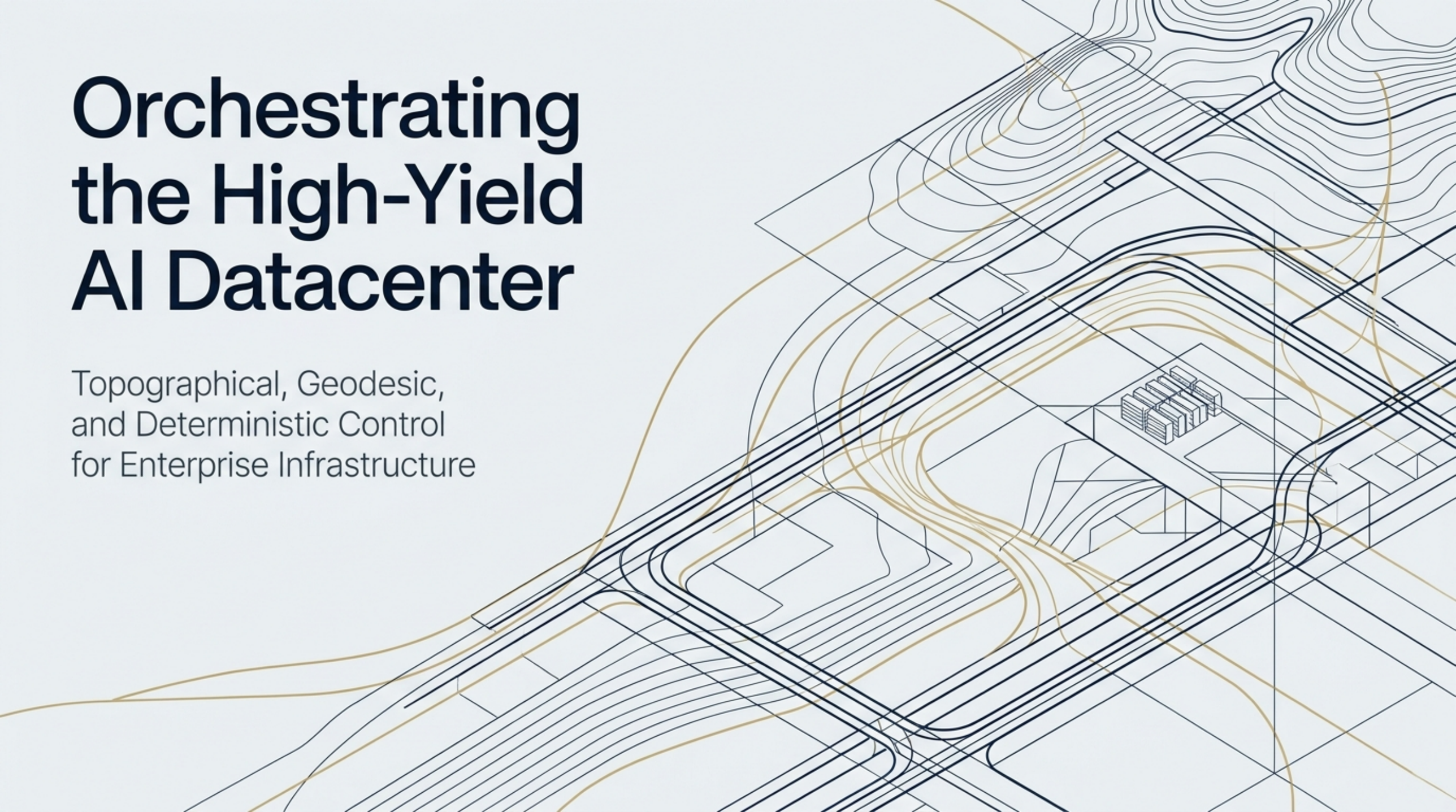
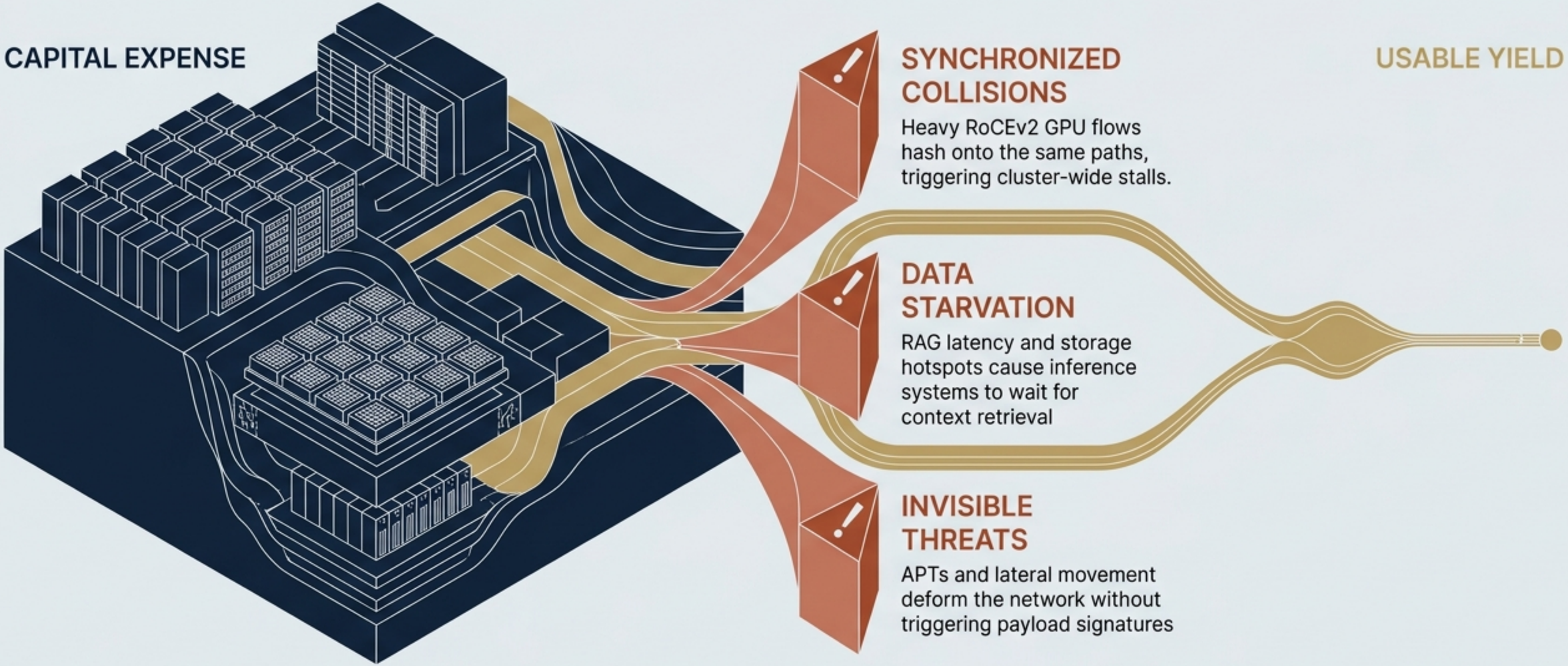
Orchestrating the High-Yield AI Datacenter

Topographical, Geodesic, and Deterministic Control for Enterprise Infrastructure



AI workloads break traditional datacenter designs

When the network, storage, and security control planes are disconnected, massive hardware investments sit idle.

