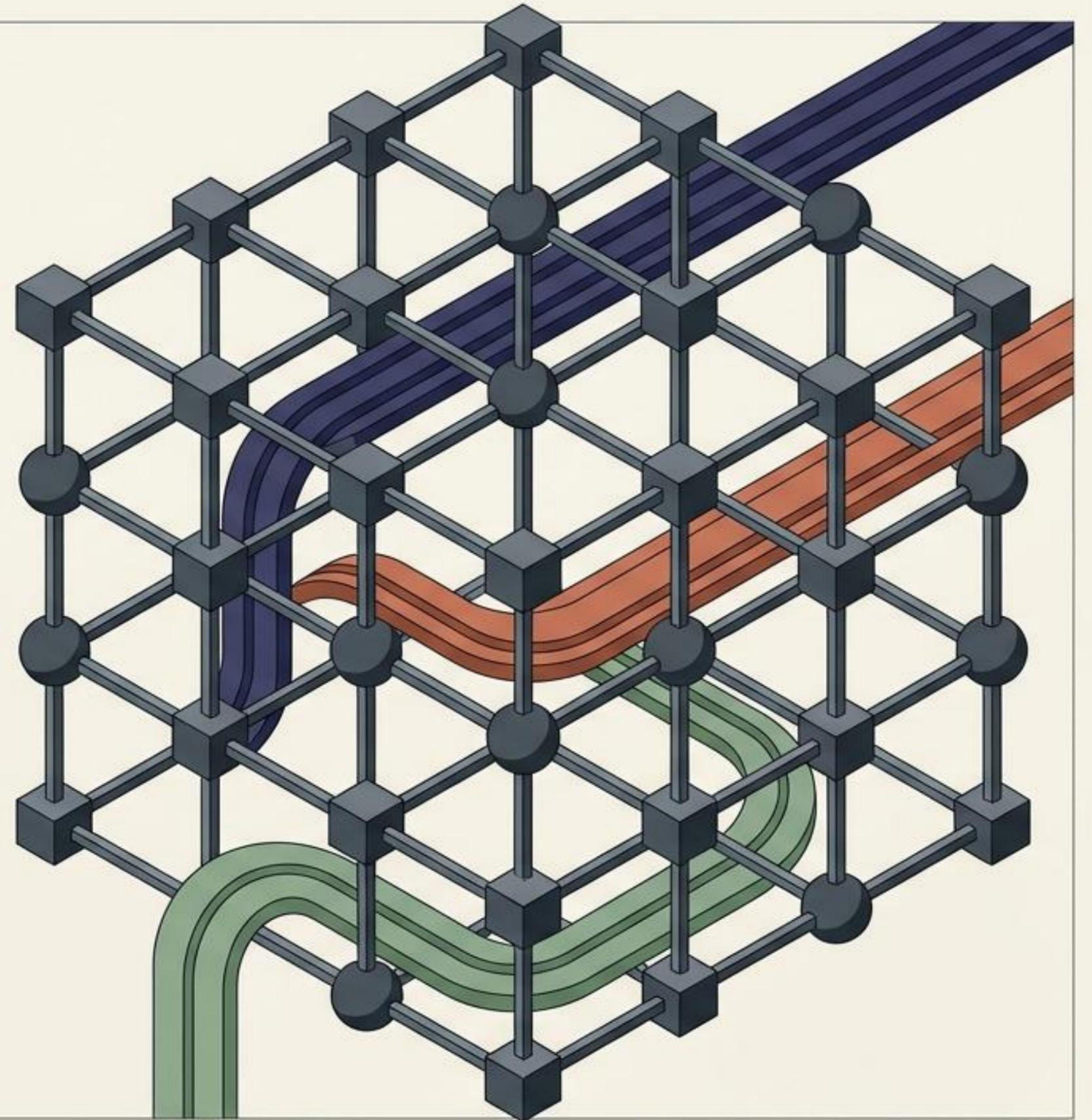
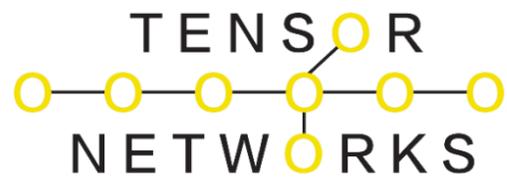


The Predictive Research Fabric

Overcoming data gravity in life sciences through the Predictive Tensor Control Plane (PTCP).





Disclaimer: Forward-Looking Statements This presentation may contain forward-looking statements regarding future product plans, expected features, or anticipated release dates. These statements outline our general product direction and should not be relied upon in making purchasing decisions. The development, release, and timing of any features or functionality described for our products remain at our sole discretion and are subject to change without notice. These statements do not represent a commitment, promise, or legal obligation to deliver any specific material, code, or functionality

Massive data gravity forces expensive GPU clusters to sit idle.

