

Tailscale alternative: naming and resolution when the coordination plane is offline

Tailscale is a widely used mesh VPN that gives devices stable, private addressing across networks through the WireGuard data plane and a hosted coordination service. This article looks at one specific axis: how devices get named and resolved when the coordination plane is unreachable, and how names survive as devices and ownership change. It is built on the Adaptive Indexing inventive step, disclosed in United States Patent Application 19/326,036, which describes a semantic, anchor-scoped naming fabric with local consensus and reconciliation on reconnection.

What Tailscale Does

Tailscale builds a private mesh network across a user's or organization's devices. It uses the WireGuard protocol for the encrypted data plane, so once two devices know how to reach each other, traffic flows directly and peer to peer wherever the network topology allows. Around that data plane, Tailscale runs a hosted coordination service that handles device enrollment, key exchange, access-policy distribution, and the exchange of connection metadata that lets peers discover and reach one another, including NAT traversal assistance through relays when a direct path is not available.

Tailscale does several things very well. Enrollment is quick and ties into existing identity providers, so a device joins a network by authenticating rather than by manual key management. Its MagicDNS feature assigns stable, human-friendly names to devices within a tailnet, which removes most of the pain of tracking changing IP addresses. Access is governed by a centrally authored policy, expressed in access-control rules, that the coordination service distributes to nodes. For a large share of remote-access and connectivity use cases, this is a clean, low-friction design, and the direct peer-to-peer data path means that ongoing traffic between two already-connected devices does not depend on a central server staying reachable.

The Architectural Axis

The axis this article addresses is narrow and specific: how names are assigned, resolved, and kept continuous, and what that depends on. It is not about the data plane, which is a separate and well-regarded concern.

In Tailscale's model, the naming and coordination layer is a hosted service that acts as the authoritative source for device identity, name assignment, and policy. This centralization is a deliberate design choice and is a large part of why the product is easy to operate: there is one clear place where enrollment, naming, and policy live, and clients synchronize against it. The structural consequence, on this one axis, is that establishing new connections, enrolling devices, resolving names for peers not already known, and picking up policy changes are operations that reference that coordination plane. The naming namespace is also organized around the tailnet as an administrative unit rather than around arbitrary, independently governed semantic scopes. These are properties of the architecture, not defects. The question worth examining is what a naming and resolution layer looks like when it is designed so that no single coordination plane is authoritative.

How the Disclosed Approach Differs

United States Patent Application 19/326,036 discloses an adaptive naming fabric built on a different structural premise: the resolution layer is decomposed into independently governed scopes, and authority over naming lives locally rather than in one hosted service.

Names in the disclosed system are semantic, hierarchical aliases such as `device@user.elizabeth/iot//[hash]`, resolved stepwise, with each segment interpreted relative to its parent scope. Critically, an alias resolves to a stable underlying unique identifier (UID) rather than binding the human-facing name directly to a location or key. The specification describes that renaming an alias, for example from `user@elizabeth` to `user@liz`, does not break references, because applications, permissions, and data bindings persist through the UID. When a container is split, merged, relocated, or reassigned to a new owner, aliases are automatically remapped to the successor using anchor-stored lineage metadata, so references resolve without a global rebind.

Each scope is governed by a group of anchors that hold the naming, policy, and lineage metadata for that scope and validate changes through a local quorum. Because governance is scoped, the specification describes anchor groups forming isolated quorums to validate mutations and maintain resolution responsiveness during periods of disconnection or high latency, with mutation lineage reconciled against the canonical record for that scope once reconnection occurs, using policy-defined arbitration. This is the asynchronous, reconnection reconciliation property: a scope can keep resolving and keep accepting governed changes locally, then converge later.

On device identity specifically, the specification describes a pseudonymous, dynamic-hash protocol. A device is represented by a volatile hash derived from an intrinsic device identifier and a short-lived local salt; that hash is held only on the user's private anchor group, while the public index records only the location of that private anchor. Resolution of an alias such as `user@elizabeth` reaches the private anchor, which

performs internal resolution to the current device hash. The specification also describes decentralized revocation: a compromised device hash can be flagged and the revocation state propagated so intermediary nodes suppress further resolution, without exposing device identity or user metadata.