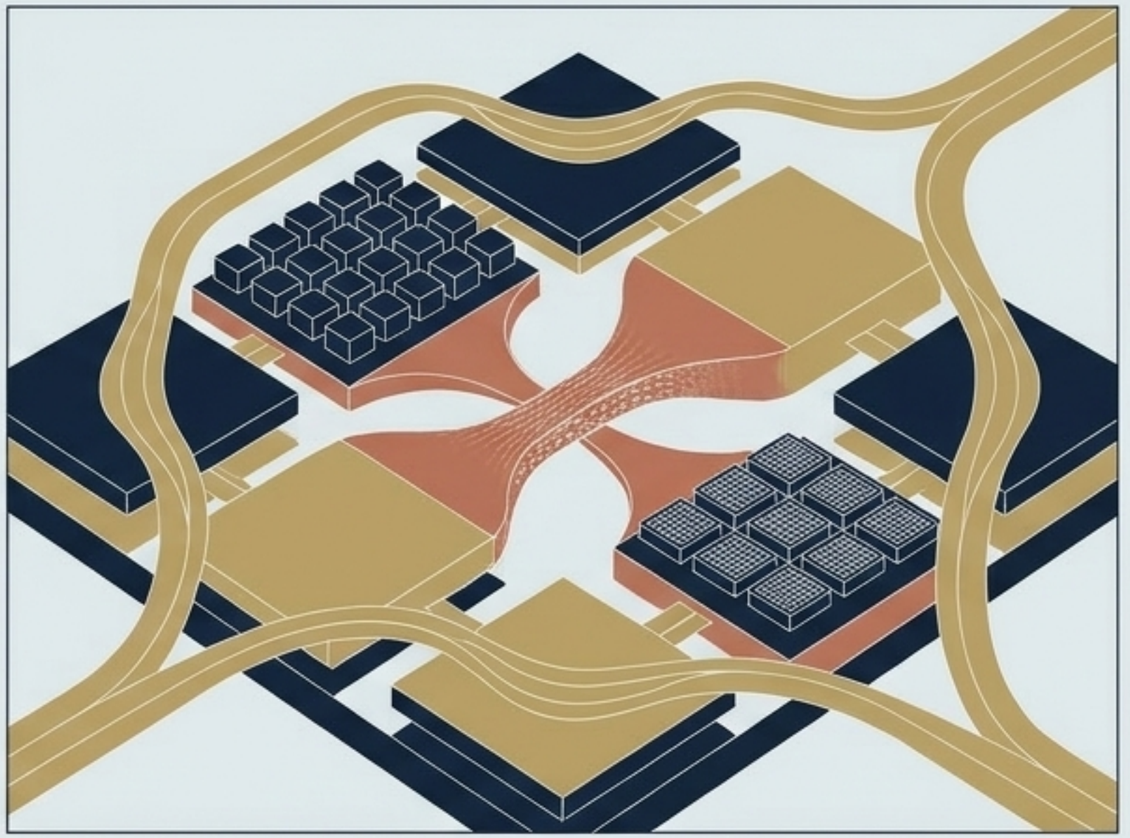


Moving from isolated counters to topological control.

The Old Paradigm: Isolated Counters

Treating the AI factory as a collection of independent switch buffers, storage arrays, and security alerts.
Result: Blind spots and reactive guessing.

