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# Storage Trends in AI


**Patrick Kennedy**
Principal Analyst, ServeTheHome

**J Metz**
Chair, SNIA
AMD, Technical Director

**Jeremiah Tussey**
At-Large Board Member, STA
Microchip Technology Inc. Alliances Manager, Product Marketing, Data Center Solutions

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# Housekeeping

- Ask questions in the dialogue box on your screen
- Questions will be answered at the end of the webinar
  - If we don't get to your question today, we will post a follow up blog to answer it
- Slides are available for download via the SNIA Educational Library
- Polls will be presented and participation is encouraged

**Polling question:** What is the biggest challenge when it comes to AI storage?

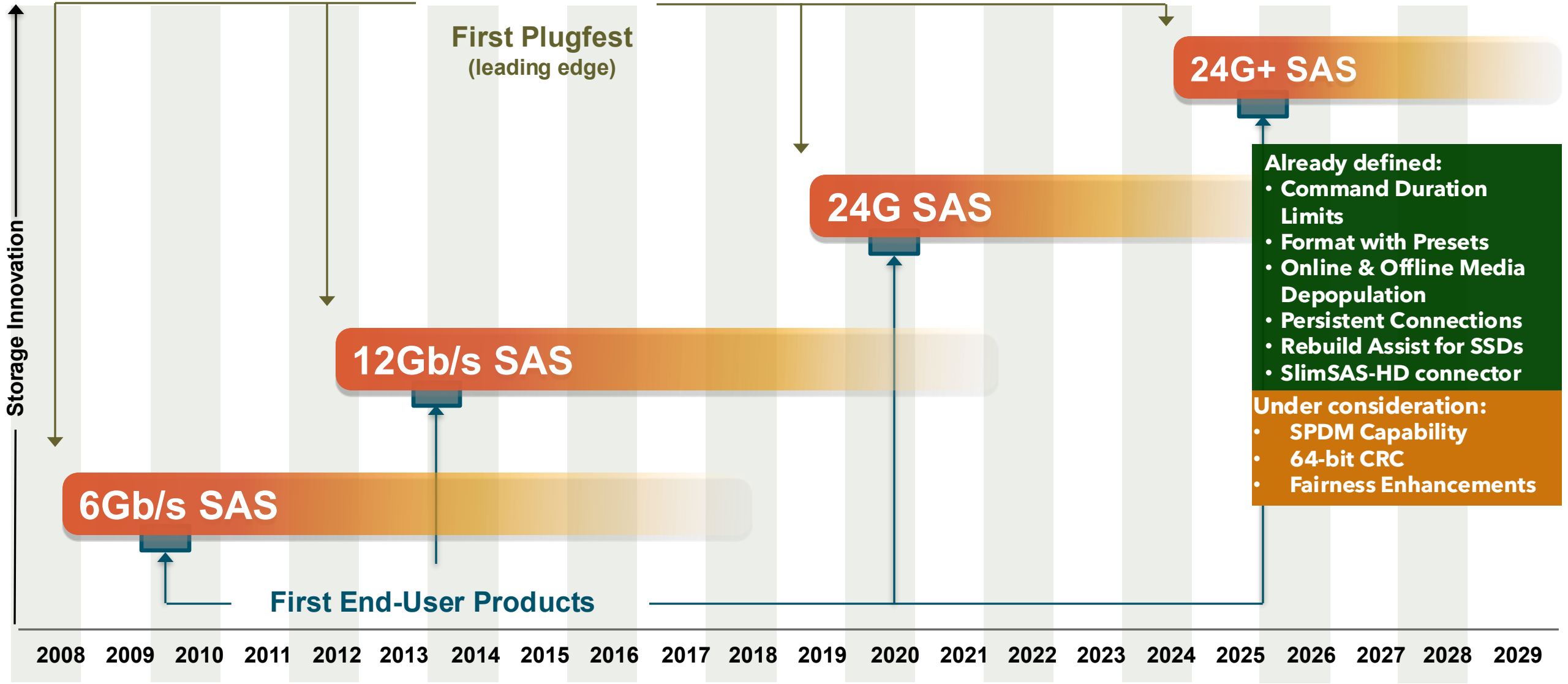
- Managing data volume
- Data security
- Impact on workload performance
- Cost & ROI

(answer in the polling window)

