Actuation State as Mesh-Broadcast Observation

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What Mesh-Broadcast Actuation State Specifies

Each actuator commit produces an actuation-state observation: which actuator (identified by credentialed device class), what magnitude (the committed authority level), what mode was selected (one of the eleven graduated modes), under what authority (the credential of the gating governance policy), and with what verification result (nominal, anomaly, fault, etc.). The observation is signed by the executing unit's credential and propagates through the governed mesh.

Receiving units consume the observation through composite admissibility. Privacy and competitive concerns are addressed through governance-policy-configurable redaction rules: the broadcast carries the structural information (which actuator class, what mode, what authority) without necessarily exposing competitively-sensitive details (the specific algorithmic decision path).

Why Private Actuation State Limits Coordination

When actuation state is private, cross-unit coordination depends on observing effects rather than actions. A vehicle that brakes hard is observed by following vehicles through the brake's effect on motion, with hundreds of milliseconds of observation

latency before following vehicles can respond. The architecture is reactive by structural necessity.

When actuation state is broadcast, coordination becomes proactive. The braking vehicle's brake commitment is observed by following vehicles at the moment of commit, before the effect propagates through physics. Following vehicles can begin their response simultaneously with the originating vehicle's action. The structural latency of cross-unit coordination drops to mesh-propagation time rather than physics-observation time.

How Broadcast Composes With Existing Telemetry

Broadcast actuation state is additive to existing per-vendor telemetry. The per-vendor telemetry continues to flow into the manufacturer's own analytics. The broadcast observation is the cross-vendor, cross-jurisdictional coordination layer that sits above per-vendor telemetry.

The architecture integrates with existing V2X infrastructure (where deployed) by treating V2X messages as one transport for the credentialed actuation observation. It also integrates with mesh radios, vehicular cellular, satellite uplink, and other transport — the observation is medium-agnostic and the credential is the load-bearing element.

What This Enables for Coordination, Intervention, and Audit

Cross-vehicle coordination at structural latency: braking, lane changes, evasive maneuvers, formation adjustments propagate through the mesh as commit observations rather than as effect-observations.

Real-time regulatory observation: state DOTs, NHTSA, FAA, FRA, and equivalent authorities can subscribe to the credentialed broadcast stream within their jurisdictions, gaining real-time situational awareness that current per-vendor telemetry integration does not provide.

Audit-grade reconstruction: every actuator commit across every fleet operating in a region is recorded as a credentialed observation with verification, supporting incident reconstruction, fleet-pattern analysis, and operational compliance review without dependency on subpoenaed per-vendor telemetry.