The New Paradigm: Topological AI Yield

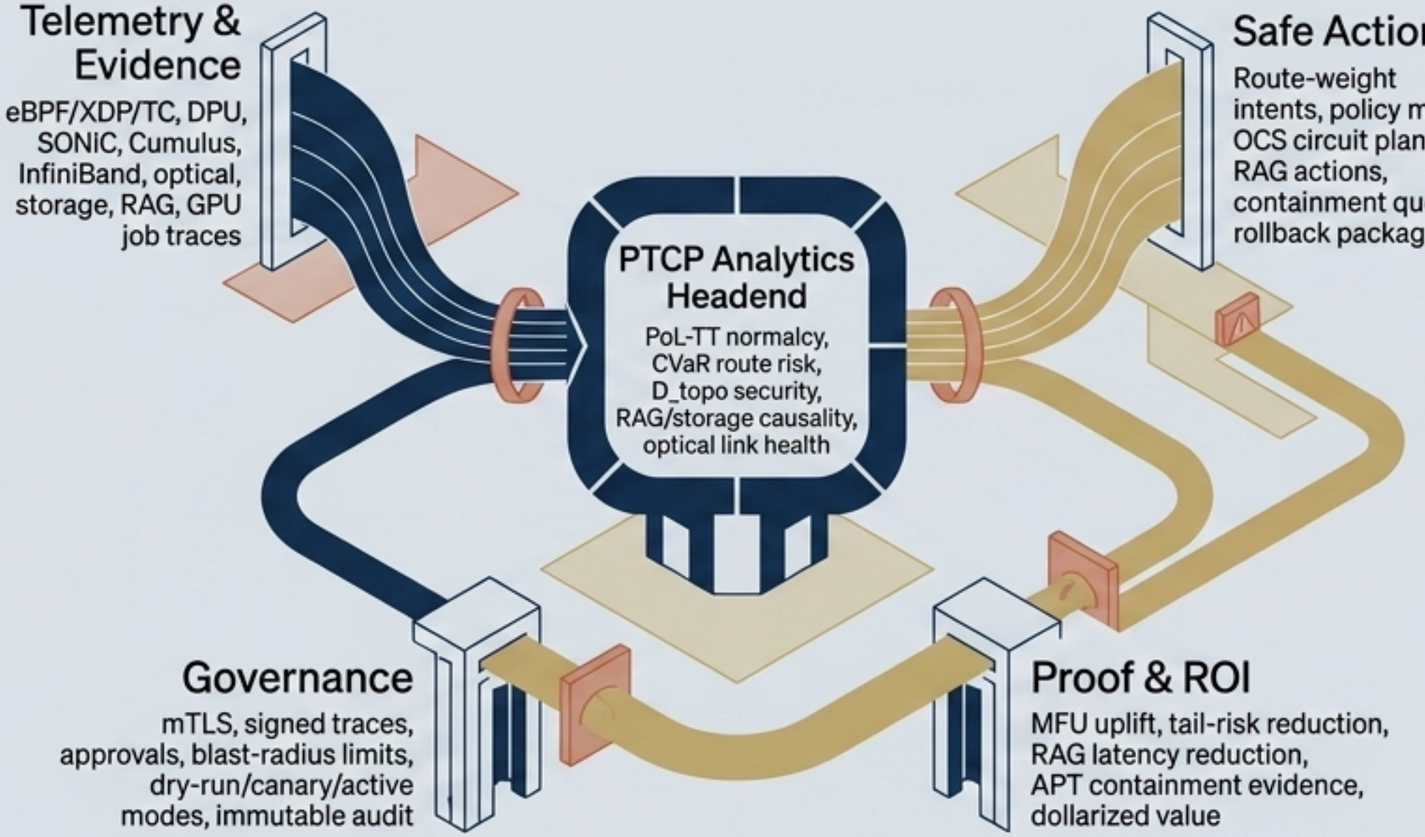


Treating the datacenter as a living topographical graph—
—measuring capacity, distance, trust, and curvature to predict and bypass bottlenecks before they impact workloads.

Meet PTCP AI Factory: The Yield Orchestrator

What it is:
A topology-native control-plane and evidence headend.

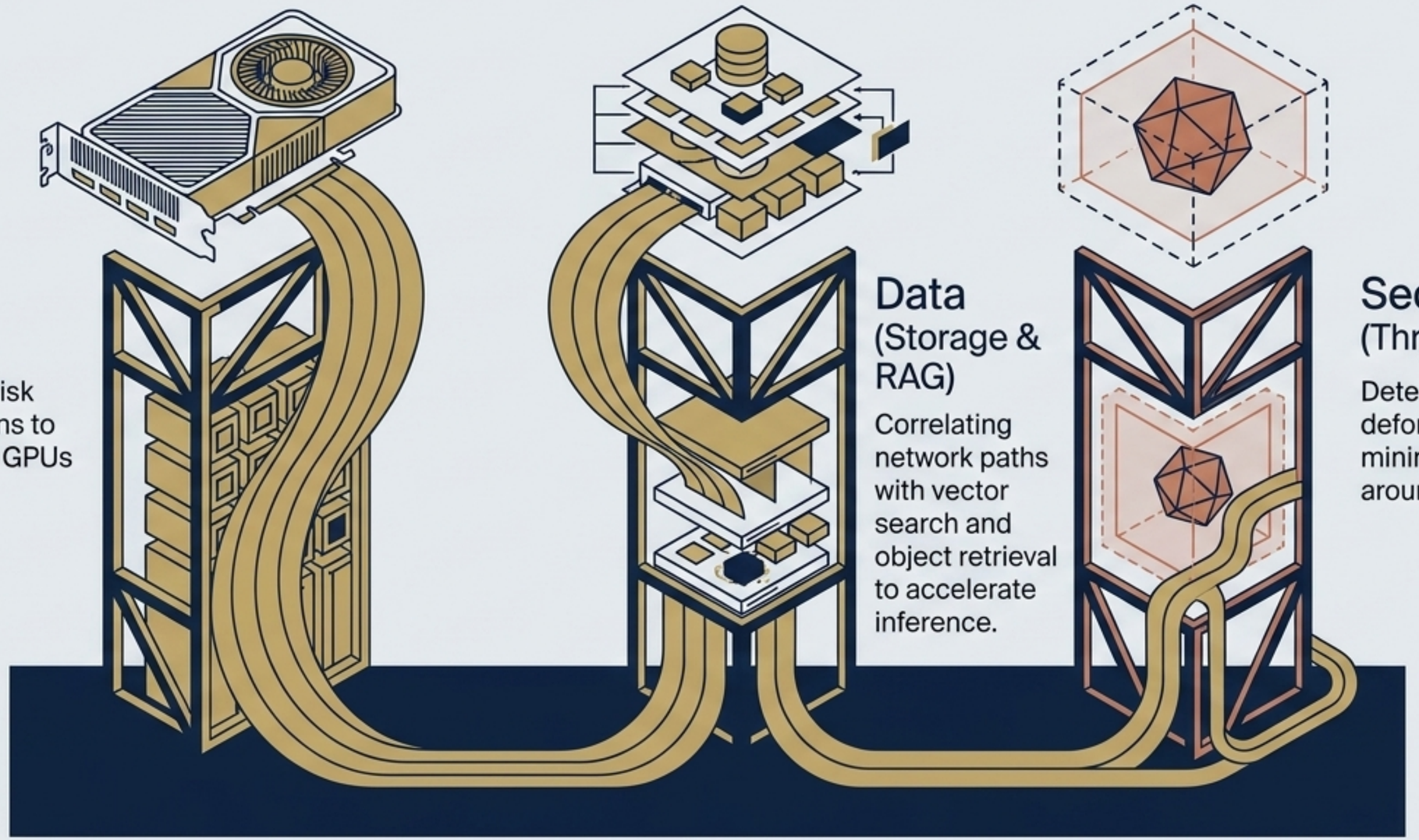
What it does:
Converts noisy, high-dimensional infrastructure telemetry into safe, evidence-backed operational decisions.



The Guarantee:
PTCP does not replace your live dataplane or ASIC forwarding; it generates generates deterministic, auditable decisions for your existing fabric.

Observe everywhere, act narrowly, verify continuously.

Three dimensions of measurable datacenter yield.



Compute
(MFU Uplift)

Eliminating tail-risk and flow collisions to keep high-value GPUs perfectly fed.

