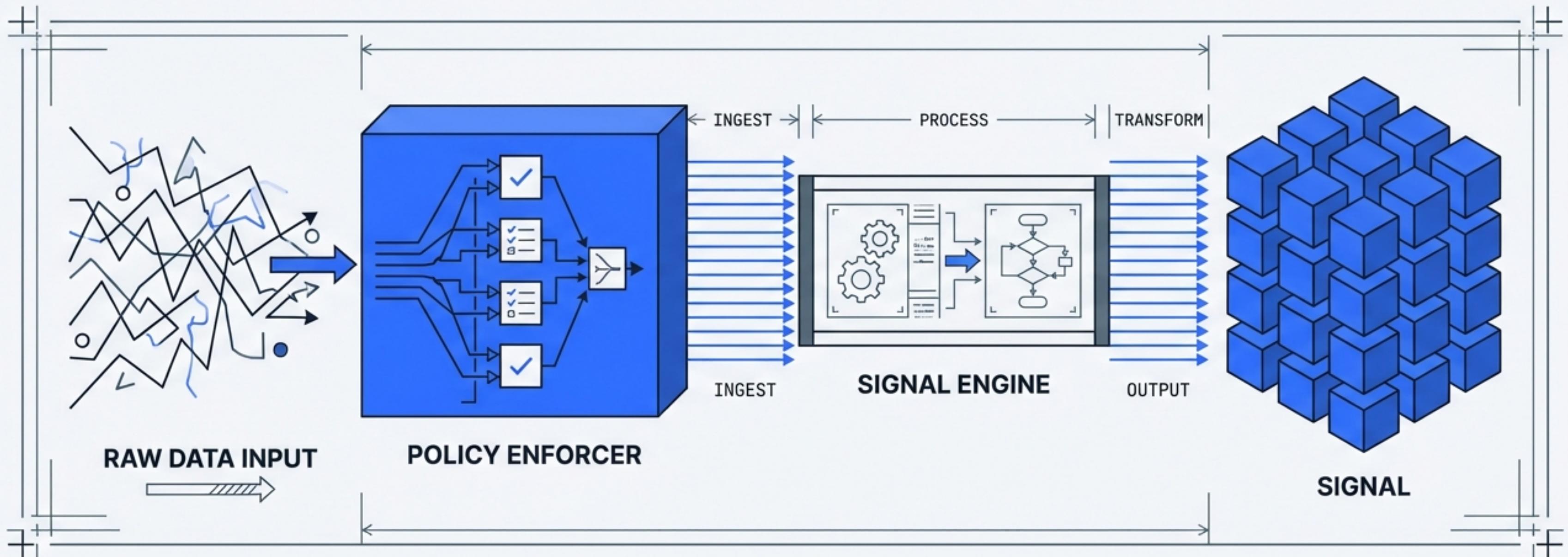


Data Observability Platform v2.0

The Signal Factory: High-Level Architecture & Implementation Strategy

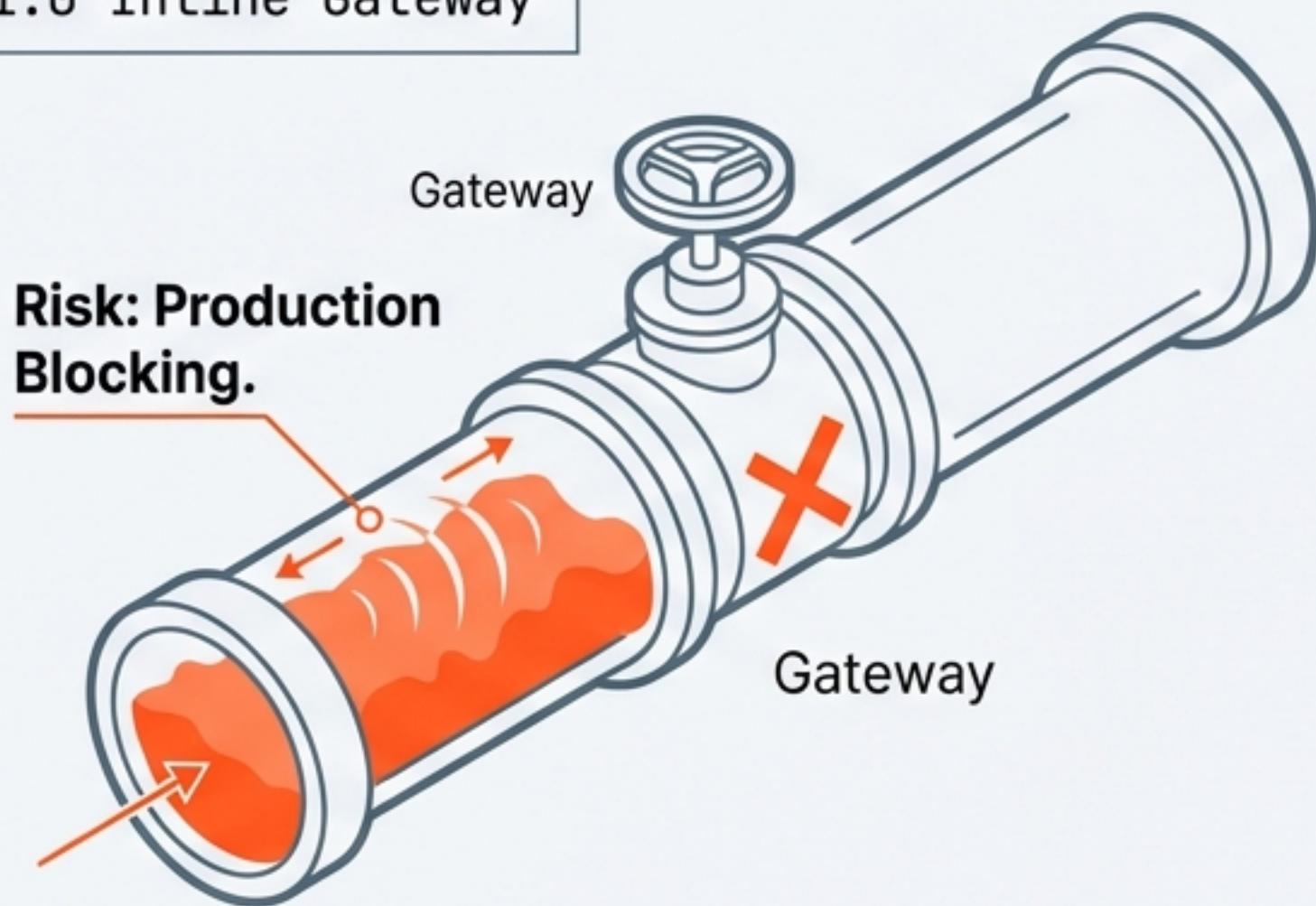


Pivoting from Prevention to Pre-Consumption Safety

