Nick Clark · Published June 22, 2026 · PDF

Hivemind: Onboard Autonomy Without an Onboard Authority Substrate

Hivemind is Shield AI's onboard autonomy stack, the software that lets a drone fly its mission with no GPS, no comms, and no operator. It solves the computation problem of contested autonomy. The authority problem, who decides what the team does, on whose behalf, with what trail, is the next layer up.

Vendor and Product Reality

Shield AI's Hivemind is an onboard autonomy stack: the software that lets an aircraft fly a mission with no GPS, no communications link, and no remote operator. It has flown on the company's own V-BAT platform and has been demonstrated on other aircraft, and its purpose is to make a single airframe, and increasingly a team of them, capable of perceiving, deciding, and acting in exactly the denied and degraded conditions that defeat remotely piloted systems. Hivemind solves a genuinely hard problem, the computation problem of contested autonomy: how a platform senses, plans, and maneuvers on its own when every external aid an operator would normally provide has been taken away. That problem is real, and Hivemind is a serious answer to it.

The Layer Above: Authority, Not Computation

Computation is the first problem of contested autonomy, and it is not the last. As Hivemind-class autonomy scales from one aircraft to teams, and as those teams span multiple operators, multiple vendors, and multiple missions, a second problem surfaces above the flying: authority. Who decides what the team does, on whose behalf, with what permissions, and with what auditable trail. An onboard autonomy stack answers can this platform fly itself; it does not, by itself, answer is this incoming instruction from a legitimate teammate under a legitimate authority, may this platform act on it given the scope it was granted, and what is the record of who told it to. Those are identity and governance questions, and they become the binding constraint precisely when autonomy works well enough to be fielded at the scale of coordinated teams rather than single aircraft.

What the Memory-Native Primitive Provides

The memory-native protocol and the keyless identity primitive sit one layer above an onboard autonomy stack, not in competition with it. Each coordinating instruction or shared observation travels as a self-governing data unit carrying an authority-taxonomy field, a device-hash continuity field that proves the originator's identity from its own history without reaching a certificate authority, a hop-history field, and store-and-forward propagation that preserves authority and scope across partition. A platform validates that an incoming message is from a legitimate teammate by checking continuity locally, evaluates whether it may act on it against the carried scope, and records the exchange in lineage, all without a reachable command post. The autonomy stack flies the aircraft; the protocol and the identity primitive govern who in the team may tell whom to do what, and leave a trail. The two compose: Hivemind-class autonomy provides the capability to act, and the carried governance provides the authority to coordinate.

Complementary Positioning

This is a stack relationship, not a rivalry. An organization fielding onboard autonomy will, as it scales to multi-platform and multi-operator operations, need exactly the identity-and-authority layer that the memory-native protocol supplies, and that layer is agnostic to which autonomy stack flies the aircraft beneath it. The protocol can carry coordination among Hivemind-equipped platforms, or among platforms running any other autonomy software, because it governs the messages between them rather than the flying within them. No relationship, endorsement, or infringement is asserted; the comparison is architectural.

Disclosure Scope

The memory-native protocol, in which coordinating data units carry authority, scope, device-hash continuity, hop history, and store-and-forward propagation evaluated locally without a central authority, is disclosed in the protocol filing (U.S. Application No. 19/366,760, published as US 2026/0052096 A1), and the keyless identity continuity it relies on in the identity filing (U.S. Application No. 19/388,580, published as US 2026/0126730 A1). This article compares those disclosed mechanisms with Shield AI's publicly described Hivemind onboard autonomy stack and positions carried identity and governance as the coordination layer above an autonomy stack. References to Shield AI, Hivemind, and V-BAT are to public materials and are used for comparison only.

Memory-Native Protocol (/memory-native-protocol) All 36 steps → (/inventive-steps)

Authority intrinsic to the object. Routing by semantic properties.