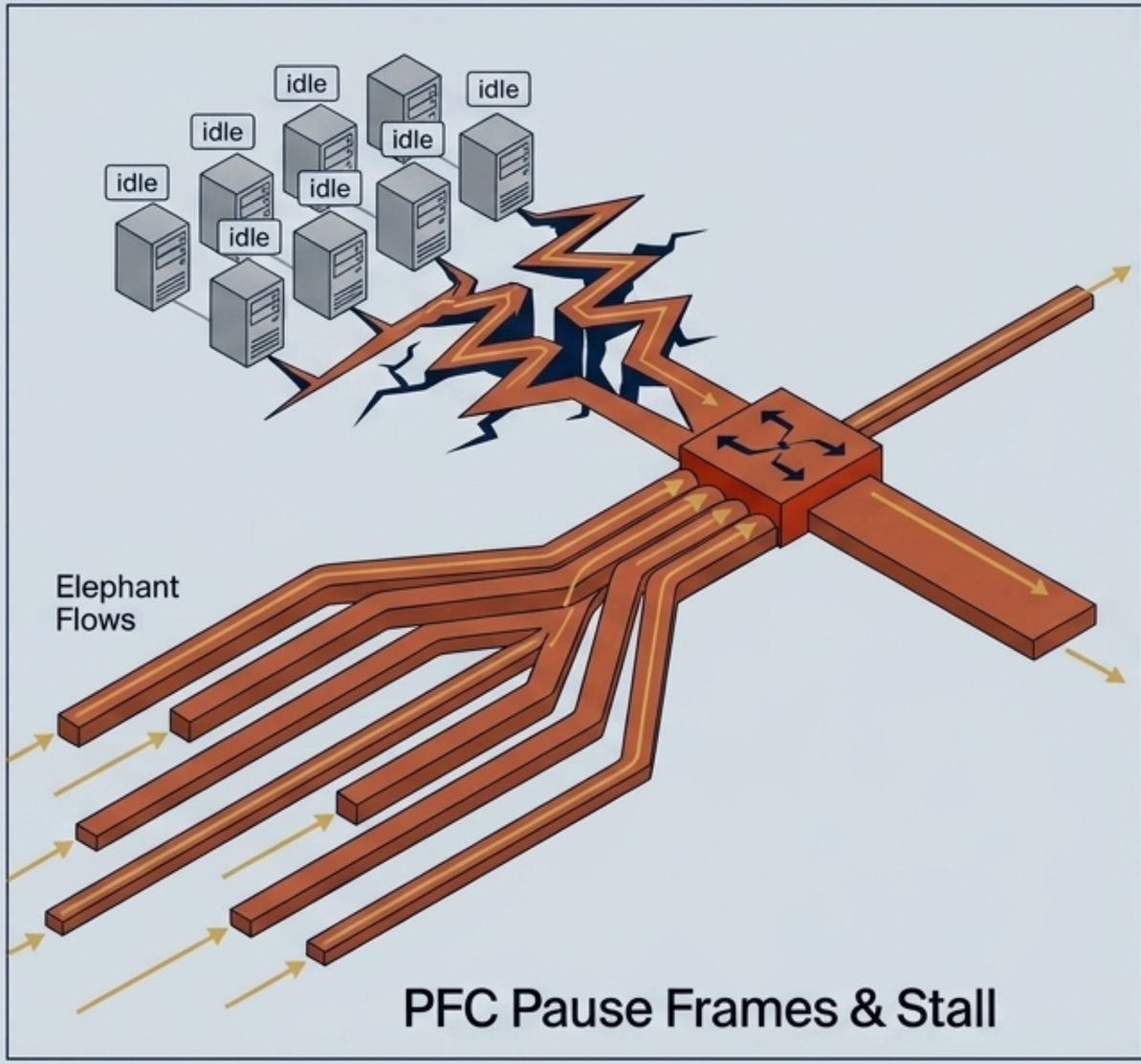
Data
(Storage & RAG)

Correlating network paths with vector search and object retrieval to accelerate inference.

Security
(Threat Containment)

Detecting trust deformation and snapping minimum safe perimeters around lateral threats.

The Compute Bottleneck: Elephant Flow Collisions



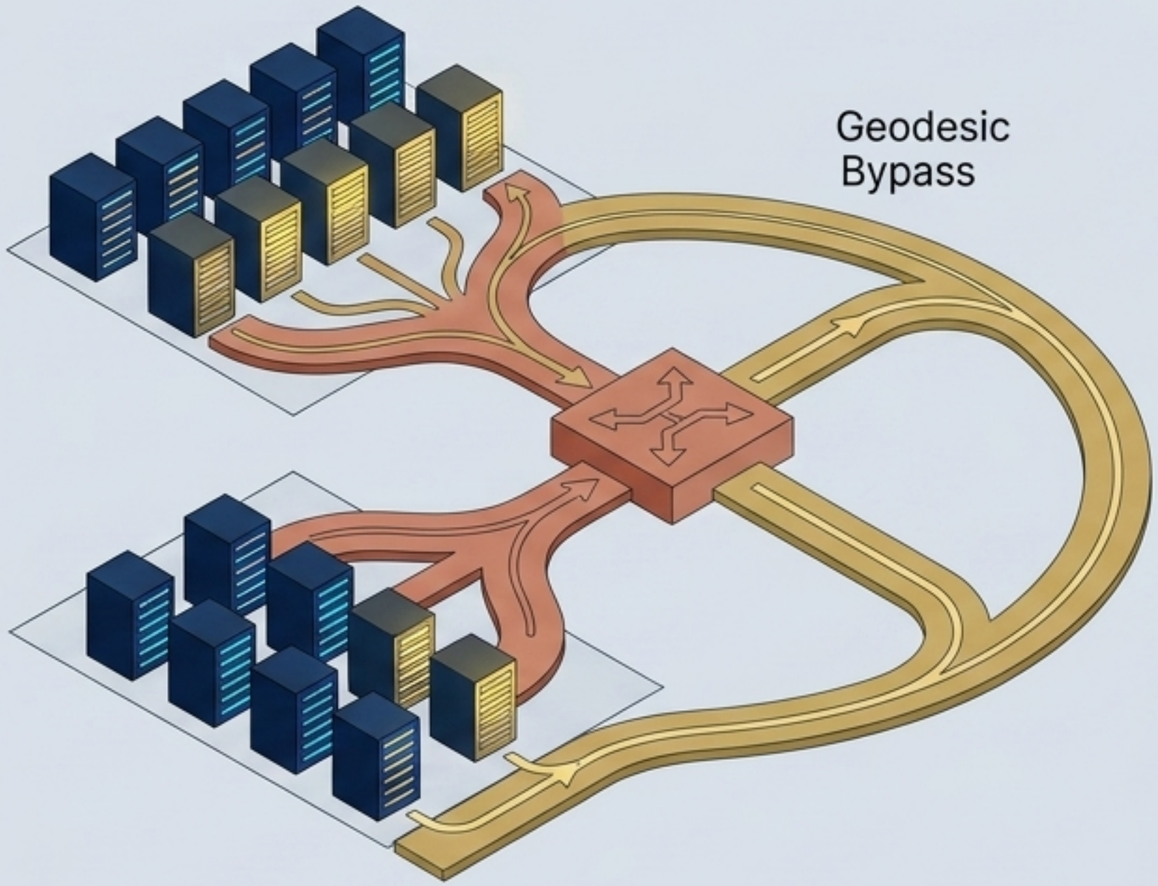
Large training jobs rely on tightly synchronized communication across GPUs.

When heavy, synchronized flows collide on a small set of physical links (**ECMP microbursts**), switch buffers instantly fill.

Priority Flow Control (**PFC**) pause frames propagate backwards, forcing expensive GPUs to stall while waiting for the slowest collective operation to finish.

Result: Plummeting Model FLOPs Utilization (MFU).