Finally, the specification frames the fabric as retrofittable. Legacy DNS lookups remain supported as a fallback when an alias fails to resolve within the network, and the anchor-and-alias layer is described as a structural overlay that can be introduced over existing decentralized systems without rewriting their core protocols.

Where They Fit Together

These are not straightforward substitutes, and it is more honest to describe them as addressing different layers. Tailscale delivers a private, encrypted connectivity fabric with a mature data plane, strong NAT traversal, and tight identity-provider integration. The disclosed invention is a naming, resolution, and governance layer concerned with how names are structured, how authority over them is distributed, and how continuity is preserved through change and disconnection.

One can imagine composition rather than competition. A connectivity fabric provides the encrypted path between endpoints; a semantically scoped naming fabric could sit above it to provide alias-to-UID continuity, locally governed namespaces, and offline-tolerant resolution. Conversely, where an organization's primary need is turnkey remote access with centrally managed policy and minimal operational overhead, a hosted coordination model is a reasonable and often preferable fit. The disclosed approach is aimed at settings where no single coordination plane should be authoritative, where namespaces are governed by many independent parties, or where resolution must continue through partition.

Boundary Conditions

Honesty requires stating limits on our side. United States Patent Application 19/326,036 is a patent application describing an architecture and its mechanisms; it is an early-stage disclosure, not a shipping product, and the comparisons here are architectural rather than benchmarked. The specification does not assert performance numbers for the naming fabric, and none are claimed here. Locally governed, eventually reconciled naming introduces its own tradeoffs that any implementation must confront, including reconciliation and arbitration behavior when scopes diverge during partition, the operational cost of distributing governance across many anchor groups, and the maturity gap between a described architecture and a hardened, widely deployed service. Tailscale, by contrast, is a production system with substantial real-world operational history on the connectivity problems it targets.

Nothing here should be read as attributing a fault to Tailscale. Its centralized coordination model is a sound engineering choice that yields real benefits in simplicity and speed of adoption, and the axis examined here is deliberately narrow.

Disclosure Scope

The mechanisms attributed to the disclosed invention in this article, semantic hierarchical aliases resolving to stable UUIDs, anchor-scoped local consensus, asynchronous reconciliation on reconnection, pseudonymous dynamic-hash device resolution and revocation, and retrofittability over existing resolution systems, are described in United States Patent Application 19/326,036. The characterizations of Tailscale and of the surrounding market are external context drawn from generally known, architecture-level facts about that product; they are not part of, and are not a claim of, the filing, and the scope of any patent rights is defined solely by the claims as examined and allowed. Nothing in this article asserts that Tailscale is defective, infringing, or deficient; the comparison is limited to structural differences on the specific axis of naming and resolution and is offered as neutral technical context.

Adaptive Indexing (</adaptive-indexing>)

[All 40 steps → \(/inventive-steps\)](/inventive-steps)

Resolution without global consensus. Anchor-governed self-organization.

[U.S. 19/326,036 \(/patents/19-326036\)](/patents/19-326036)

PRIMARY TECHNICAL DISCLOSURE

- [The Adaptive Index: A Scalable Foundation for Decentralized Systems \(/articles/the-adaptive-index-a-scalable-foundation-for-decentralized-systems\)](/articles/the-adaptive-index-a-scalable-foundation-for-decentralized-systems)

SECONDARY TECHNICAL

- [Anchor-Governed Hierarchical Nesting: Recursive Semantic Containers at Unlimited Depth \(/articles/adaptive-indexing/anchor-nesting\)](/articles/adaptive-indexing/anchor-nesting)
- [Entropy-Triggered Index Splitting: Deterministic Partitioning Under Mutation Load \(/articles/adaptive-indexing/entropy-splitting\)](/articles/adaptive-indexing/entropy-splitting)
- [Dormant Index Merging: Recursive Consolidation of Low-Entropy Subindices \(/articles/adaptive-indexing/dormant-merging\)](/articles/adaptive-indexing/dormant-merging)
- [Elastic Anchor Group Management: Governance That Scales With Criticality \(/articles/adaptive-indexing/elastic-anchors\)](/articles/adaptive-indexing/elastic-anchors)
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APPLICATIONS · GENERAL

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APPLICATIONS · SPECIFIC

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[Adaptive Indexing overview → \(/adaptive-indexing\)](#)