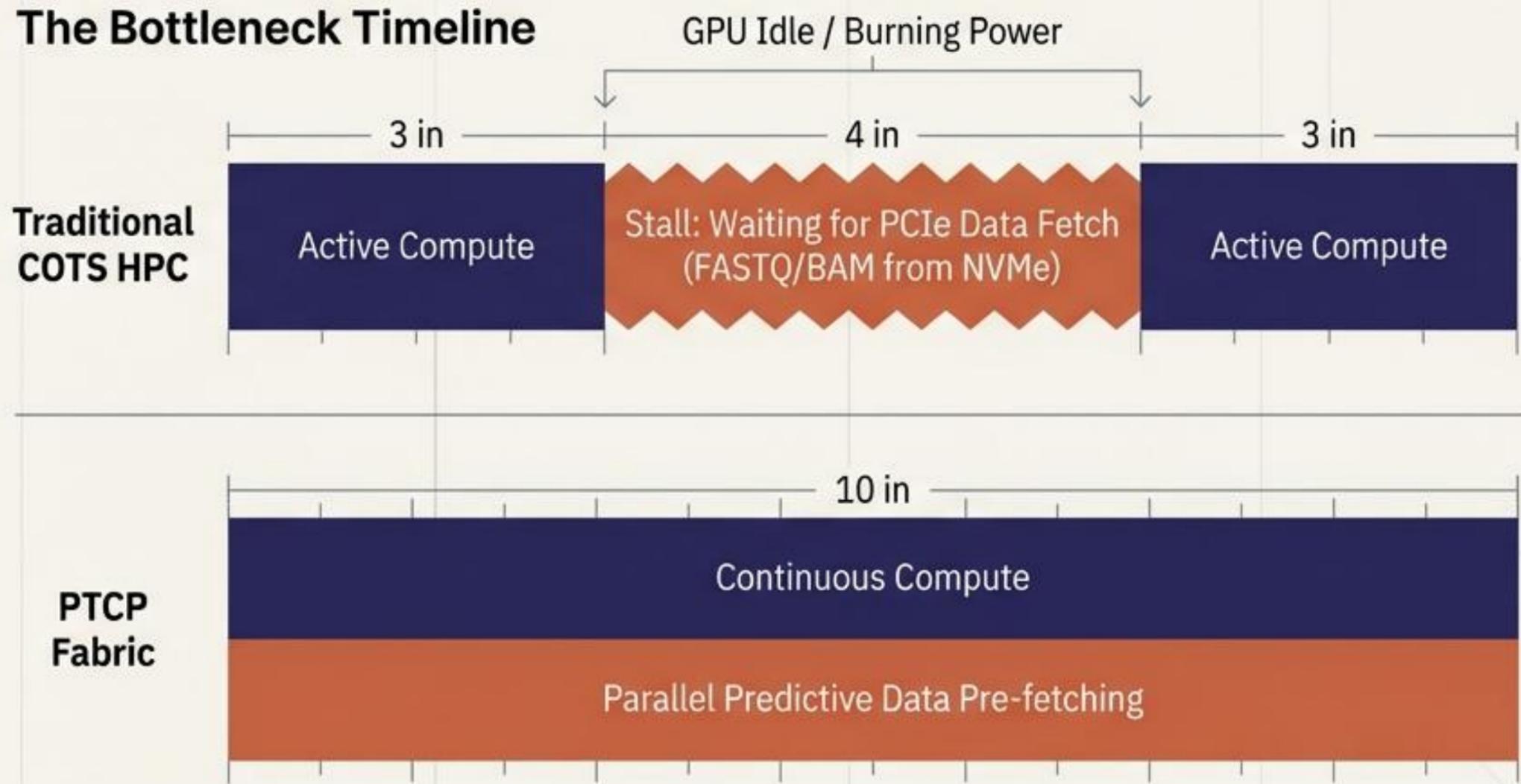
The Data Gravity Crisis

Modern Next-Generation Sequencing (NGS), Cryo-EM, and AI drug discovery generate terabytes to petabytes of highly sparse data per run.

The Reactive Penalty

Standard clusters wait for explicit read commands. Storage controllers react slowly, paralyzing active GPU memory while multi-terabyte batches are pulled across the PCIe bus.

