

A World-Class Solution for Enterprise Artificial Intelligence (AI)



WHITEPAPER

Today's Challenge for Enterprise AI Workloads: Subpar Performance and Capacity

Many of today's business missions are extraordinarily complex. This is especially true in the Artificial Intelligence (AI) space, given the speed of change with AI's constant updates and iterations. Within large Enterprise Organizations, compute-heavy workloads—such as data analytics, AI and machine learning (ML)—can be some of the most demanding anywhere.

For most Enterprise Organizations, AI today isn't about training large language models (LLM)—it's about operationalizing Generative AI and Agentic AI workflows across documents and business processes. These systems need a responsive, well-governed foundation that includes multiple capabilities: fast content ingestion; optical character recognition (OCR), classification and redaction; vector indexing and metadata enrichment; low-latency retrieval; and reliable inference and orchestration.

Naturally, content constantly changes. This means embeddings and indexes must be rebuilt, prompts and tools are versioned and evaluated, and agents rerun tasks. As a result, the AI data pipeline is iterative, but centered on retrieval, governance and workflow execution rather than model training. The performance profile is read-heavy and latency-sensitive (sub-second), mixing large files with many small files, plus bursts from indexing and agent fan-out.

At the high end of the AI spectrum, high-performance computing (HPC)—in which thousands of interlinked computers run countless calculations in parallel, which are then collated to produce results that spawn subsequent calculations—require responsive and robust IT infrastructures. This is especially true with LLM training, which puts data through a cyclical pipeline as organizations constantly train, retrain and evaluate different model versions. This requires massive datasets to repeatedly cycle through the various stages of the AI pipeline an indefinite number of times. On top of this workload, organizations must retain previous model versions to assess whether the training has been effective.

All of this requires a specific data storage architecture—tiered data storage, scalable vector/search services, policy and access controls, caching, and observability. Without a coherent data storage architecture, teams experience fragmentation, saturated hot tiers, soaring token costs, and underutilized bandwidth that never turns into actual business value.

When facing these challenges, Enterprise Organizations need solutions that can



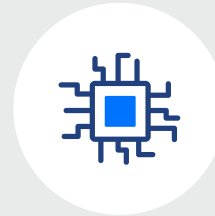
Meet demands for performance and capacity



Fully exploit the highest available bandwidth speeds



Operate with high efficiency



Scale as needed

These demands of a data-driven enterprise require a new approach to data storage with an integrated combination of high-performance hardware and adaptive, scalable data storage software. The approach needs to support existing workloads as well as adapt and scale quickly to address new applications, evolving IT models and AI data pipelines.

CTG National/NetApp Storage Solutions for AI and ML

CTG National is a value-added reselling partner serving Enterprise Organizations with IT expertise and solutions. We've teamed with NetApp, the intelligent data infrastructure company, to provide enterprise clients with a high-performance AI data management solution. This solution is exceptionally efficient, highly scalable, and capable of fully leveraging 40, 100 and even 200+ gigabit Ethernet networks.

SOLUTION OVERVIEW

Our solution is a high-performance data storage cluster that comprises I/O storage nodes, allowing it to handle multiple petabytes of data storage for the most demanding AI/ML workloads. The nodes are managed by a common operating system and constitute a single storage namespace, which simplifies management by presenting a single interface for all data, regardless of where it resides.