PRIMARY TECHNICAL DISCLOSURE

- Memory-Native Networking: A Cognition-Compatible Protocol Substrate (/articles/memory-native-networking-a-cognition-compatible-protocol-substrate)

SECONDARY TECHNICAL

- Protocol-Native Carriers: Agents as the Fundamental Unit of Transmission (/articles/memory-native-protocol/protocol-native-carrier)
- Dynamic Routing Protocol: Memory-Aware Path Selection for Semantic Agents (/articles/memory-native-protocol/dynamic-routing)
- Trust-Weighted Route Scoring: Dynamic Path Selection Through Policy-Defined Trust Thresholds (/articles/memory-native-protocol/trust-weighted-routing)
- Network Health Monitoring System: Signed Health Agents as Distributed Operational Telemetry (/articles/memory-native-protocol/network-health-monitoring)
- Health Agents as Semantic Objects: Operational Metrics That Route Like Any Other Agent (/articles/memory-native-protocol/health-agents)
- Dynamic Indexing Protocol: Entropy-Driven Restructuring of Semantic Flows (/articles/memory-native-protocol/dynamic-indexing)
- Soft-Index Anchors: Ephemeral Index Points Inferred From Agent Lineage (/articles/memory-native-protocol/soft-index-anchors)
- Adaptive Consensus Protocol: Memory-Native Quorum Without Fixed Validator Sets (/articles/memory-native-protocol/adaptive-consensus)
- Trust-Weighted Voting in ACP: Domain-Scoped Votes Accumulated Against Agent Memory (/articles/memory-native-protocol/acp-trust-voting)
- Dynamic Alias Resolution: Zone-Local Semantic Aliases Resolved Through Transport Headers (/articles/memory-native-protocol/alias-resolution)
- Horizontally Composable Protocol Stack: Independent Layers Operating in Parallel (/articles/memory-native-protocol/composable-stack)
- Transport-Layer Agnosticism: One Protocol Stack Above Any Carrier (/articles/memory-native-protocol/transport-agnosticism)
- Federated Semantic Zone Deployment: Heterogeneous Nodes Coordinating Across Trust Boundaries (/articles/memory-native-protocol/federated-zones)
- Health-Triggered Quorum Adjustment: Dynamic Thresholds From Network Stability Signals (/articles/memory-native-protocol/health-triggered-quorum)
- Authority Credential as a First-Class Field on the Wire (/articles/memory-native-protocol/governed-mesh-wire-format)
- Hop-History Relay and Byzantine Custody Chain (/articles/memory-native-protocol/hop-history-relay)

- Dynamic Device Hash Continuity Without CRLs or OCSP (/articles/memory-native-protocol/dynamic-device-hash-continuity)
- Rateless Forward-Error-Correction for Lossy Mesh Media (/articles/memory-native-protocol/rateless-fec-fountain)
- Mobile Store-and-Forward Without Cellular Backhaul (/articles/memory-native-protocol/mobile-store-and-forward)
- Credentialed Firmware and Policy Distribution Through the Mesh (/articles/memory-native-protocol/firmware-via-mesh)

APPLICATIONS · GENERAL

- Edge Computing Without Central Routing Authority (/articles/memory-native-protocol/edge-routing)
- IoT Device Mesh Governance at Scale (/articles/memory-native-protocol/iot-mesh)
- Vehicle-to-Vehicle Communication With Intrinsic Governance (/articles/memory-native-protocol/autonomous-vehicle-networking)
- Military Mesh Networks Without Central Routing Authority (/articles/memory-native-protocol/military-mesh-networks)
- Smart City Infrastructure With Self-Governing Transport (/articles/memory-native-protocol/smart-city-infrastructure)
- Satellite Communication With Delay-Tolerant Governance (/articles/memory-native-protocol/satellite-communication)
- Industrial IoT Protocols With Embedded Authority (/articles/memory-native-protocol/industrial-iot-protocols)
- Healthcare Device Mesh Networking (/articles/memory-native-protocol/healthcare-device-mesh)
- Contested-Mesh Radio for Defense and Public Safety (/articles/memory-native-protocol/contested-mesh-radio)
- Expeditionary Mesh for GNSS-Denied Operations (/articles/memory-native-protocol/expeditionary-mesh)
- Maritime, Agricultural, and Mining Mesh Without Cellular (/articles/memory-native-protocol/maritime-iot-mesh)
- The Mesh Ceiling: Why Packet-as-Payload Networks Plateau (/articles/memory-native-protocol/carried-authority-ceiling)
- The Malicious Host Problem, Reframed: Attribution, Quorum, and Routing Beat a Compromised Node (/articles/memory-native-protocol/malicious-host-contained)
- Beyond Jamming: Autonomy in Space, Deep Disconnection, and Delay-Tolerant Networks (/articles/memory-native-protocol/disconnected-and-interplanetary)