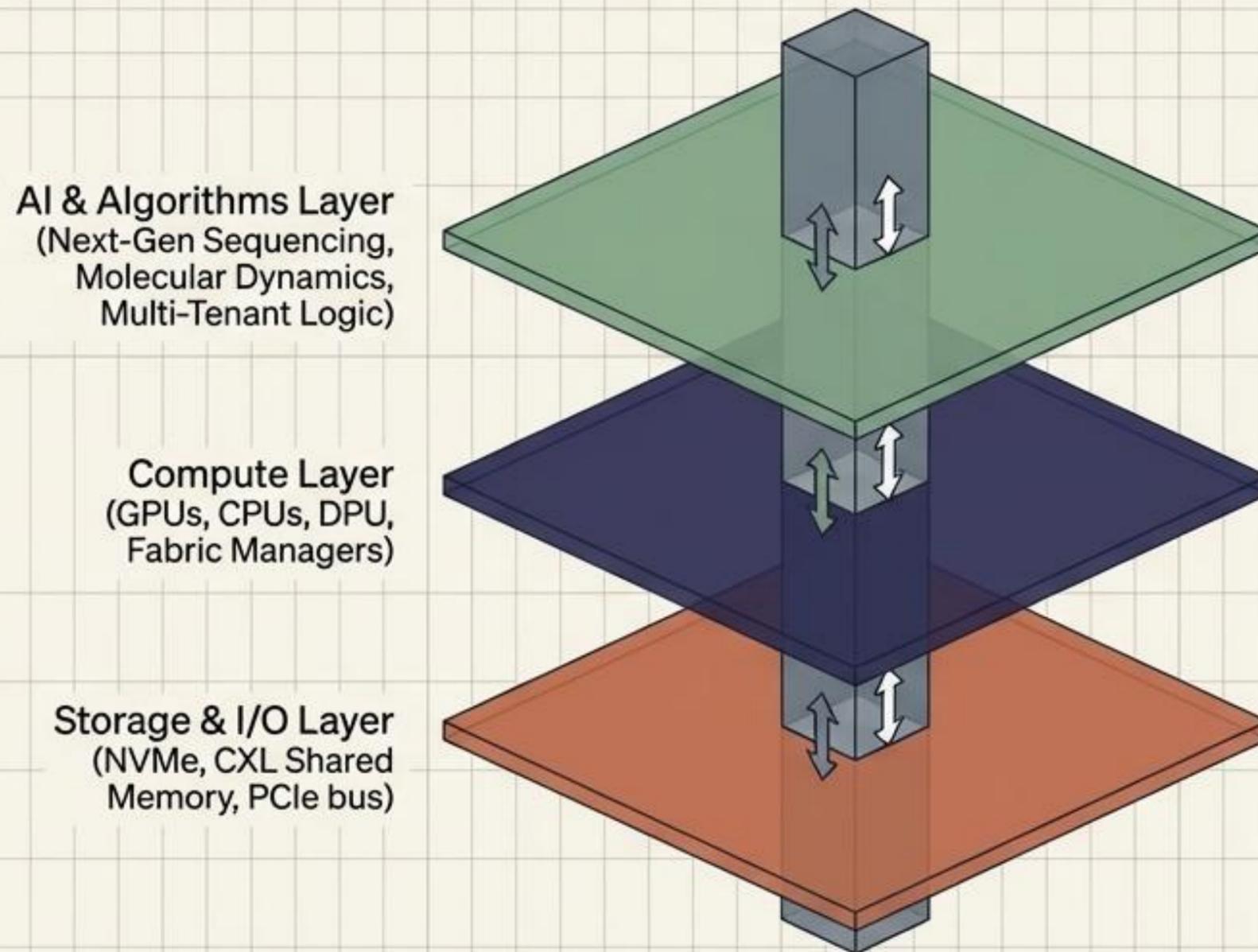
The Bottleneck Timeline



Shifting from reactive hardware to a predictive semantic layer.

Dimension	Reactive COTS HPC	Predictive PTCP Fabric
Data Fetching	Explicit read requests causing compute stalls.	Probabilistic tiering & pre-warmed CXL memory pools.
Network Pacing	Collision-prone traffic & reactive dropping.	Pre-emptive pacing guided by predictive behavioral models.
Shared Resources	Unbounded access leading to noisy neighbors.	Strict, mathematically bounded policy envelopes.
Telemetry	Raw broadcast of system states.	Compact mathematical summaries ensuring HIPAA/GDPR privacy.