Predictive Fabric Scoring & Geodesic Bypass

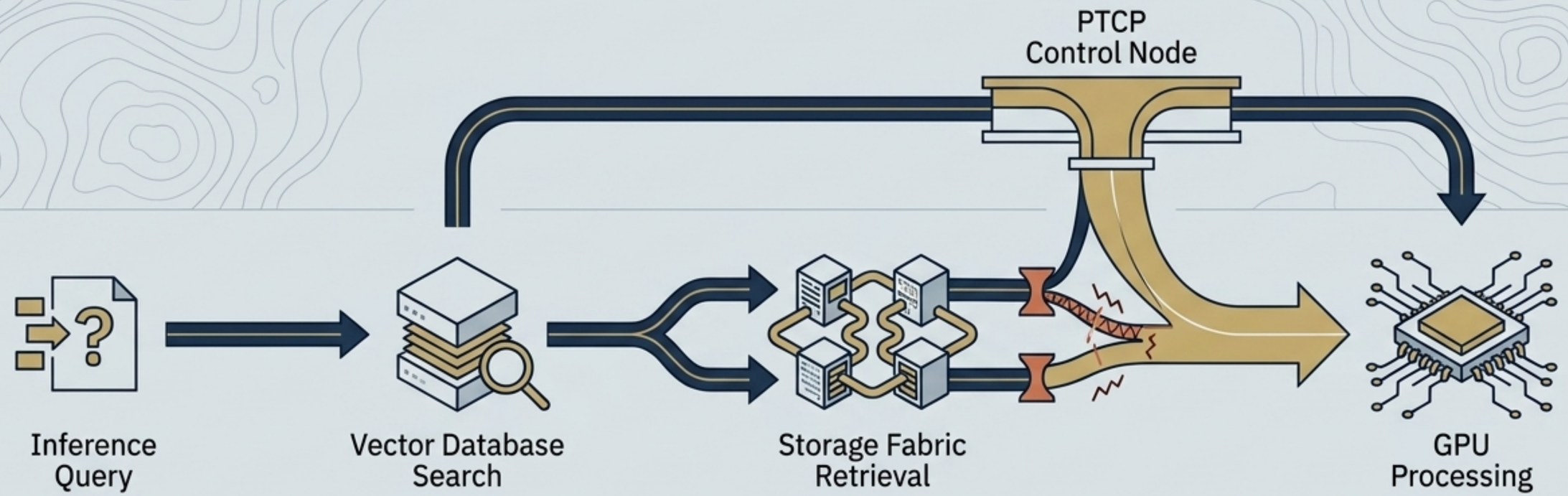


Instead of waiting for dropped packets, PTCP continuously calculates the Conditional Value-at-Risk (CVaR) of every route.

It identifies the lowest-risk geodesic path and stages a route-weight intent to bypass the congestion before the microburst stalls the cluster.

The Outcome: Deterministic internal tests demonstrate up to +13.0 percentage points of MFU uplift, directly recovering lost GPU-hours.

Accelerating Retrieval-Augmented Generation (RAG) pipelines



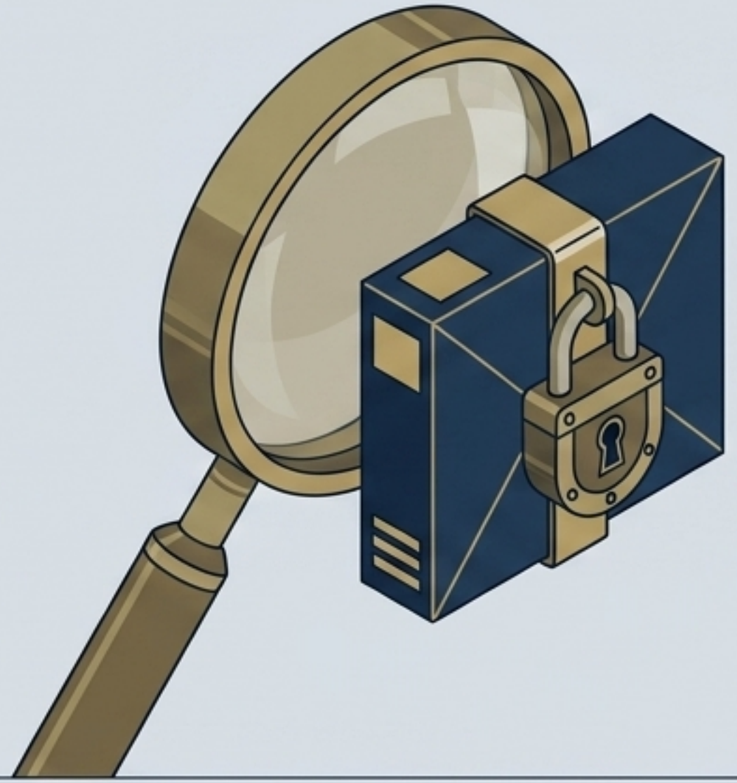
1.
Inference and agentic workflows are only as fast as their context retrieval.

2.
PTCP correlates vector search, metadata access, and cache locality with physical network telemetry.

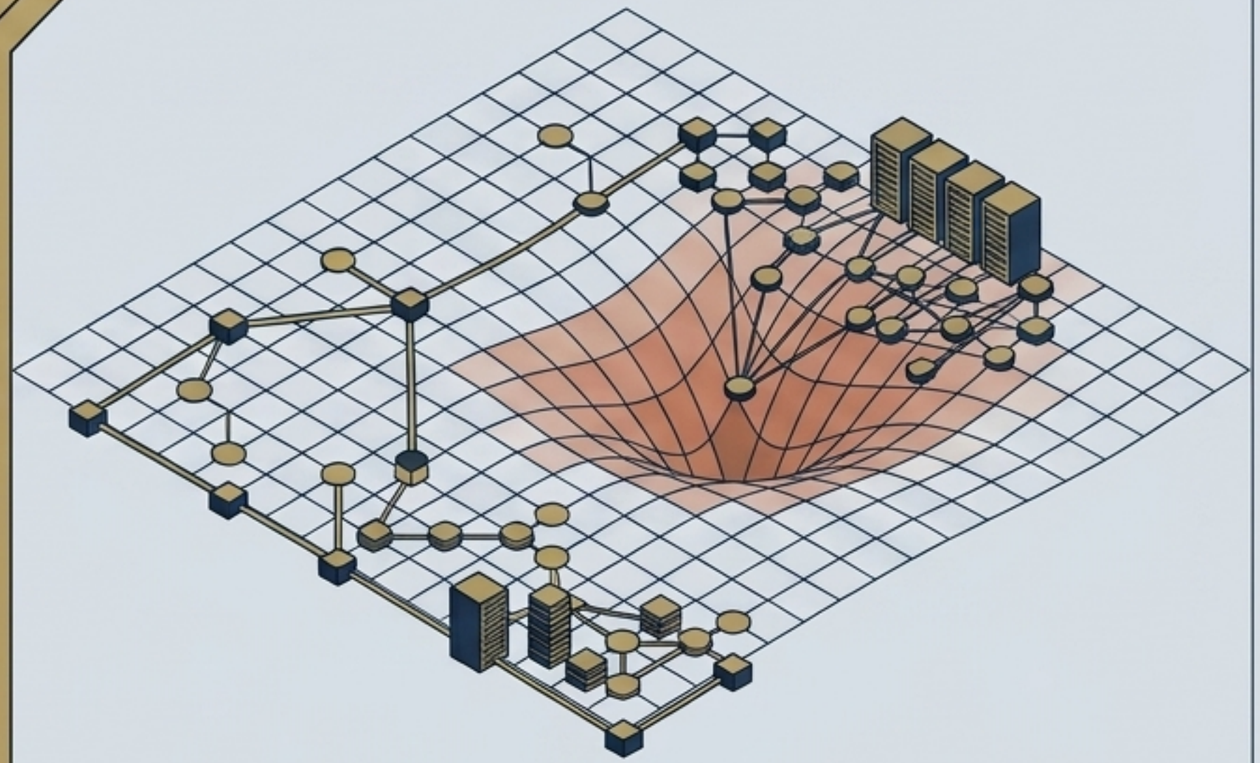
3.
By optimizing end-to-end storage and optical circuit locality, data friction is eliminated.