The Constraint (Current Reality)

- Central Streaming Platform is immutable.
- Producer SDK adoption is stalled.
- **Implication:** We cannot block the ingestion pipes.

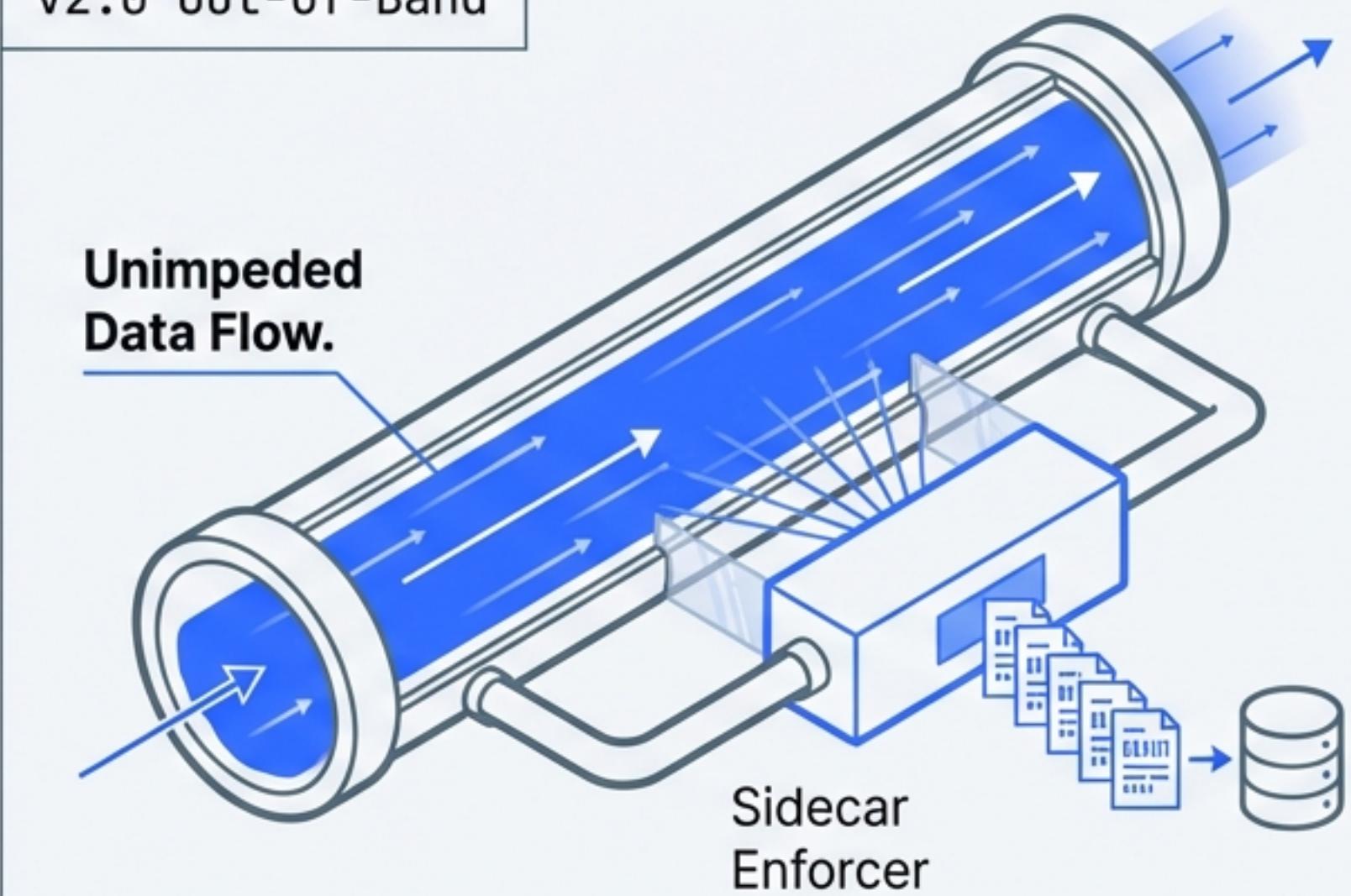
v1.0 Inline Gateway



The Solution (v2.0 Pivot)