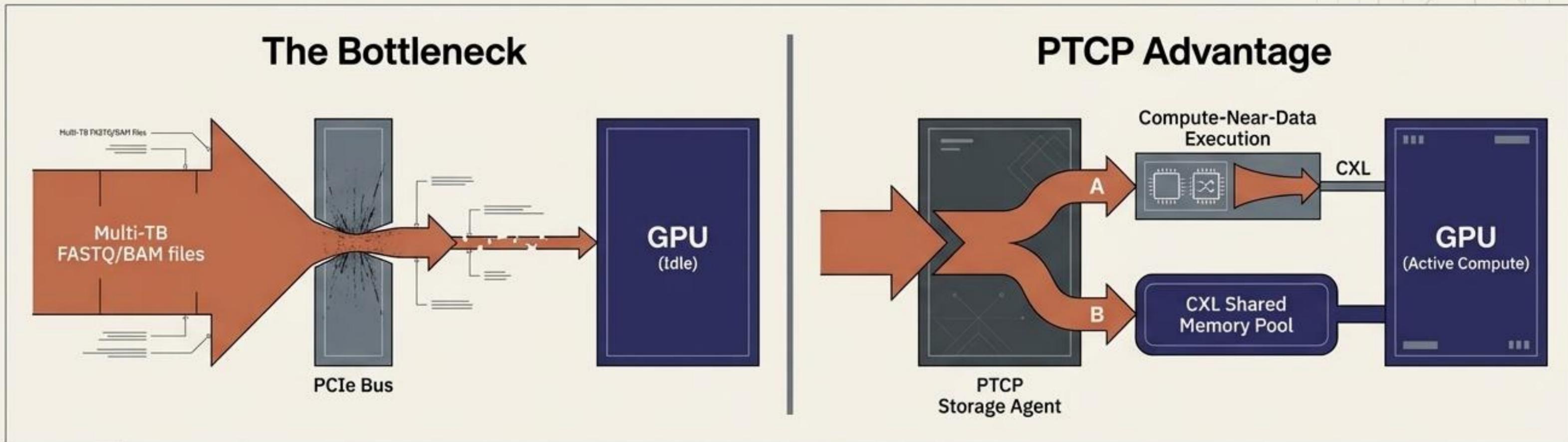
PTCP transforms infrastructure into a synchronized, mathematically tractable pipeline.



The Predictive Semantic Layer

PTCP operates across the network and storage views simultaneously. It evaluates the unified behavioral state of the entire environment, ensuring expensive compute nodes are never starved of data.

Genomic Sequencing: Defeating the I/O bottleneck through predictive pre-warming.



Predictive Pre-Warming via CXL

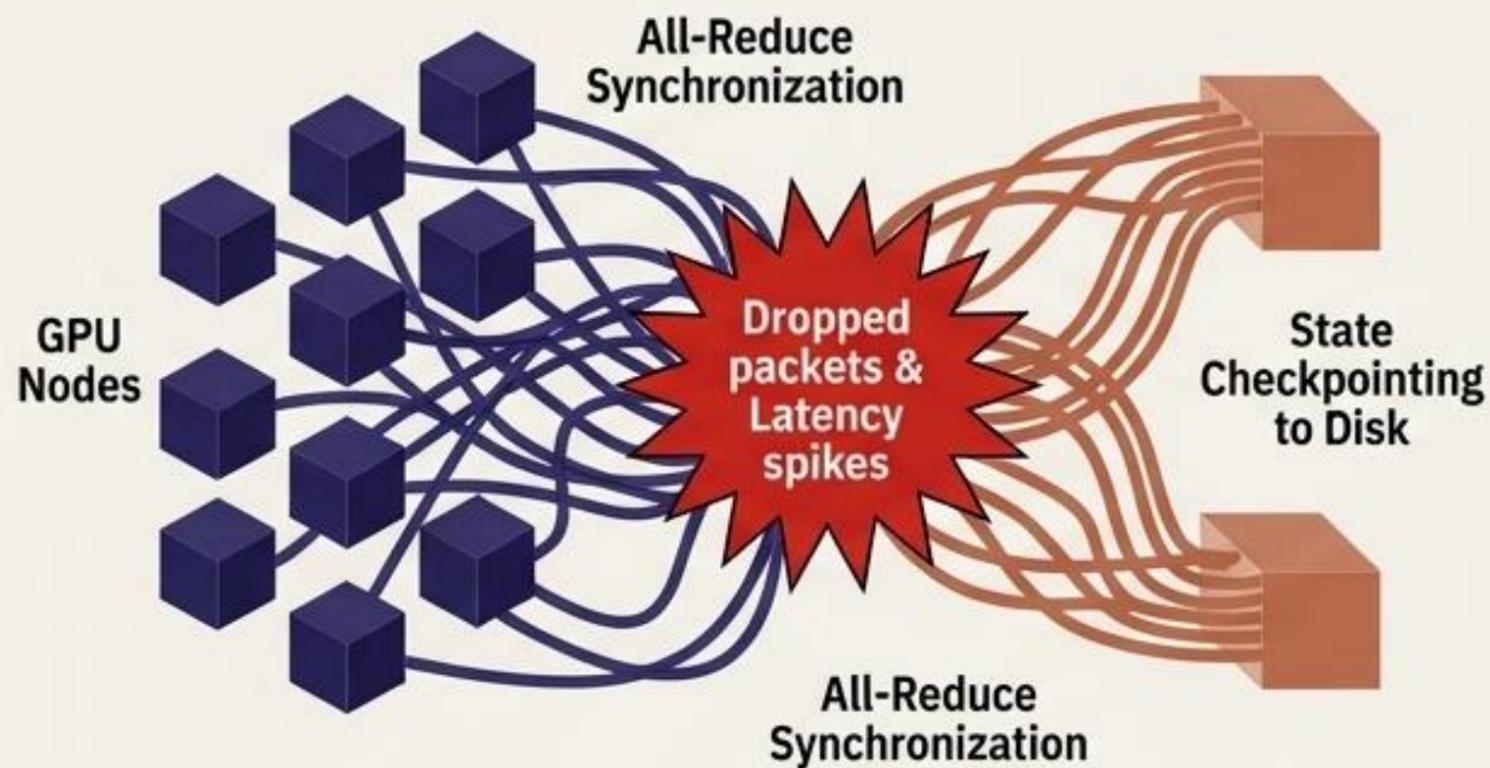
PTCP uses a TT-compressed behavioral model to forecast required data sequences, pre-positioning blocks into high-speed memory.

