarity. Governance structures balance diverse interest groups. Decisions occur at the lowest level capable of effective action, ensuring that legitimacy derives from procedural fairness and outcome effectiveness.

Principle 7: Coalition substrate neutrality with embedded values. Infrastructure supports various coalitions while preventing value capture. The architecture embeds distributed power and reciprocal exchange as fundamental operating values rather than neutral pipes.

Principle 8: Sustainable substrate through scaled contribution. Production requires compensating contribution rather than massive capital concentration. Contributions scaled to capacity fund shared services, allowing commons-based peer production to complement funded coordination mechanisms.

X. Conclusion: The Politics of Networked Solidarity

The political architecture for networked solidarity is grounded in coalition theory, operationalizing Mancur Olson's logic of collective action while addressing William Riker's coalition dynamics. Robert Axelrod's conditions for cooperation join Ronald Noë and Peter Hammerstein's market mechanisms to inform a design where coordination becomes rational even for self-interested actors. Coalition formation remains the fundamental political problem for distributed systems because infrastructure shapes the very possibility of alliances. Dominant platforms function as political architectures that concentrate power, whereas Myceloom offers an alternative "coalition substrate" enabling multi-stakeholder alliances.

Mycorrhizal networks provide proven biological solutions³² to these coordination problems, demonstrating how plants and fungi with divergent needs form durable alliances. Myceloom translates these protocols into digital infrastructure where preferential allocation and graduated response sustain cooperation. Biological inspiration ultimately requires political translation because networks do not govern themselves. Choices about control reside with participants, meaning all decision-making remains inherently political. While the coalition substrate enables formation, the political work of building and maintaining these alliances remains a necessary human endeavor.

Platform cooperatives and social movements experiment with these³³ alternative forms of governance, generating knowledge that Myceloom synthesizes into reusable infrastructure. The stakes remain high as digital power concentration threatens democratic governance and collective self-determination.³⁴ Infrastructure must be animated by political will. Myceloom provides the substrate, but networked solidarity must provide the politics. Recursive relationships between infrastructure and politics thus define the protocol's contribution: a political architecture for a digital age that serves democratic purposes.

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