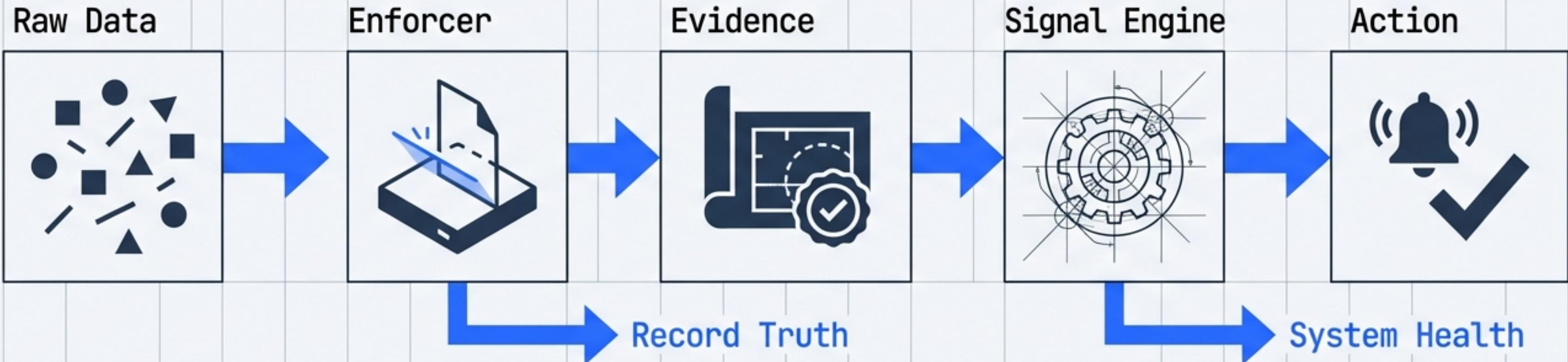
- **Architecture:** Out-of-Band Enforcement.
- **Mechanism:** Asynchronous Sidecar Observer.
- **Benefit:** Zero Latency Impact / Zero Producer Changes.

v2.0 Out-of-Band



Telemetry is a Manufactured Product, Not Exhaust

The Signal Factory Supply Chain Paradigm



North Star Metrics

MTTR	Toil	Lineage Coverage	RCA Latency
Current: 12+ Hours	Current: 20% Dev Time	Current: 0%	Current: 60 Mins
Target: < 2 Hours	Target: < 5%	Target: 100% Tier-1 Assets	Target: < 2 Mins

The 5-Plane Architecture Model

Decoupling Production from Observability

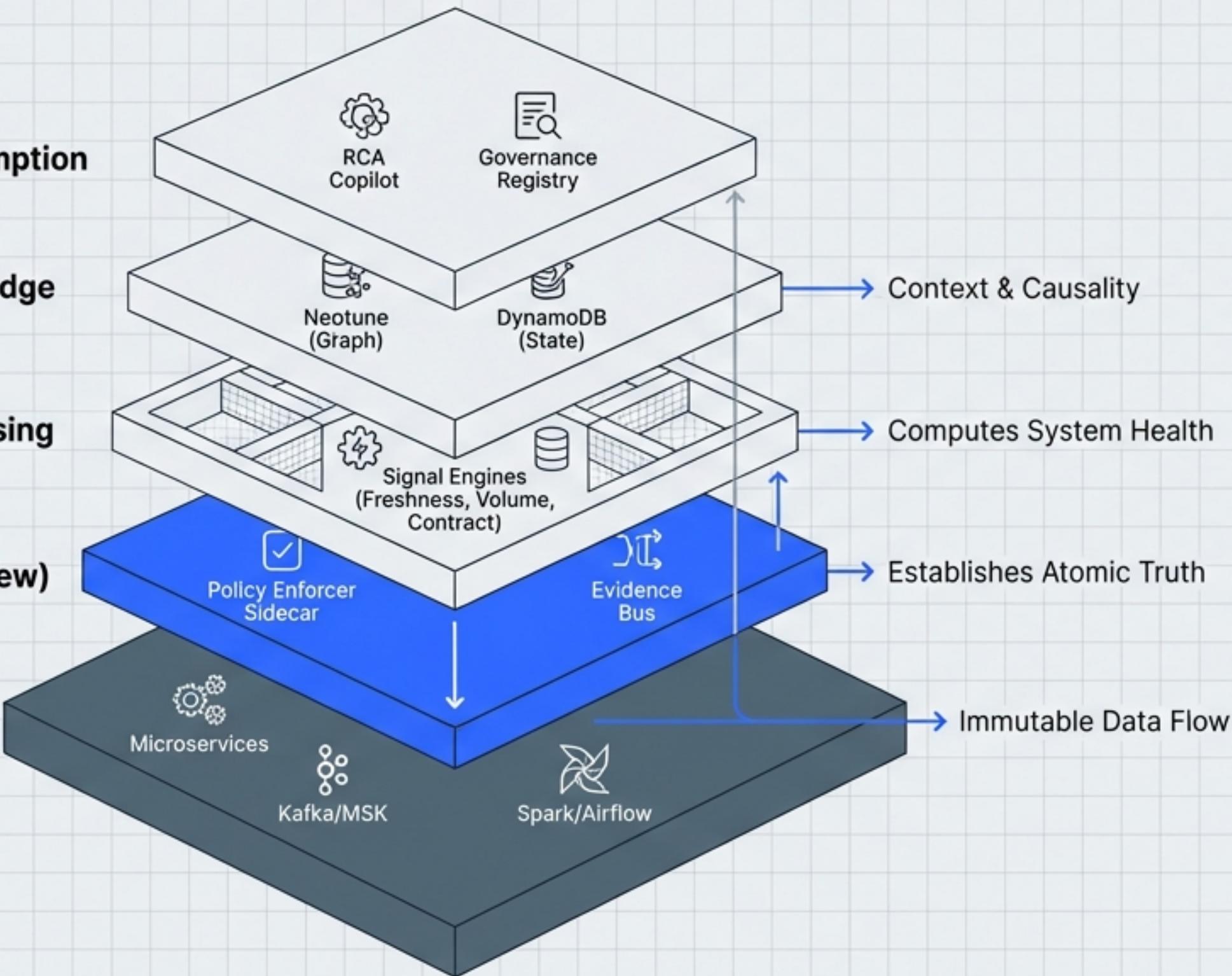
Plane 5: Consumption

Plane 4: Knowledge

Plane 3: Processing

Plane 2:
Enforcement (New)