Compute-Near-Data

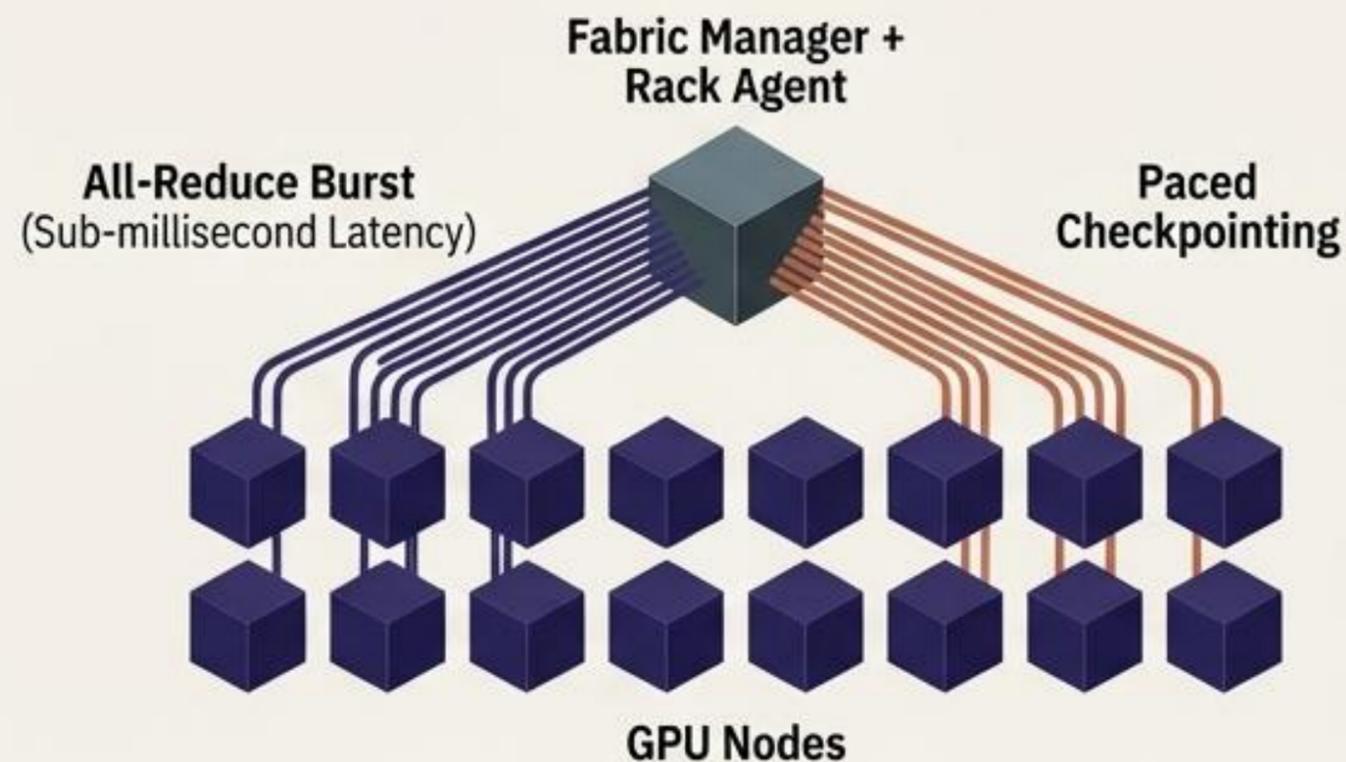
Because genomic data is sparse, local decompression and filtering occur directly on the computational storage drive, avoiding PCIe congestion.

Protein Folding: Synchronizing thousands of GPUs without catastrophic collisions.