# Storage Architecture

# SAS Technology Roadmap




Updated March 2025

# 24G+ SAS Feature Overview

| | Feature | Benefit |
|---|---|---|
| **Already Defined:** | | |
| Command Duration Limits (CDLs) | Gives user control of HDD latencies | Better supports SLAs |
| Format with presets | Ability to format as SMR or CMR HDD technology. | Reduction of SKUs |
| Online & Offline Media Depopulation (Depop) | Ability to isolate media components and logically remove them from data set. | Less service calls in the data center; allows drives to degrade in place, extending the life of the device, thus improving sustainability. |
| Rebuild Assist for SSDs | Device reports failed LBAs to reduce read time of stripes; | Improves the rebuild time for RAID systems |
| Persistent Connections | Ability to sustain a connection | Less overhead & higher performance (overhead is associated with opens & closes) |
| SlimSAS-HD connector (SFF-TA-1016) | Adding a higher density connector | More connectivity out of a low profile board and adding compatibility with CopperLink internal cables. |
| **Under Consideration:** | | |
| SPDM Capability | Attestation and authentication of devices | Advanced systems security |
| Grow the PI (Protection Information) field | Greater capacity, support 64-bit CRC | Increase data reliability |
| Fairness enhancements for Large Topologies | Expanders assess quality of service across the topology | Improved quality of service for all devices. |

**Designed to enhance SAS architectures that include 24G SAS, 12Gb/s SAS, and 6Gb/s SATA products**

# Phases of AI and Storage Workload Requirements

**Ingest**
Importing vast amounts of raw data

**Transform**
Preparing data into Proper formats for analysis, cleaning and validating

**Training/Tuning**
Processing through AI algorithm, evaluate results and refine for accuracy

**Inference**
Model recognizes new patterns and extrapolates conclusions


## Ingest
- High capacity
- Low power
- High sequential read throughput

## Transform
- High capacity
- Low power
- Random reads
- High sequential write throughput

## Training/Tuning
- High burst throughput
- Random reads
- Occasional large sequential writes during checkpoints
- Low latency
- Higher GPU utilization

