Mesh Wire Format: Medium-Agnostic Message Structure

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What Medium-Agnostic Wire Format Specifies

The wire format is a structural specification independent of the underlying transport. Each transmission carries the credential field, the dynamic-device-hash continuity element, the hop-history field, the rateless-FEC descriptor, and the message payload. The same fields travel over any conforming transport.

Transport-specific encodings adapt the abstract structure to the medium's capacity. RFID-class markers encode the structure in fixed-length stored data; UWB transmissions encode in time-bounded packets; satellite uplinks encode in bandwidth-efficient framing. The architectural primitive specifies the structure; the encoding for each transport is implementation detail.

Why Medium-Specific Protocols Fragment the Architecture

Existing communication architectures fragment by transport. V2X has its own protocol, satellite has its own protocol, RFID has its own protocol. Cross-transport operation requires per-transport gateway integration that produces structural friction at every transport boundary.

Medium-agnostic wire format eliminates the gateway integration. A message that originates as RFID-stored marker data can propagate through cellular relay, satellite uplink, store-and-forward via mobile carriers, and final delivery via UWB to a receiving unit, with the credentialing chain intact throughout. The architecture supports the multi-transport operating reality structurally.

How Encoding Maps to Each Transport

Each transport carries its own encoding. Passive RFID encodes the structure in tag stored data with the fixed byte layout. UWB packets encode the structure in their payload with appropriate framing. Cellular and satellite transmissions encode through their respective protocol stacks. Optical fiducials encode through visual patterns. The architectural primitive doesn't constrain the encoding; it specifies the structural content that any encoding must preserve.

Cross-transport conversion is structural rather than per-pair-of-transports. Any conforming transport can produce or consume the wire format; the format itself is the interoperability point.

What This Enables for Cross-Transport Operations

A single observation can travel through multiple transports during its propagation lifecycle. A roadway marker (RFID) is read by a passing vehicle (UWB-capable); the vehicle relays to a sentinel (cellular); the sentinel forwards to a cognitive infrastructure agent (Wi-Fi mesh); the agent processes and re-broadcasts (satellite for cross-region propagation). The observation maintains its credential, continuity, and lineage throughout.

Defense, expeditionary, maritime, agricultural, and other operating geographies that span multiple transport types gain structural support. The patent positions the

primitive at the layer where multi-transport operations have been operating with per-pair gateway integration.