The Bottleneck



PTCP Advantage



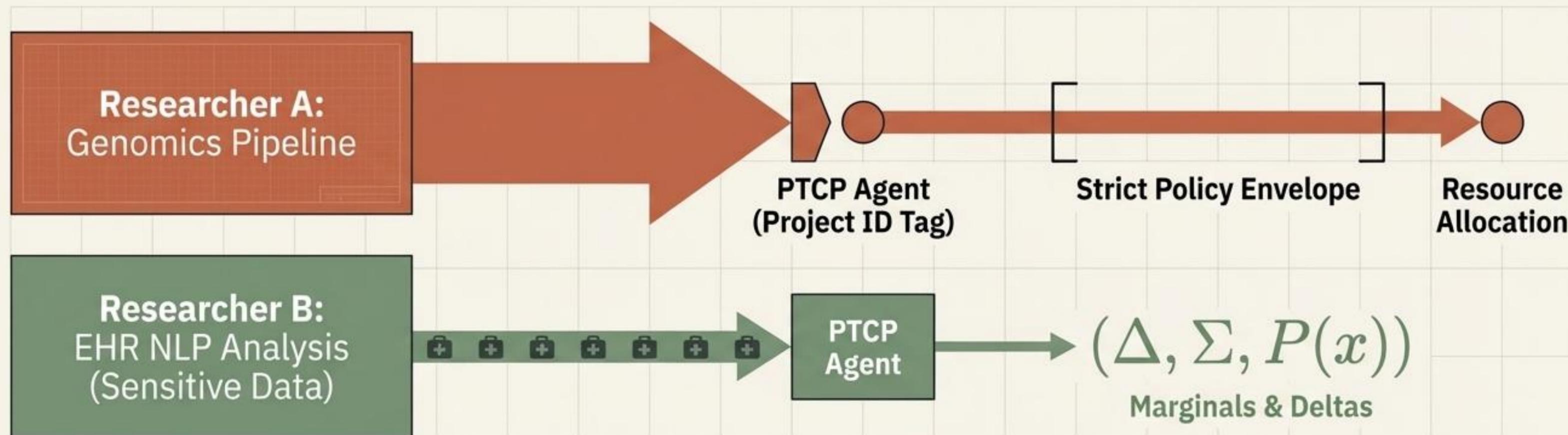
Cross-Layer Checkpoint Coordination

The exact same mathematical model tells the DPU how to pace network traffic and instructs the storage controller on handling the incoming massive data flood.

Pre-emptive All-Reduce Pacing

The Rack Agent forecasts an approaching synchronization storm and advises the Fabric Manager to pre-emptively shift paths or pace background traffic.

Multi-Tenant Environments: Fair resource pooling and mathematically guaranteed privacy.