## Inference/Tuning
- Mix of random reads and writes
- Quickly feed compute resources
- Reduce idleness

# AI Storage Problems To Be Solved

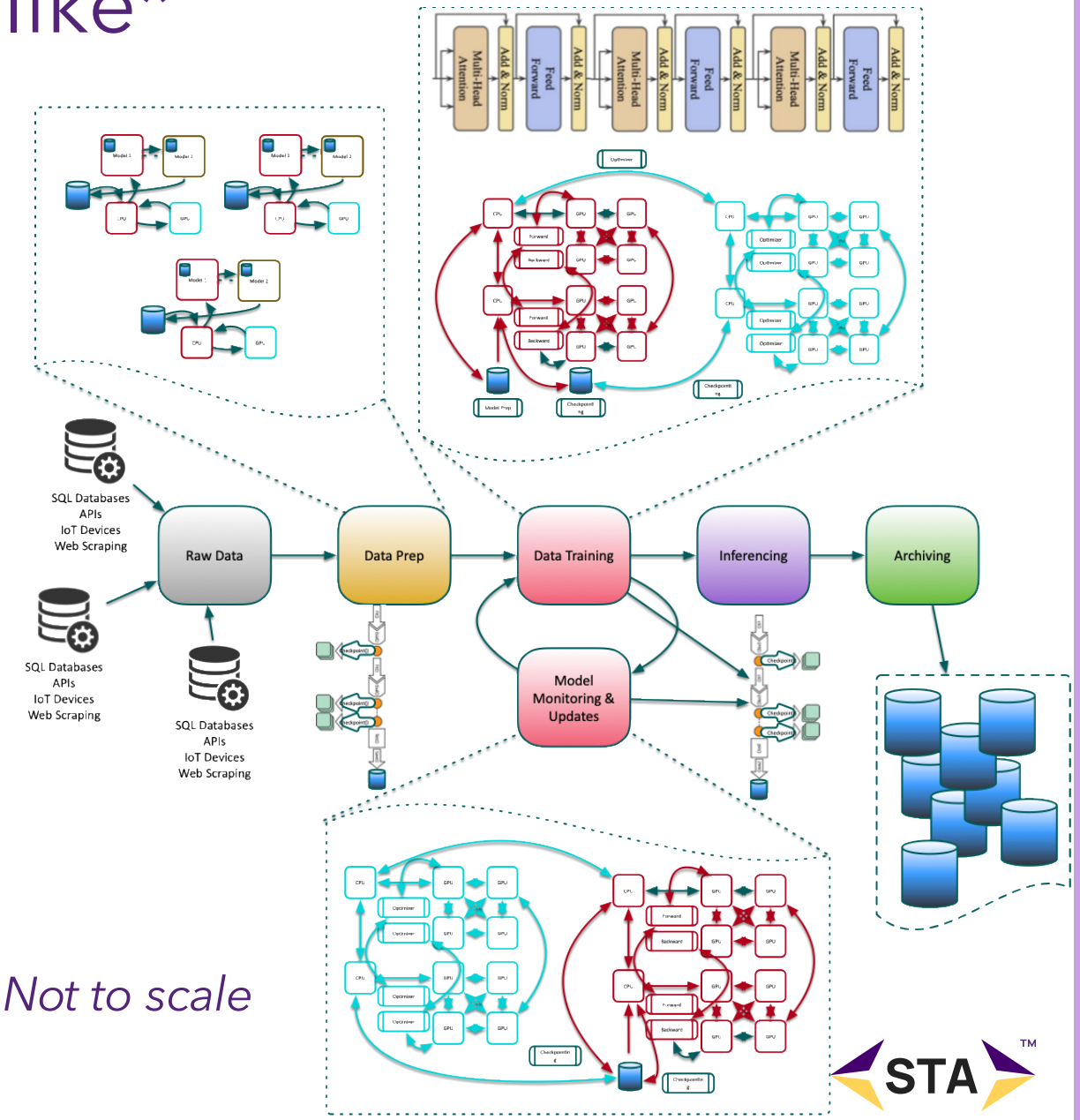
# The AI Monster

- AI workloads need:
  - Ever-increasing Memory Bandwidth
  - Ever-increasing Memory Capacity
  - (Near) Instantaneous Data Access (Exabytes)
- Intermittent data surges
- "Straggler" data (tail latency) significantly impacts completion time
- Extended operation duration (hours, days)

# What workloads are really like*

- Storage needs vary at each stage
  - Ingest –
    - High capacity and sequential write performance
    - High capacity, heavy read, moderate write
  - Data prep –
    - Sequential read and write performance
    - Moderate capacity, heavy read/write
  - Training –
    - Random read performance
    - Moderate capacity, high read/write
  - Checkpointing –
    - Sequential write performance
    - Moderate-to-high capacity, high read, moderate-to-high write
  - Inference –
    - Random read/write performance
  - Archive –
    - Very High Capacity
    - Heavy capacity, heavy read, moderate write