APPLICATIONS · SPECIFIC

- Starlink Built a Satellite Mesh. The Routing Authority Is Still Terrestrial. (/articles/memory-native-protocol/starlink)
- Zigbee Built a Mesh Protocol for IoT. The Messages It Carries Have No Memory. (/articles/memory-native-protocol/zigbee)
- Matter Unified Smart Home Devices. The Protocol Still Separates Data From Authority. (/articles/memory-native-protocol/matter)
- Helium Decentralized Wireless Coverage. The Protocol That Uses It Did Not Follow. (/articles/memory-native-protocol/helium)
- LoRaWAN Solved Long-Range IoT. The Messages Are Still Passive Payloads. (/articles/memory-native-protocol/lorawan)
- Tailscale Made WireGuard Usable. The Coordination Server Still Holds the Authority. (/articles/memory-native-protocol/tailscale)
- QUIC Modernized Transport. The Protocol Carries No Semantic Authority. (/articles/memory-native-protocol/quic-protocol)
- MQTT Connected Billions of IoT Devices. The Broker Still Holds the Authority. (/articles/memory-native-protocol/mqtt)
- CoAP Brought REST to Constrained Devices. The Protocol Carries No Governance Semantics. (/articles/memory-native-protocol/coap)
- gRPC Made Service Communication Type-Safe. The Protocol Carries No Trust Semantics. (/articles/memory-native-protocol/grpc)
- ZeroMQ Eliminated the Broker. Routing Authority Still Lives in Application Code. (/articles/memory-native-protocol/zeromq)
- WireGuard Simplified VPN Tunnels. The Protocol Has No Semantic Routing Layer. (/articles/memory-native-protocol/wireguard)
- Nebula Built Overlay Mesh Networks. The Certificate Authority Is Still Central. (/articles/memory-native-protocol/nebula-mesh)
- Calico Enforces Network Policy at the Kernel Level. Policy Authority Is Still External. (/articles/memory-native-protocol/calico)
- Cilium Made eBPF the Network Data Plane. The Protocol Layer Carries No Governance. (/articles/memory-native-protocol/cilium)
- Weave Net Built a Virtual Network for Containers. The Protocol Carries No Semantic Authority. (/articles/memory-native-protocol/weave-net)
- Persistent Systems Wave Relay Hardens Mesh Without Authority Semantics (/articles/memory-native-protocol/persistent-systems)
- Silvus StreamCaster Solves the Radio Layer, Not the Trust Layer (/articles/memory-native-protocol/silvus-streamcaster)

- Rajant Kinetic Mesh Has Mobility, Lacks Credential Authority (/articles/memory-native-protocol/rajant-kinetic-mesh)
- Trellisware TSM Optimizes Routing, Not Authority Resolution (/articles/memory-native-protocol/trellisware-tsm)
- Autotalks Craton2 Is V2X Silicon Without Governance (/articles/memory-native-protocol/autotalks-craton2)
- Qualcomm 9150 C-V2X Authenticates Messages, Not Behavioral Authority (/articles/memory-native-protocol/qualcomm-9150)
- NXP RoadLink Implements DSRC, Not the Authority Taxonomy (/articles/memory-native-protocol/nxp-roadlink)
- Chroma Vector Database (/articles/memory-native-protocol/chroma-vector-db)
- Milvus Vector Database (/articles/memory-native-protocol/milvus-vector-db)
- Pinecone Vector Database (/articles/memory-native-protocol/pinecone-vector-db)
- Qdrant Vector Database (/articles/memory-native-protocol/qdrant-vector-db)
- Weaviate Vector Database (/articles/memory-native-protocol/weaviate-vector-db)
- Anduril Lattice Mesh: Defense-Grade Mesh, Without Carried Authority (/articles/memory-native-protocol/anduril-lattice-mesh)
- **Hivemind: Onboard Autonomy Without an Onboard Authority Substrate (/articles/memory-native-protocol/shield-ai-hivemind)**

Memory-Native Protocol overview → (/memory-native-protocol)