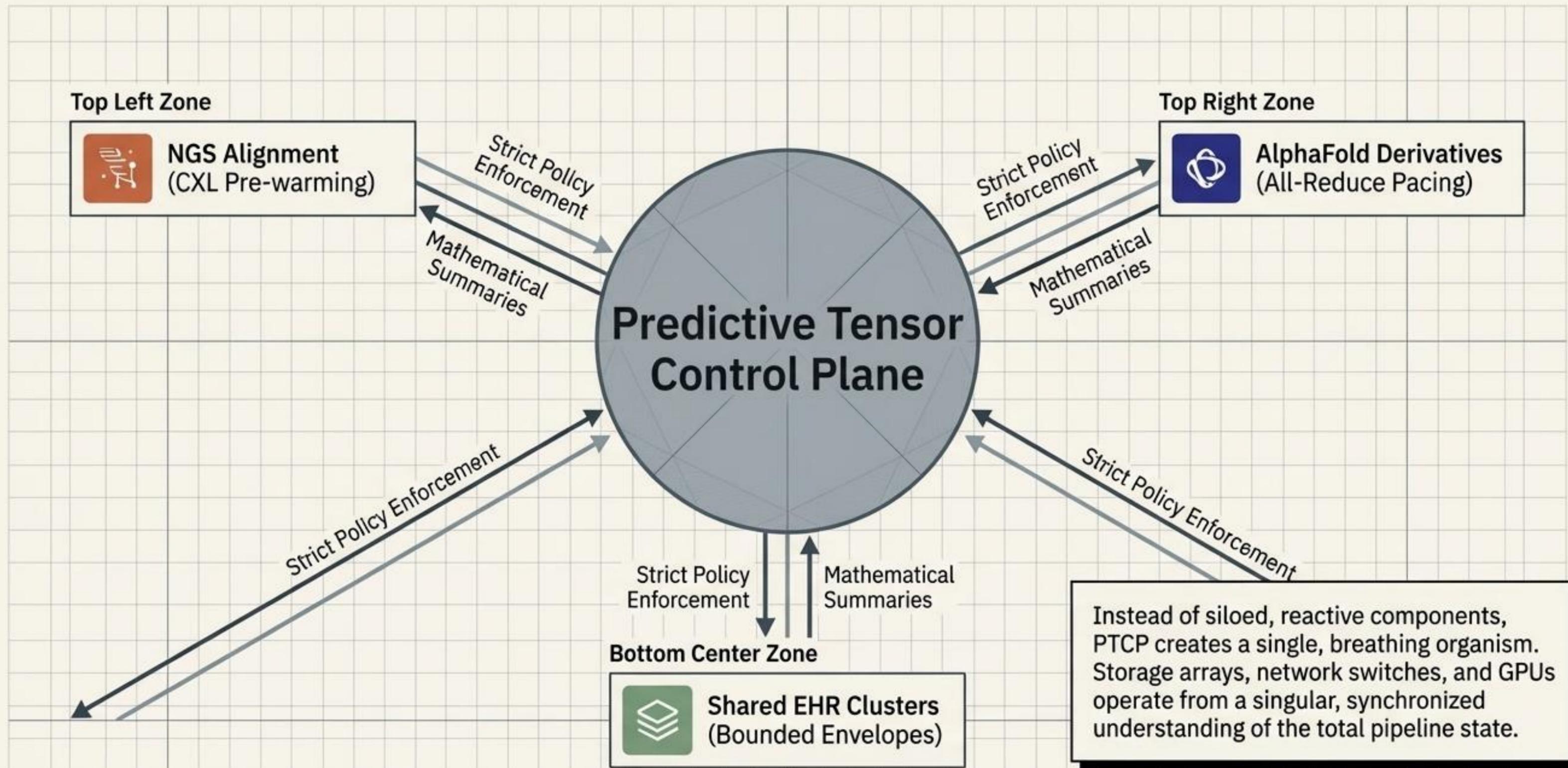
Tenancy Tagging & Bounded Envelopes

The central controller pushes strict operational envelopes downward. Autonomous local agents pace traffic to eliminate the noisy neighbor effect and protect baseline cluster performance.

Privacy via Mathematical Summaries

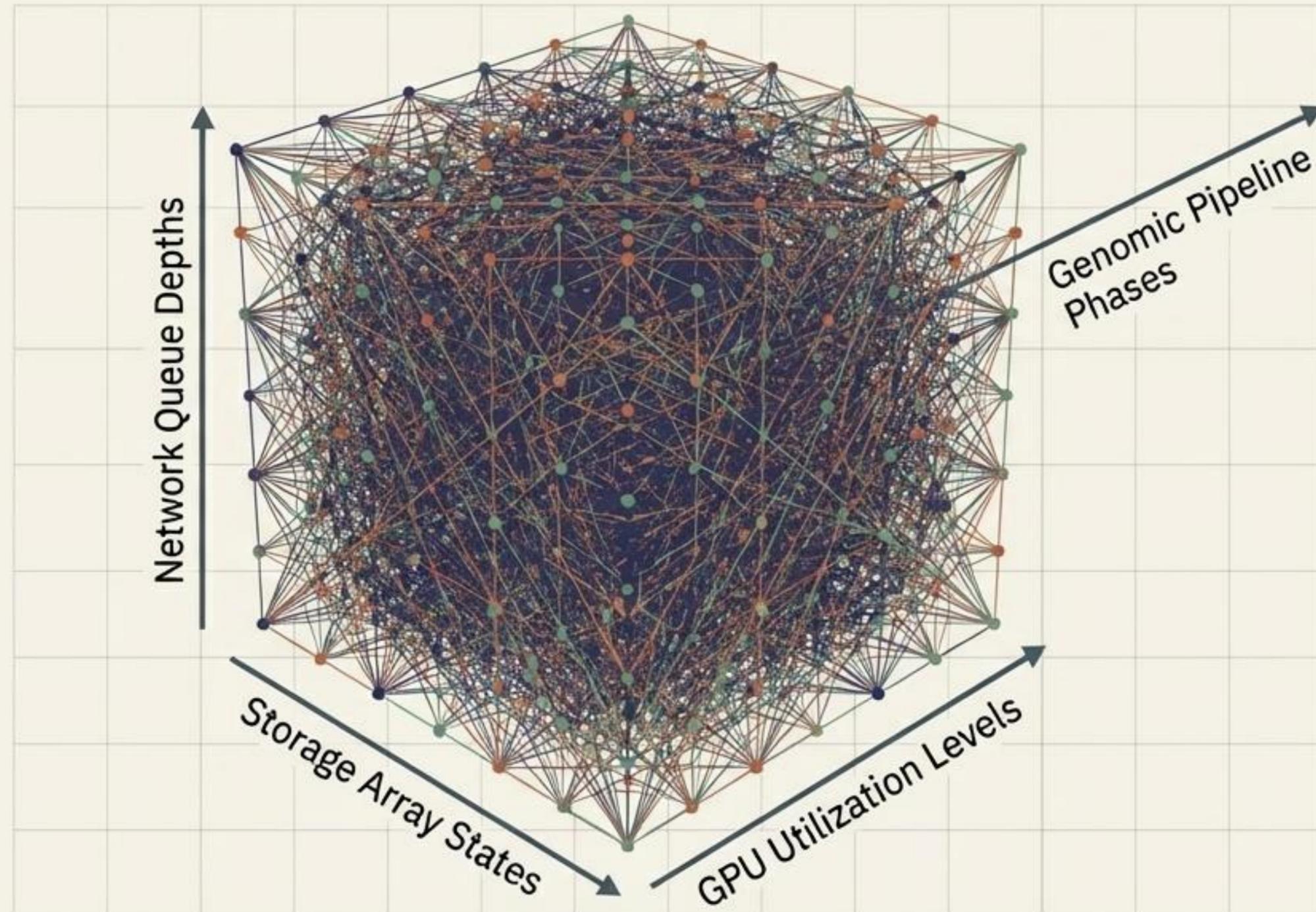
For HIPAA/GDPR compliance, local behavior is normalized. Only compact mathematical summaries (marginals and deltas) are sent upward, ensuring proprietary research and patient data are never broadcast.