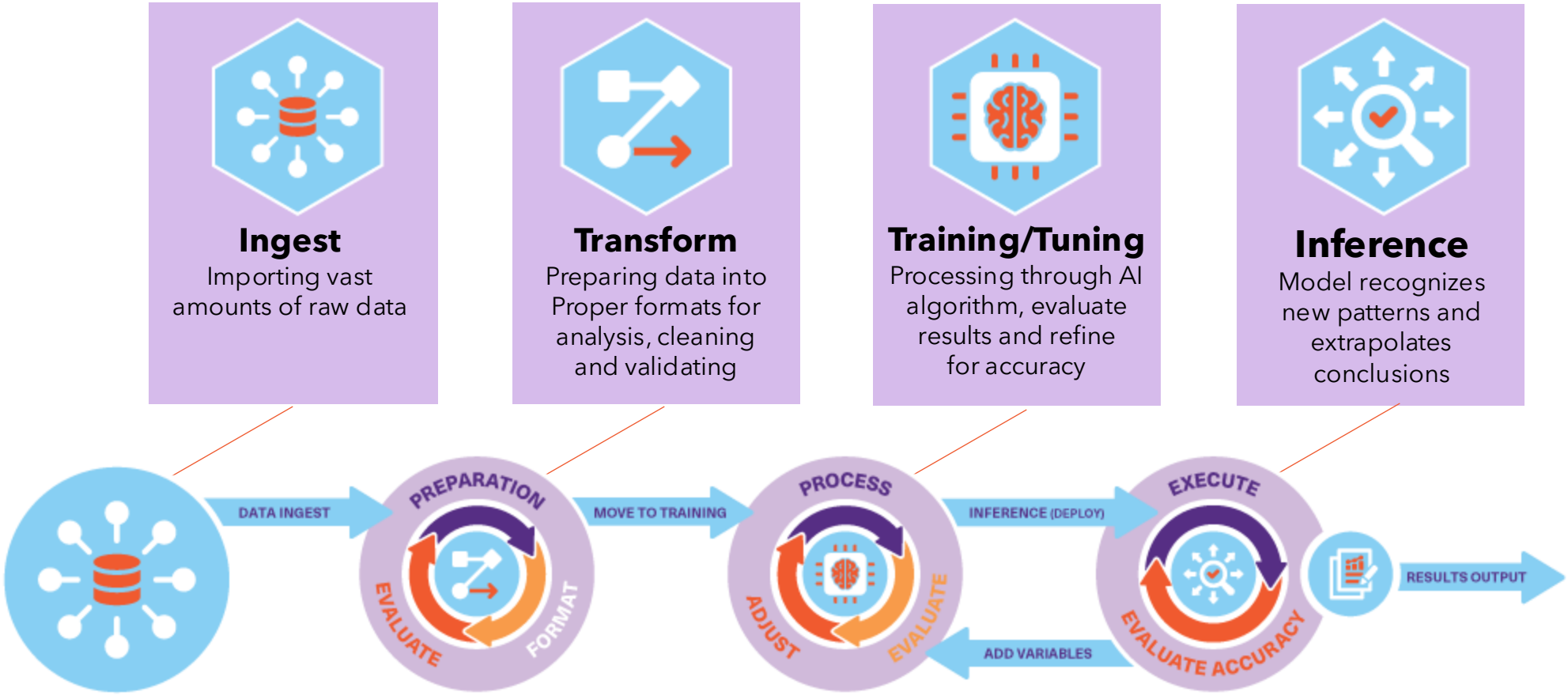



** Not to scale*

# Phases of AI and Storage Workload Requirements

## *SNIA Initiatives*




### Ingest

- Storage Data Placement (SDP)
- SDXI
- SFF – Connectors, Transceivers, Form Factors
- STA
- NVMe-oF Drive Spec.
- DNA (future)

### Transform

- Computational Storage
- SDXI

### Training/Tuning

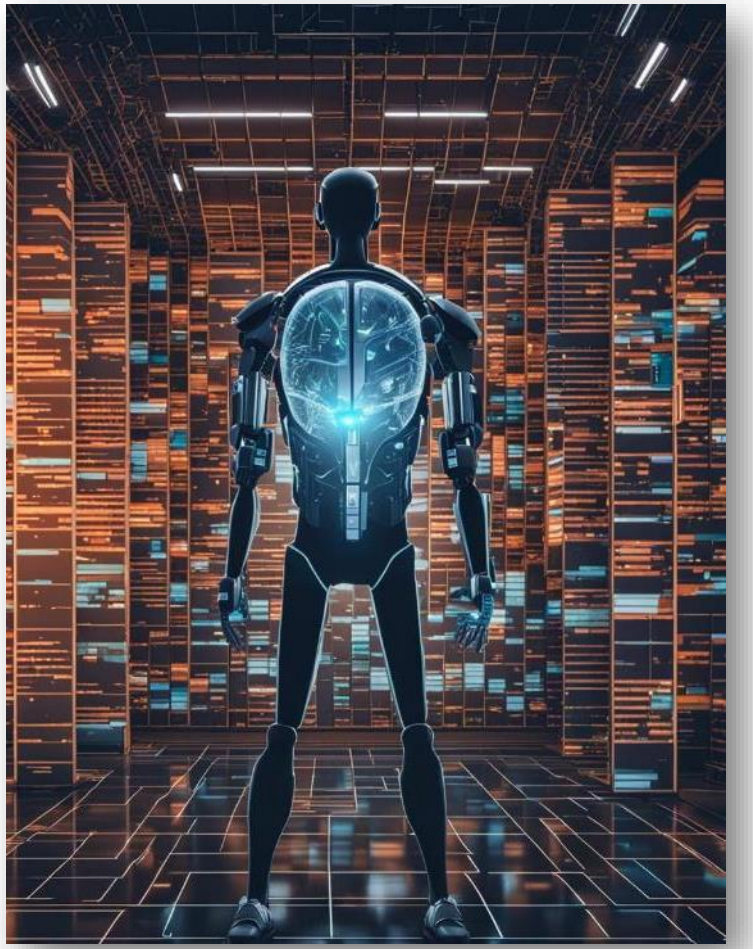
- Computational Storage
- DPU
- Green Storage/Energy Efficiency