The Outcome: Self-tests demonstrate a **37.8% reduction** in RAG latency, enabling faster, more responsive AI applications.

Security in the AI era is a topology problem.



Deep payload inspection is inherently incomplete in high-throughput, encrypted environments.

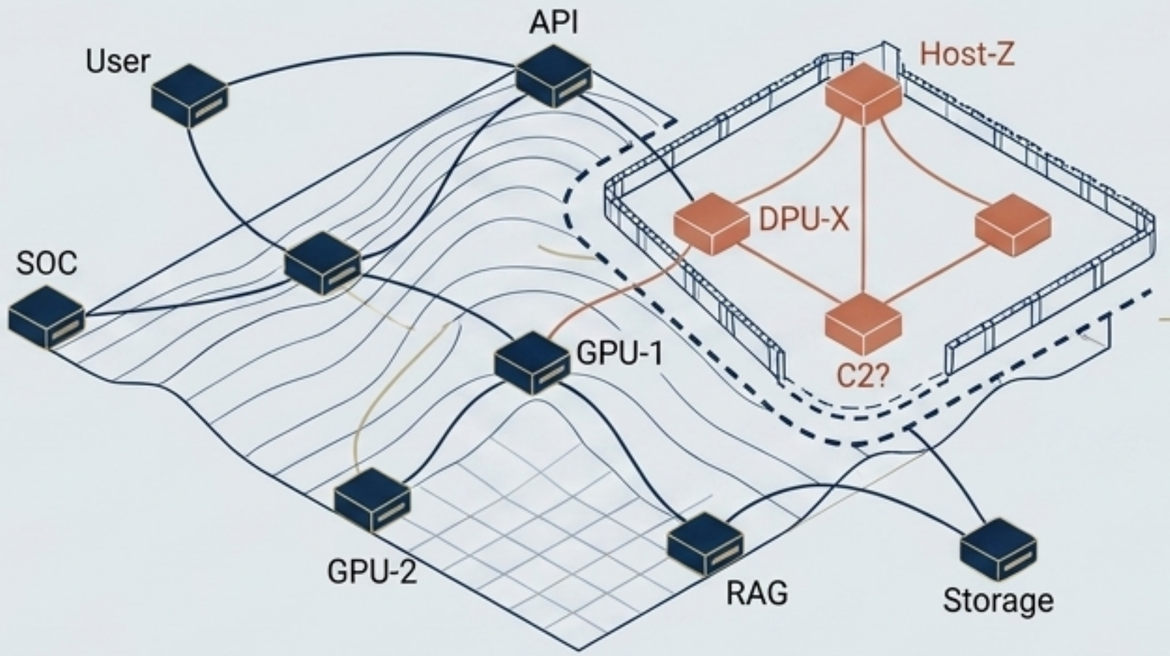


Advanced Persistent Threats (APTs) and agentic AI campaigns stealthily reshape trust paths, exploit lateral movement, and alter service dependencies. We must look at how the shape of the network itself deforms.

Payload-blind threat containment at line rate

PTCP looks for deformation in trust, cuts, and curvature, then stages a minimum safe containment boundary.

PTCP generates a continuous topology defect score (D_topo) by tracking anomaly evidence and graph-curvature changes.



When lateral movement deforms the graph, it calculates and stages the minimum safe containment boundary, isolating the threat without severing clean nodes.

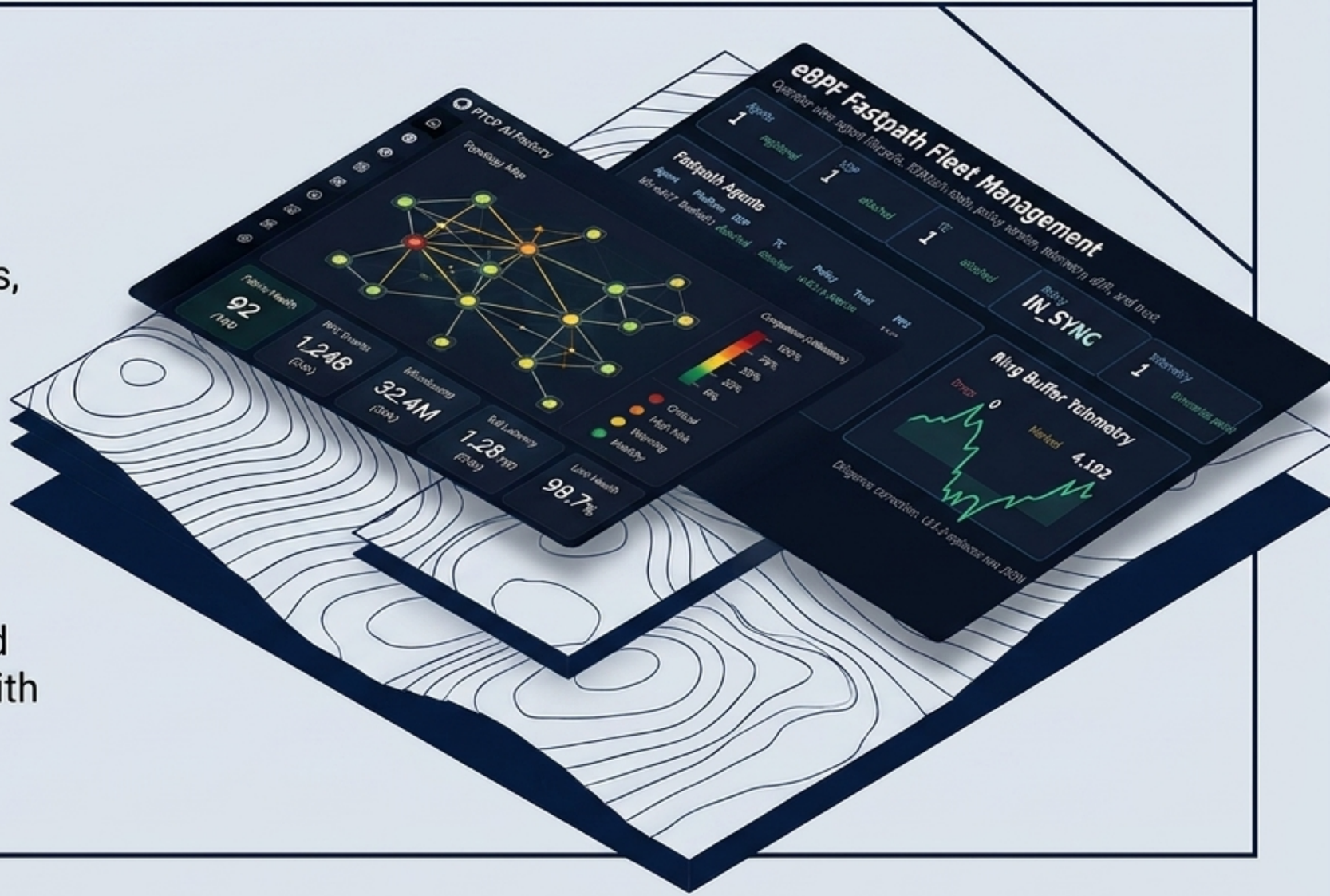
Actionable, surgically precise, and entirely payload-blind.