Cross-Cluster Orchestration: A unified view of the research fabric



Instead of siloed, reactive components, PTCP creates a single, breathing organism. Storage arrays, network switches, and GPUs operate from a singular, synchronized understanding of the total pipeline state.

The Fundamental Constraint: Tracking behavior triggers the curse of dimensionality.

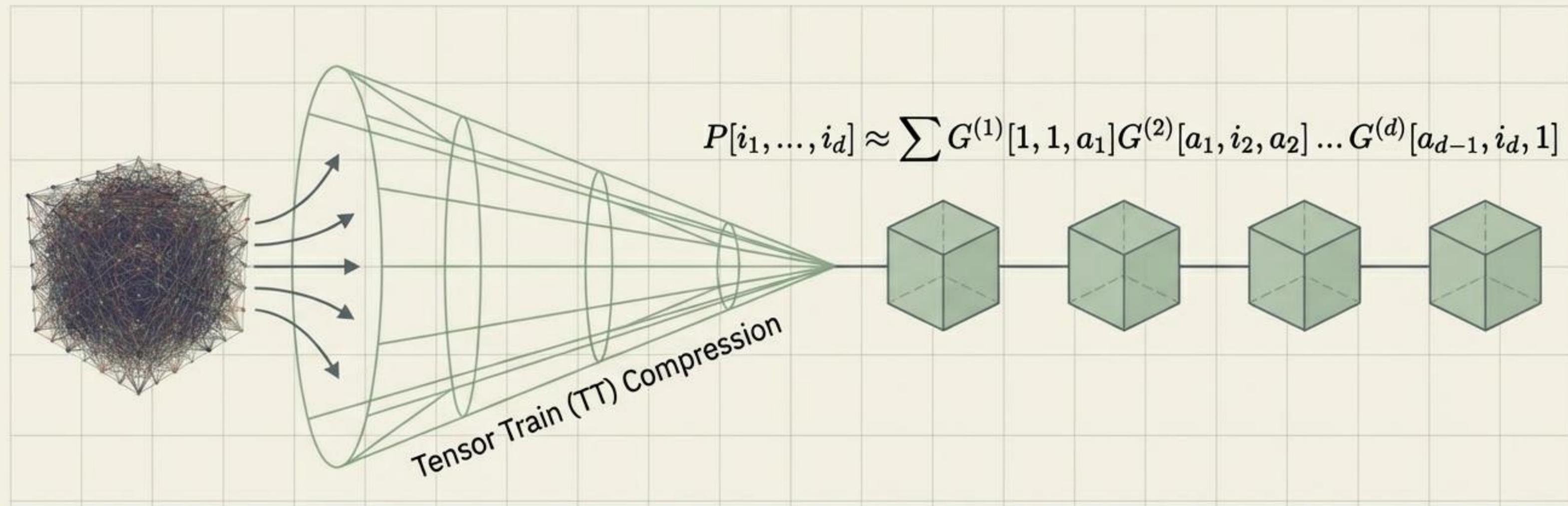


The Discretized Joint State

Tracking the absolute state of every component in a bioinformatics data center creates a mathematical tensor of unimaginable scale.

Attempting to query this raw behavioral state directly creates an intractable processing burden, preventing real-time orchestration in standard HPC setups.

The Breakthrough: Pattern-of-Life Tensor Train (PoL-TT) compression restores tractability.

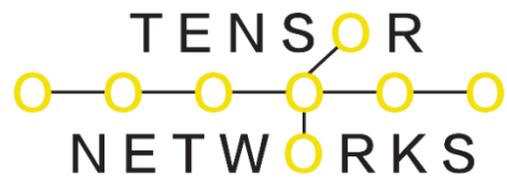


By approximating the massive behavioral state into smaller, tractable **3D tensor cores**, standard HPC network switches and storage controllers can **evaluate exact marginals, conditionals, and anomaly scores** directly near the data path in **real-time**.

Slashing time-to-solution for critical medical research.

Predict Demand, Don't React to It.

By replacing reactive, COTS HPC bottlenecks with the predictive precision of the Pattern-of-Life Tensor Train, life sciences organizations ensure their most valuable assets —compute power and human intellect—are never kept waiting.



Thank You for Your Partnership We look forward to building the future of networking together. Please don't hesitate to reach out with any questions.

Tensor Networks, Inc. Contact Us:
information@tensornetworks.net