### Inference/Tuning

- Computational Storage
- DPU
- Green Storage

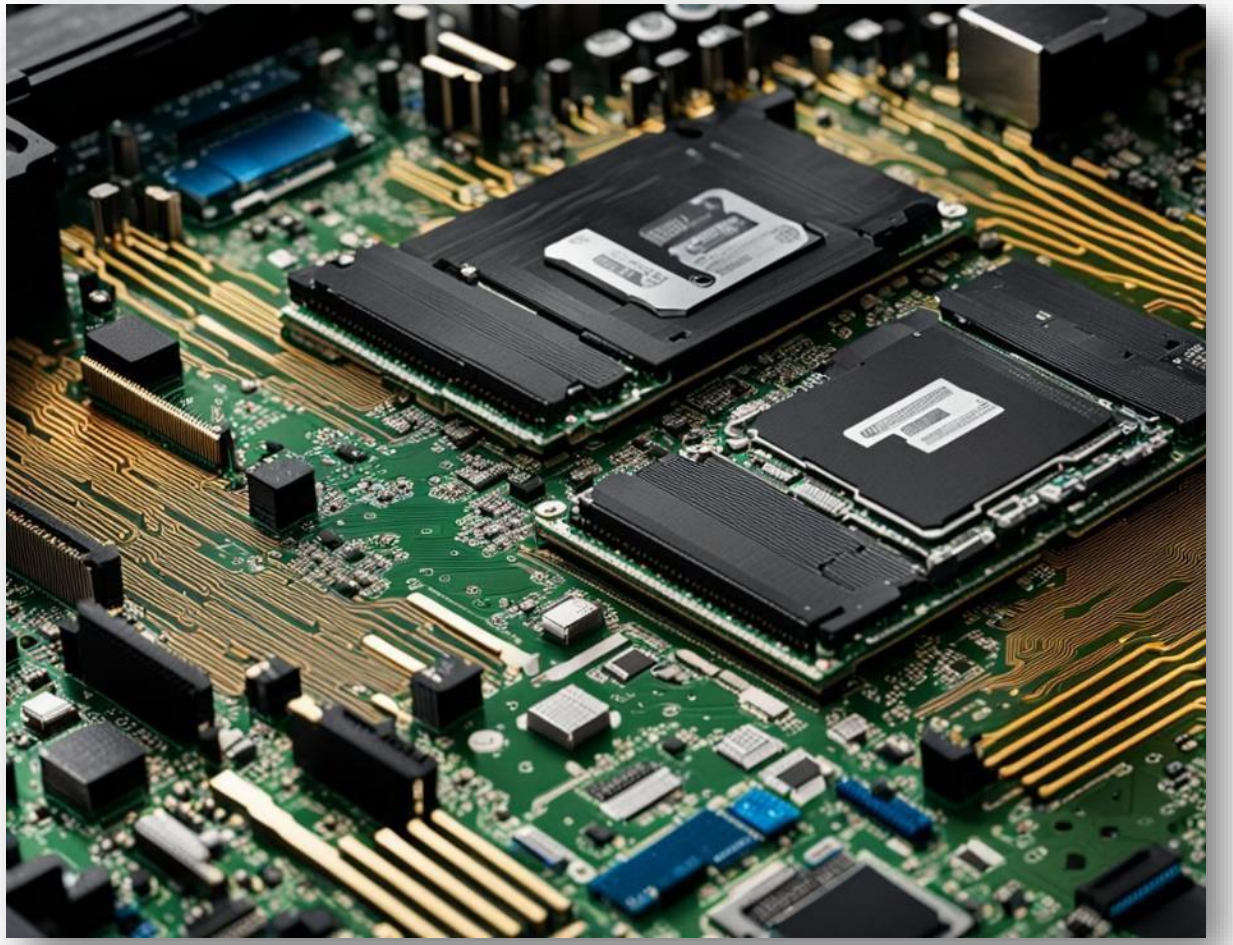
# Storage AI Needs

- Scalability and Performance
- Data Diversity and Edge Computing
- Cloud Integration
- Cost-Effectiveness
- AI-Specific Features



# Memory Infrastructures



- High-Concept Futures
  - Computational Fabric-Attached Memory
  - Hierarchical memory pooling
  - Intra- and Inter-processor network fabric end-points
  - Disaggregated multi-access Ethernet-based storage/data
- Low-Level Efficiency Improvements
  - Kernel-Bypass for memory access
  - In-process data mutation
  - Processing-near-data

# SNIA Addresses AI Storage Needs


- Standards for AI-Driven Data Storage
  - Computational Storage Architecture 1.0 & API 1.0
  - SNIA Emerald™ Power Efficiency Measurement Specification v4
  - Native NVMe-oF Drive Specification v1.0.1
  - Persistent Memory (PM) Performance Test Specification (PTS) v1.0
- Best Practices for AI Data Management
  - Swordfish™ Scalable Storage Management API Specification v1.2.6
  - Flexible Data Placement; Zoned Storage Models v1.0
- R&D Initiatives
- Advocacy for AI-Friendly Policies

# Industry Ecosystem – It's a Big Problem!

- Everyone has a stake in the game:








… and more!