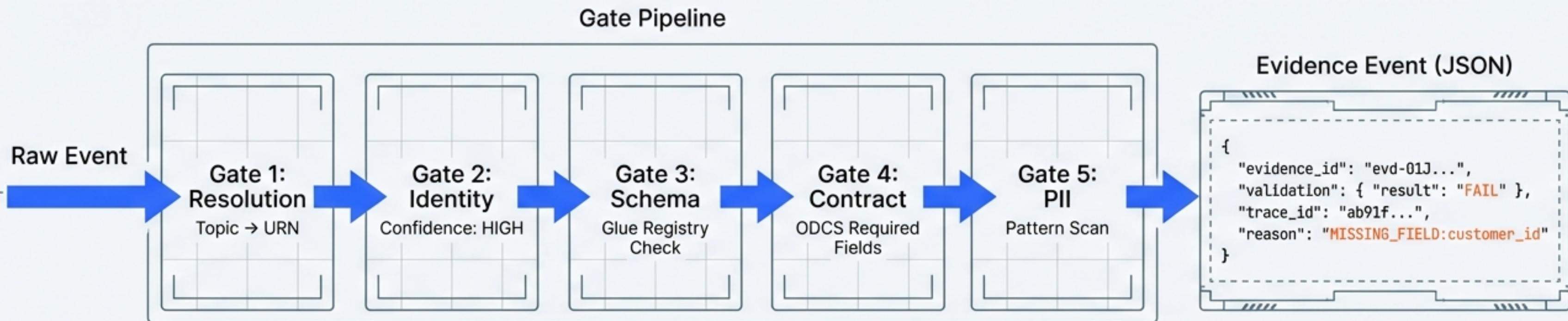
Plane 1:
Production



Architectural Key:

The Enforcement Plane is the bridge. It operates as a sidecar, decoupling the messy reality of Production from the structured requirements of Observability.

The Policy Enforcer: A Deterministic Truth Machine



Design Principle: Non-blocking. The Enforcer **NEVER** stops the data flow; it only witnesses it.

Signal Engines: From Atomic Evidence to System Health

JetBrains Mono: Separation of Concerns: Enforcers see Records, Engines see Time.

Signal Engine Types

JetBrains Mono

- Freshness:** Tracks time_since_last_valid_evidence



JetBrains Mono

- Volume:** Detects throughput anomalies (-50% drops)



JetBrains Mono

- Contract:** Computes compliance rates (e.g., 99.5%)