Augment your infrastructure. Don’t replace it.

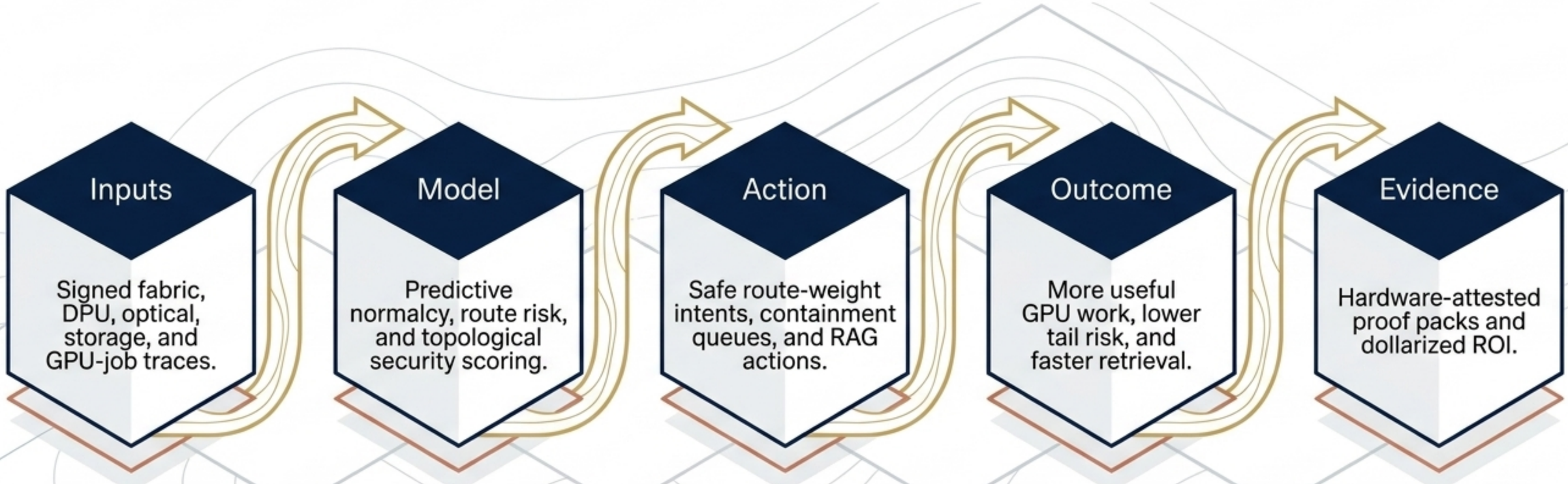
Platform	What You Already Have	What PTCP Adds
NVIDIA Spectrum-X & Fabric ASICs	High-speed Ethernet, adaptive routing, raw telemetry	Vendor-neutral cross-fabric reasoning, optical planning, and RAG-causality
SONiC / Cumulus / eBPF	Open switch operating systems and fastpath runtimes.	Safe policy map generation, route diffs, and evidence-backed rollback.
Storage & Vector DBs	High-performance data lakes.	Correlation between storage behavior, network tail-risk, and GPU idle times.
SIEM / SOAR	Alerting and ticketing workflows.	Topology-native risk scoring and minimum-safe containment geometries.

Complete visibility meets bounded control.

- PTCP is a fully guided enterprise console, not a raw JSON sandbox.
- Manage eBPF agent lifecycles, verify XDP/TC attach states, and track policy drift.
- Review human-readable containment queue recommendations.
- Stage signed policy maps and export ROI/evidence packs with zero operational friction.