STA™

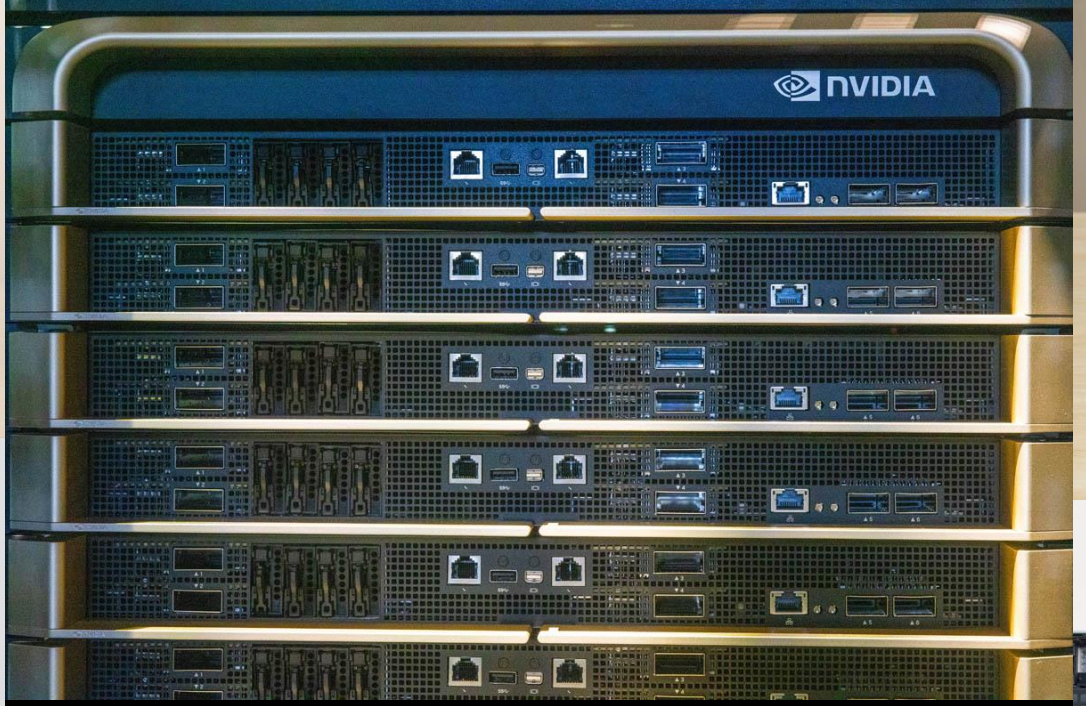
**Polling question:** Which aspect of storage for AI workloads is most critical?

- Speed
- Capacity
- Reliability
- Cost

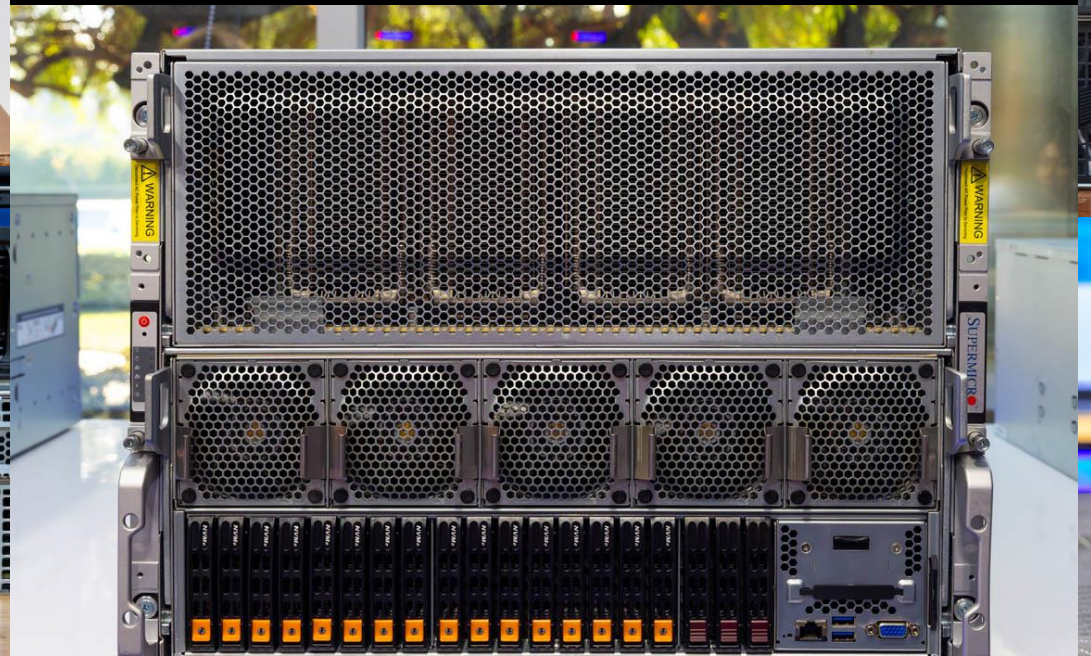
(answer in the polling window)