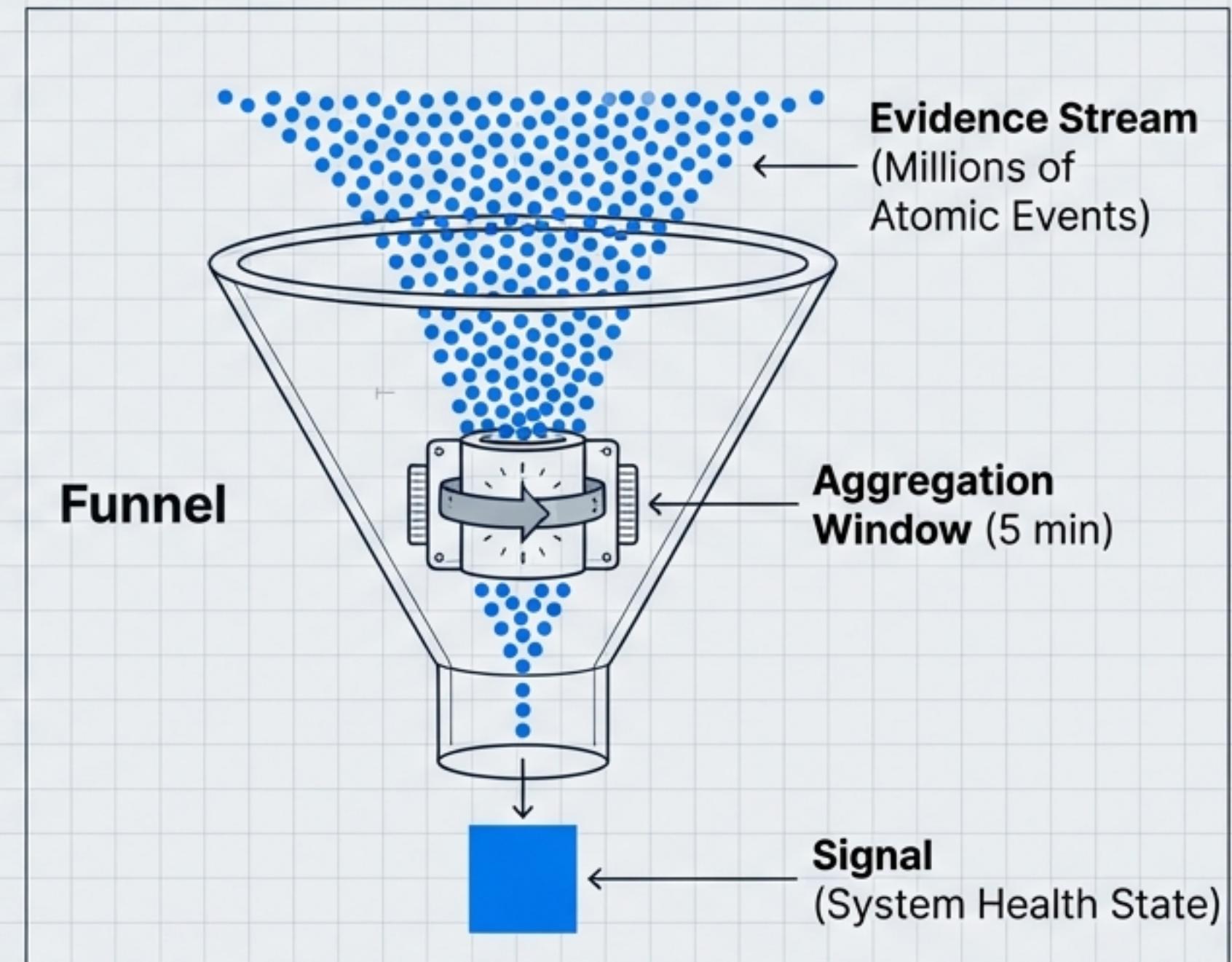
JetBrains Mono

- Drift/Anomaly:** ML-based pattern detection



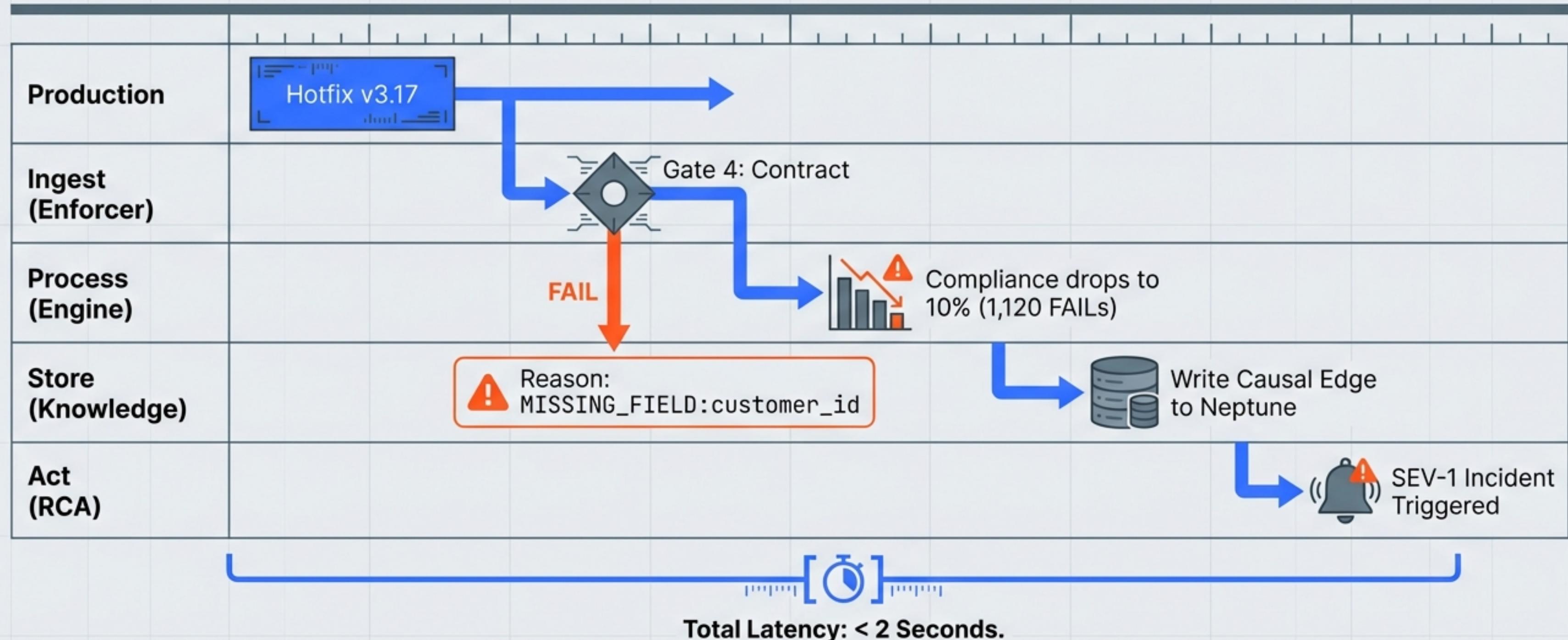
JetBrains Mono

Data Contract: Engines consume ONLY from the Evidence Bus (`signal_factory.evidence`), never raw topics.



Steel Thread: The Orders Service Incident

Subhead: Tracing a failure from code to alert.



The Knowledge Plane: Graph & State

Subhead: Dual-Storage Strategy for Speed and Depth

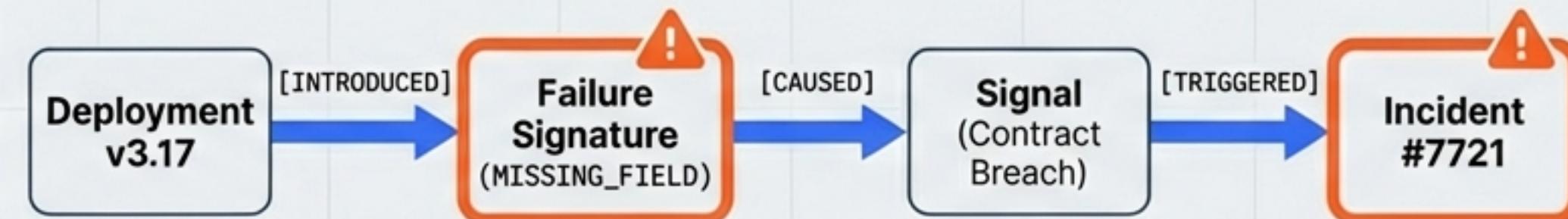
DynamoDB (State)



Purpose: “Operational Truth”

Use Case: “Dashboards & Alerts”

Neptune (Graph)