The Value Derivative: From Telemetry to Predictable ROI

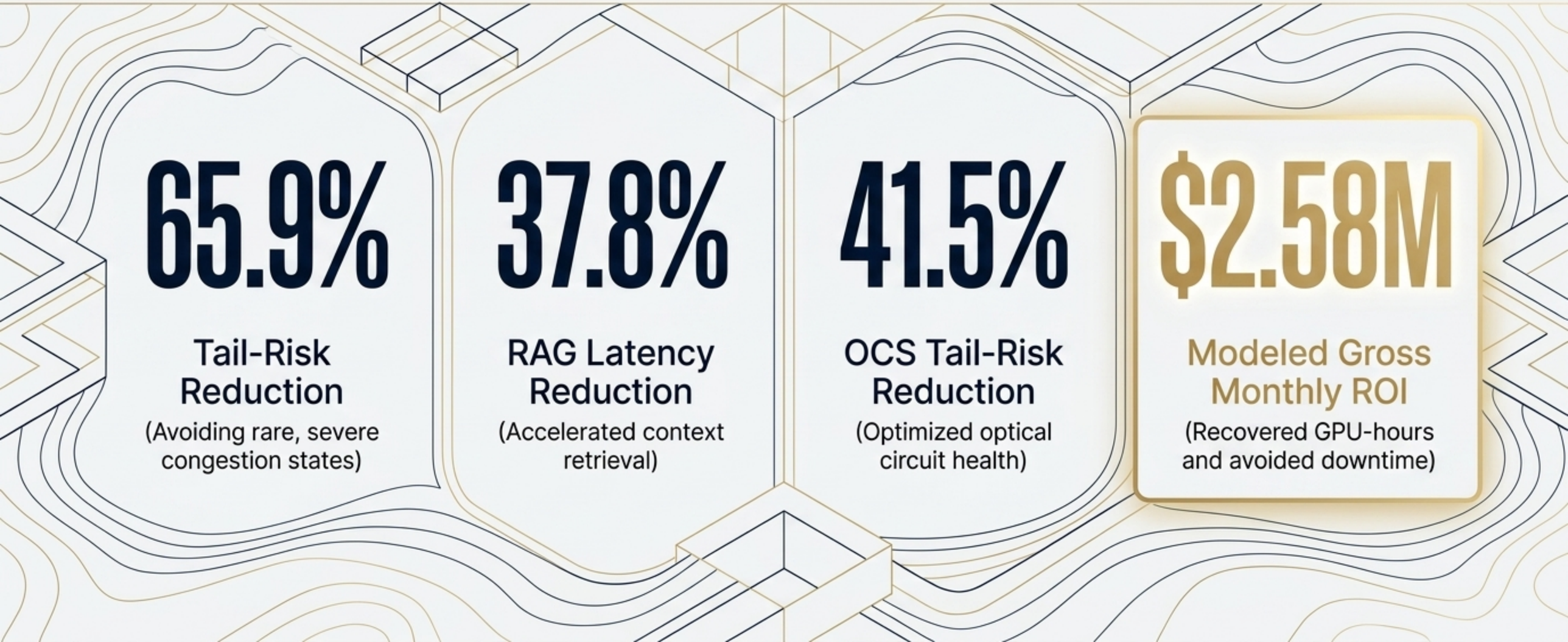


Modeled gross monthly ROI in v14.2 self-test: $2,578,664

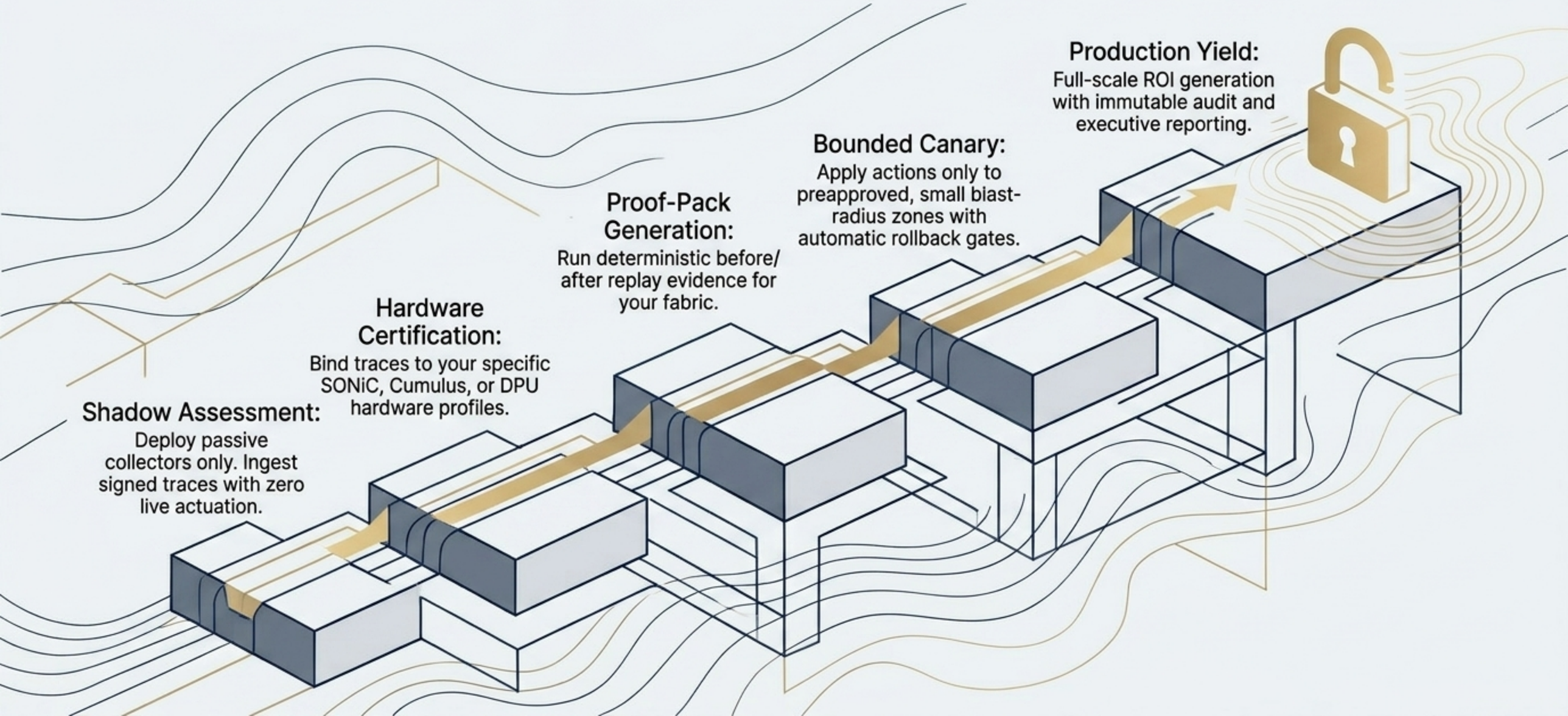
This is a modeled internal proof-pack value, not a live customer financial claim; it becomes external evidence only when tied to signed customer traces.

Deterministic, Evidence-Backed Results

Context: Results from the v14.2 internal deterministic self-test and proof-pack harness.



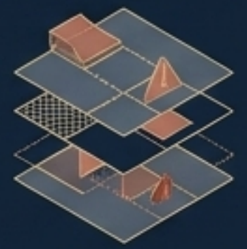
The Safe Envelope: A zero-risk adoption path.



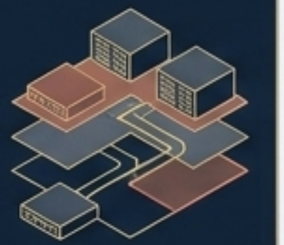
The Ultimate Yield Orchestrator for the AI Factory

Observe the topology.
(Beyond isolated counters)

Model the deformation.
(Identify hidden bottlenecks and invisible threats)



Stage the safest action.
(Augment existing hardware with bounded intents)



Convert outcomes into ROI. (Generate hardware-attested, dollarized evidence)

Turn your AI factory's topology into an executable, high-yield asset.