# Real World Insights

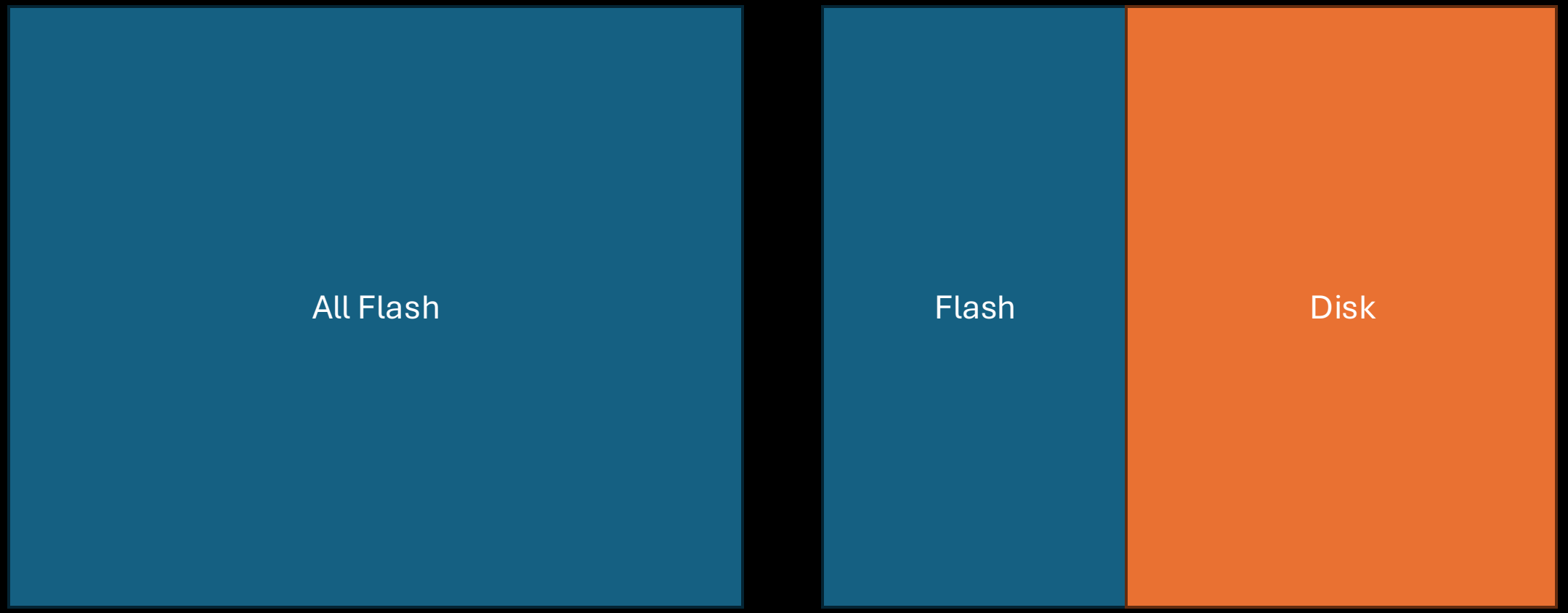



# AI Servers and Local Storage




# Shared Cluster Storage

## Two Camps in AI Clusters



# Where is Data Today?

Enterprise Arrays

Cloud Storage

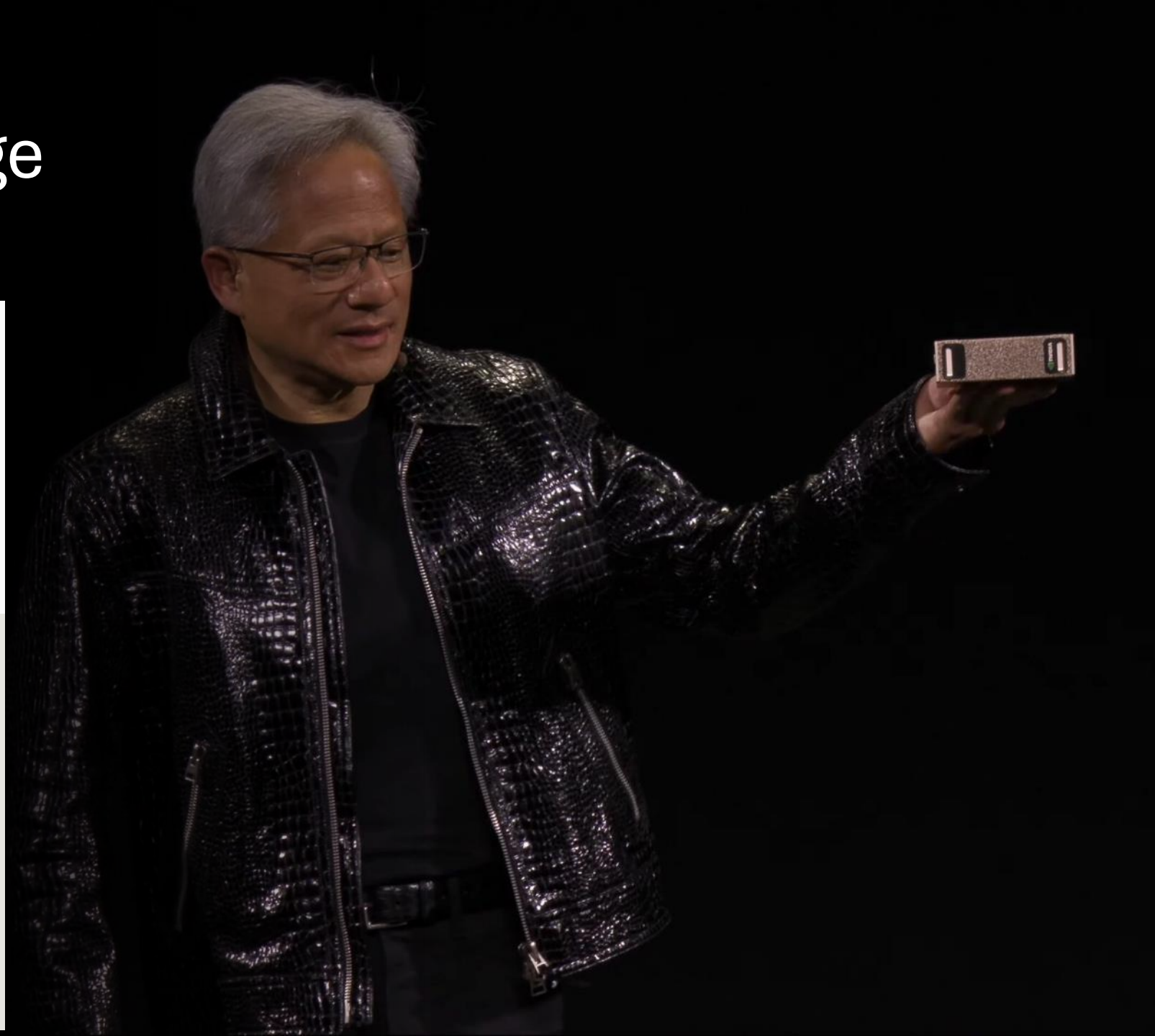
Local Storage

Back-up Storage

**Key Questions**

- Are the arrays fast enough to feed AI systems?
- Does the data proximity to AI accelerators meet the enormous speed and latency demands of an AI cluster?
- Folks focus on the GPUs and AI accelerators, but how do you solve for interconnects?

# What is the storage for AI Agents?



# Where Does AI Generated Data Land in 2027?

Enterprise Arrays

Cloud Storage

Local Storage

Back-up Storage

**Key Questions**

- Compliance needs
- Cost
- Performance
- When to tier

# Opportunities & Challenges

# Thank you!

**Patrick Kennedy**
Principal Analyst

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https://www.youtube.com/ServeTheHomeVideo

**Dr. J Metz**
Chair, SNIA

https://www.snia.org/

https://www.linkedin.com/in/jmetz/

 

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