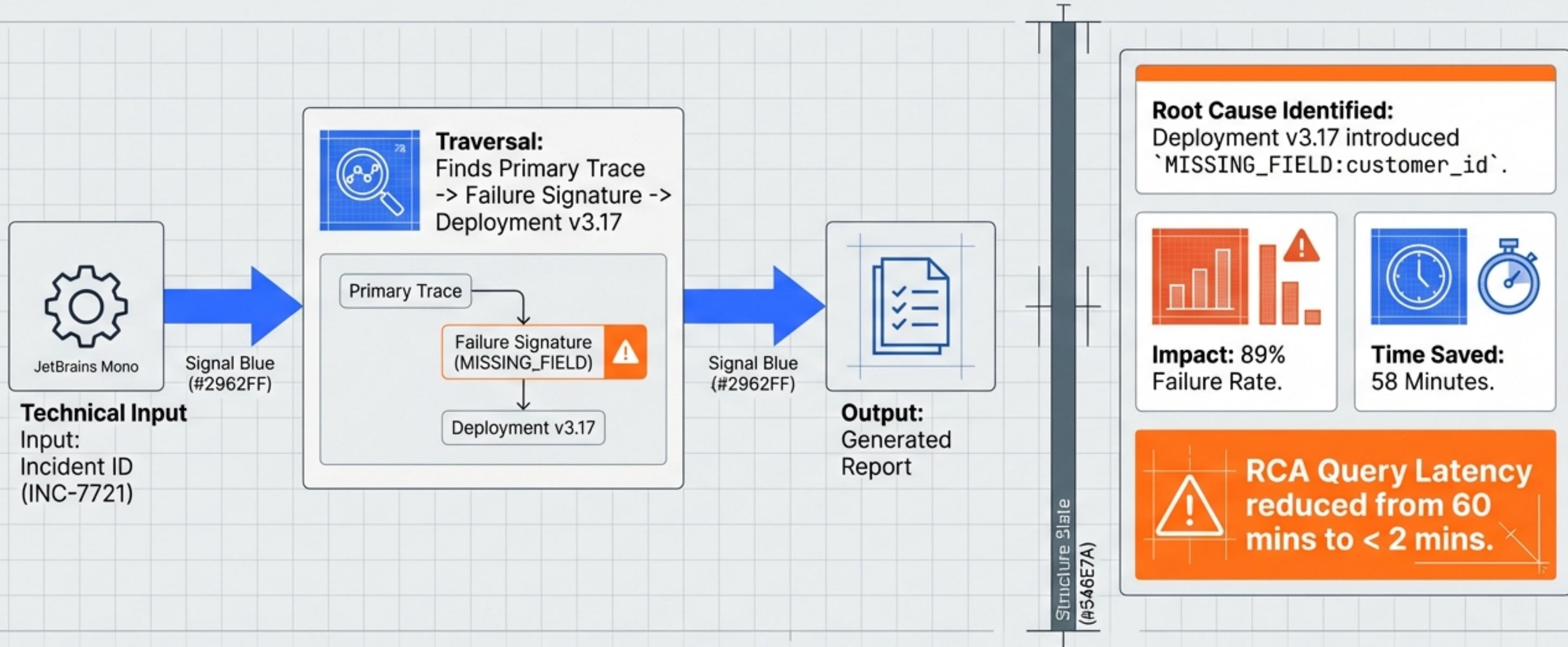


⚠ Optimization: Failure Signatures.

To prevent graph explosion, we map **1,000,000** evidence records to a **SINGLE** ‘Failure Signature’ node.

RCA Copilot: Trace-Anchored Causality

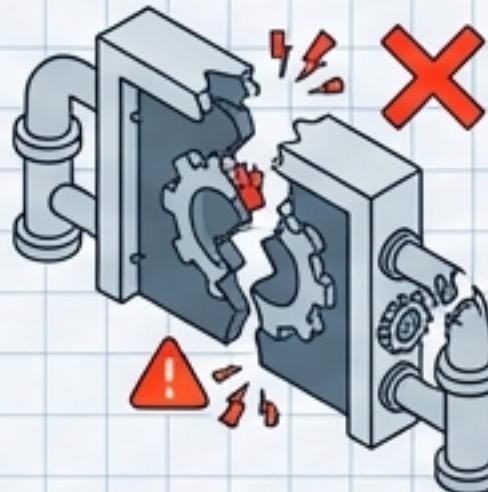
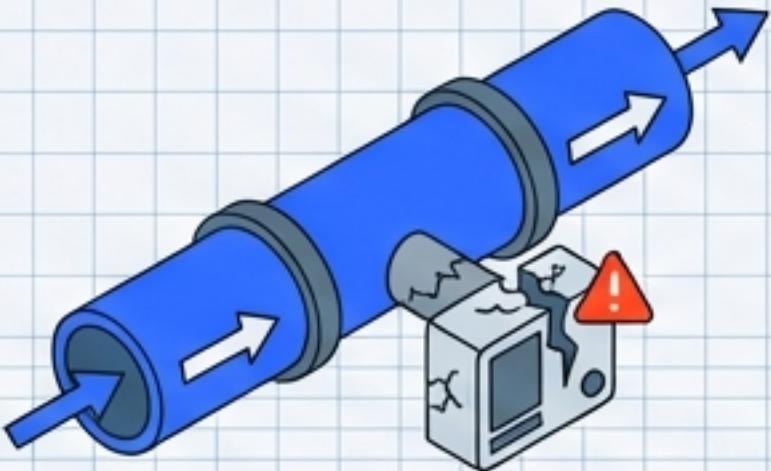
Subhead: Deterministic AI traversing a known graph.



"No hallucination—if the graph doesn't have an edge, Copilot says 'unknown'."

Resilience & Reduced Blast Radius

Comparison of Failure Modes

Risk Matrix			
ARCHITECTURE	VISUAL (FAILURE)	CONSEQUENCE	RISK LEVEL
Legacy Gateway (Inline)		Ingestion BLOCKED. 	HIGH  (Critical Path Failure)
Policy Enforcer (Out-of-Band)		Observability Gap Only.	LOW  (Data flow unaffected)

Observability of Observability

Self-Monitoring Metrics:

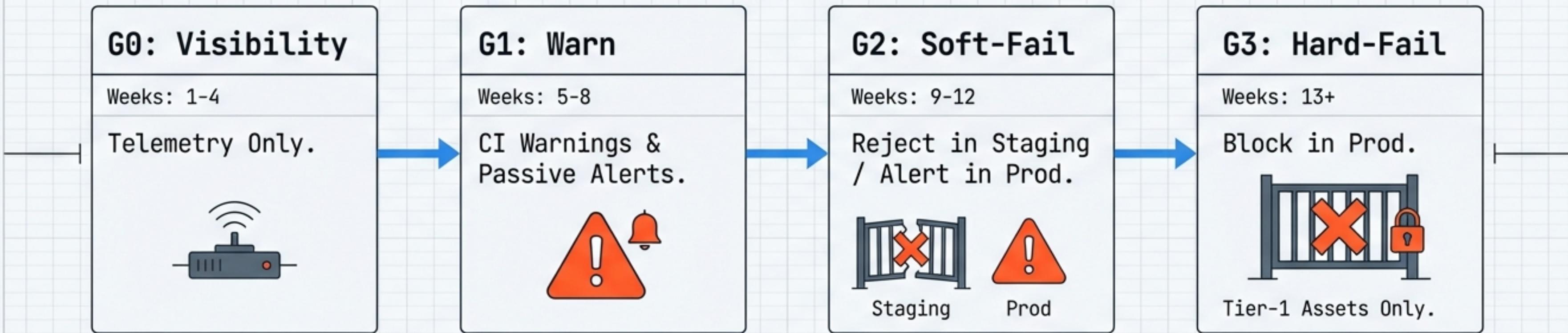
- enforcer.lag_seconds
- evidence_rate

Mitigation:

Fallback to WARN mode if Registry is down.

Progressive Enforcement Strategy

Ramping up governance without breaking production.

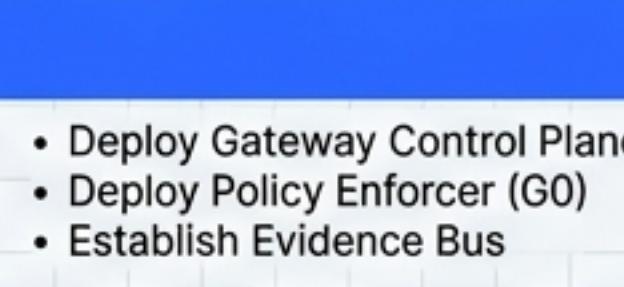
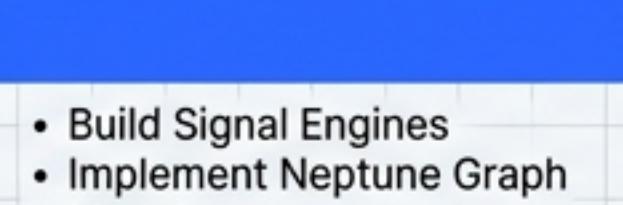
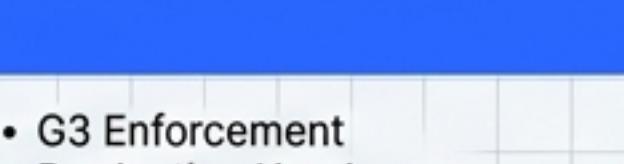


Tiered Application Strategy

- Tier 1 (Revenue Critical): Full G3 Enforcement.
- Tier 3 (Experimental): Best-effort monitoring (G0/G1).

16-Week Implementation Roadmap

Swiss Industrial Blueprint in Paper White | Inter

	WEEKS 1-4 JetBrains Mono	WEEKS 5-8 JetBrains Mono	WEEKS 9-12 JetBrains Mono	WEEKS 13-16 JetBrains Mono
Phase 1: Foundation JetBrains Mono	 <ul style="list-style-type: none">• Deploy Gateway Control Plane• Deploy Policy Enforcer (G0)• Establish Evidence Bus			
Phase 2: Intelligence JetBrains Mono		 <ul style="list-style-type: none">• Build Signal Engines• Implement Neptune Graph Model		
Phase 3: Automation JetBrains Mono			 <ul style="list-style-type: none">• Launch RCA Copilot• G2 Enforcement (Soft-Fail)	
Phase 4: Hardening JetBrains Mono				 <ul style="list-style-type: none">• G3 Enforcement• Production Handover

Technical ROI & Cost Analysis

Inter Tight (Bold)

Infrastructure Cost

JetBrains Mono (Medium)

~\$15k / month



- **EKS** (Compute): \$3k
- **Neptune** (Graph): \$4k
- **MSK** (Streaming): \$3k
- **Bedrock** (AI): \$2k



The Cost of Inaction

JetBrains Mono (Medium)



**MTTR: 12+ Hours
(Current)**



Developer Toil: 20%
of Sprint Velocity

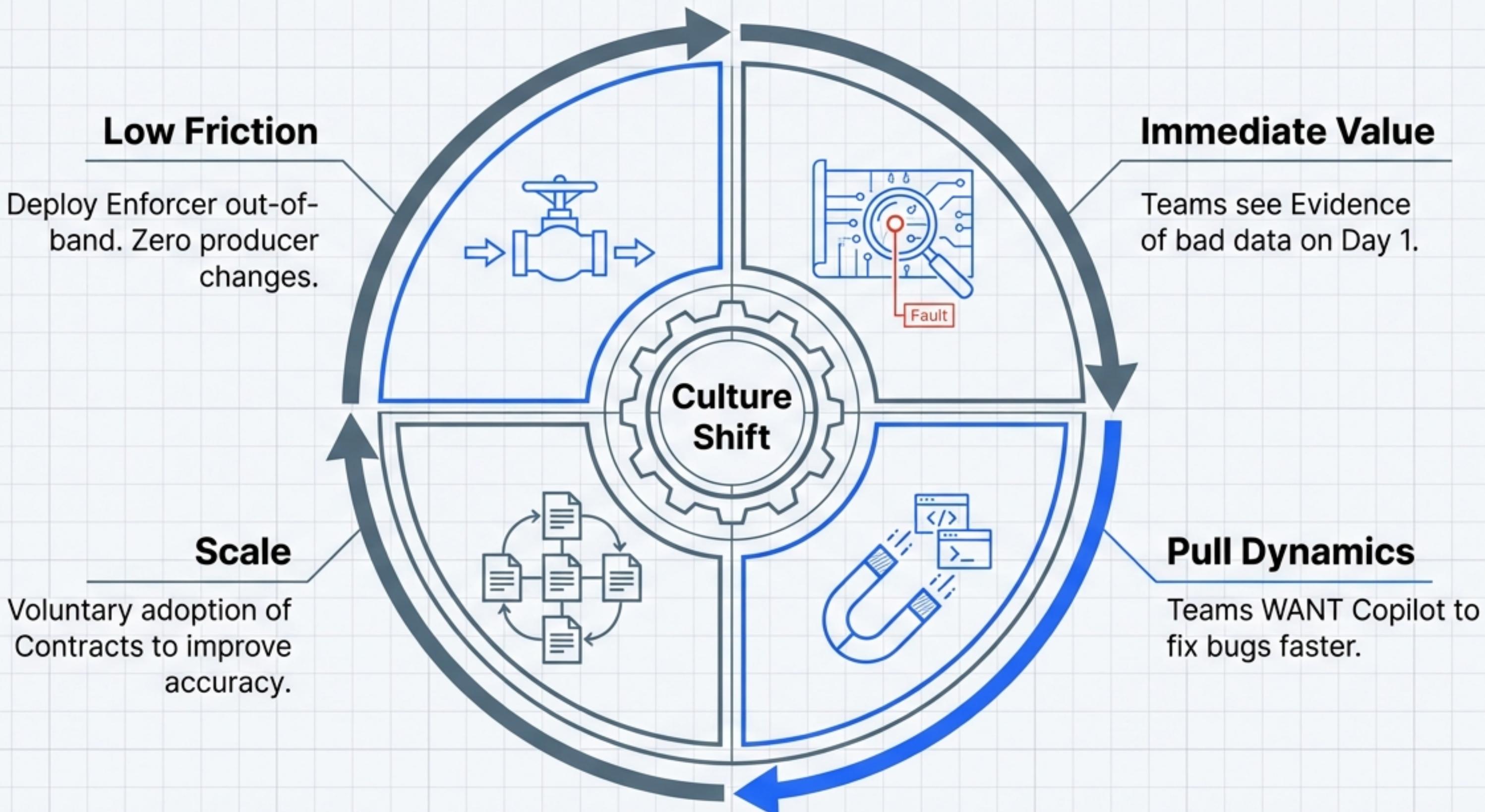


Risk: Erosion of
Downstream Data Trust

Success Criteria: False Positive rate < 20% | Lineage Coverage 100%

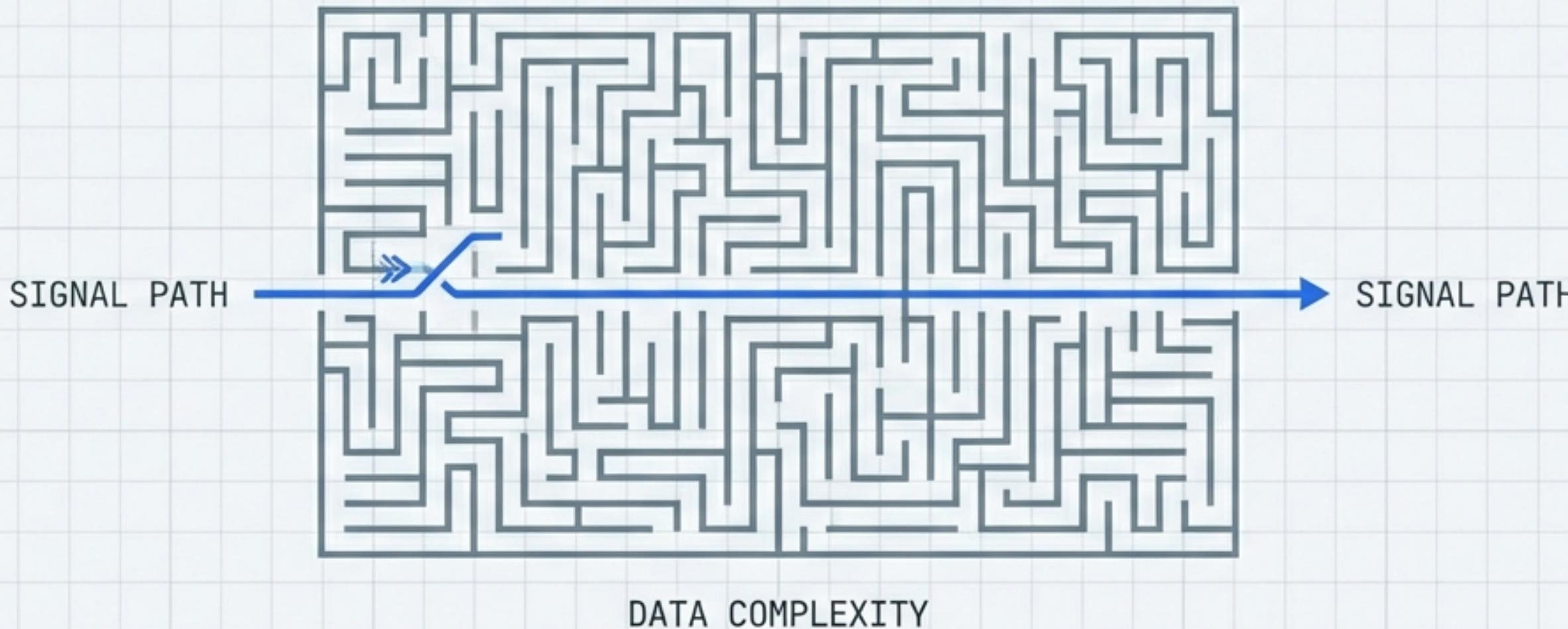
The Adoption Flywheel: Pull vs. Push

Technical Blueprint for Sustainable Growth & Culture Shift



Governance Without Friction

By decoupling enforcement from transport, we solve the paradox of data governance: we achieve **total visibility and safety without slowing down the business.**



Request: Approval to proceed with Phase 1 Implementation.