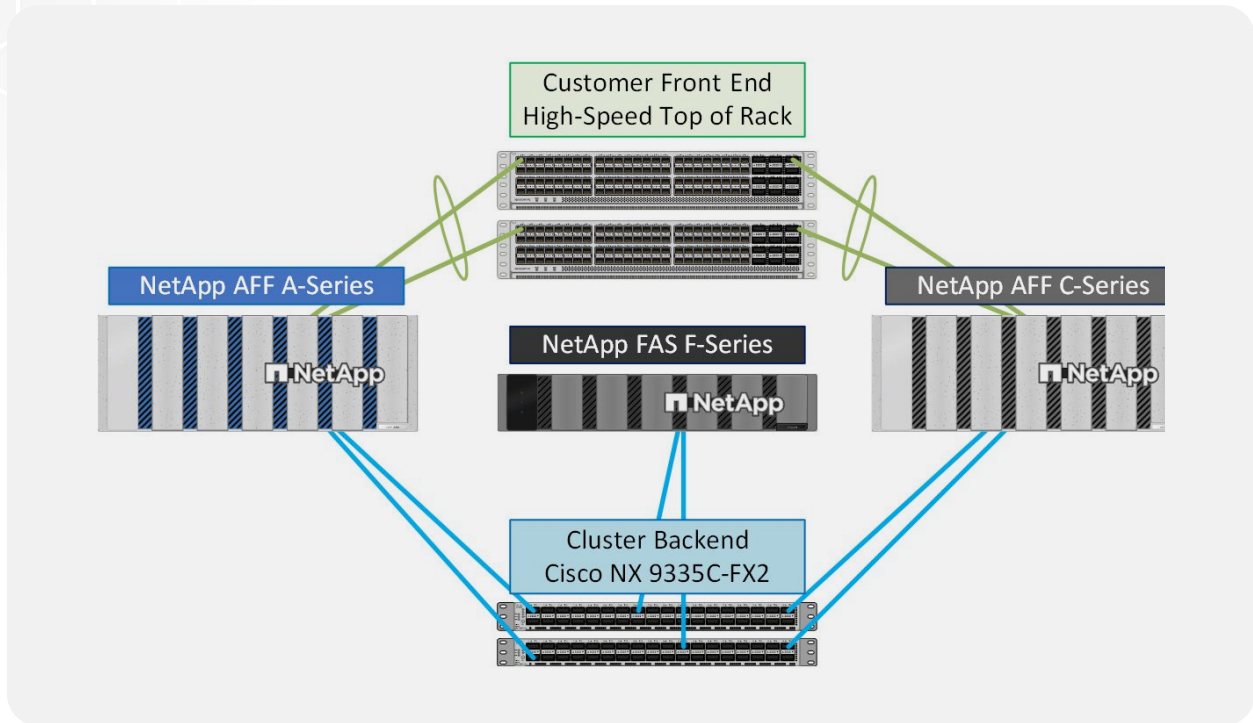
Each node within the data storage cluster is a self-contained unit that comprises a controller, the NetApp ONTAP operating system, data storage, and network connectivity. Nodes are paired for high availability (HA). Collectively, they compose the data storage cluster and communicate with each other over a private, dedicated cluster interconnection.

EXCEPTIONALLY FAST STORAGE

The data storage may consist of any combination of Non-Volatile Memory express Solid State Disks (NVMe-SSDs), Capacity NVMe-SSDs or spinning hard drives. For this proposed solution, the data storage consists of four NetApp FAS F-Series hybrid-flash storage controllers (Fabric Attached Storage), two NetApp AFF C-Series controllers (All Flash FAS with Capacity NVMe SSDs) and four NetApp AFF A-Series controllers. NVMe is a storage protocol that was designed for use with faster media. It lowers latency and boosts input/output operations per second (IOPS). The All-Flash FAS (AFF) A and C-series controllers offer the fastest end-to-end NVMe all-flash array to accelerate critical workloads, including AI and ML applications.

NETWORK

The nodes within the data storage cluster communicate via a redundant pair of high-speed Cisco Nexus 9336C-FX2 switches, while the clients connect to the data storage through redundant pairs of data center top-of-rack switches—usually Cisco Systems Nexus 9000 series switches or the NVIDIA Spectrum-X™ networking platform.



AI/ML Key Benefits

This CTG National/NetApp AI/ML data storage solution delivers numerous significant benefits to Enterprise Businesses. This solution delivers:

EXCEPTIONAL OPERATIONAL EFFICIENCIES

The more data enterprises have, the better their models will be. With in-line compression, data deduplication and data compaction made possible by Intel Quick Assist Technology (QAT), enterprises can store more data using fewer drives without sacrificing performance.

ACCESSIBILITY FOR MULTIPLE TYPES OF CLIENTS

With multi-protocol access, NetApp's AI/ML solution accommodates virtually any type of client, including Windows, Linux and Unix.

MINIMAL STAFF SUPPORT

Extensive automation features create operational efficiencies that reduce administrative workloads.

HIGH SCALABILITY UP AND OUT, WITH EASE

Enterprises can add upgraded data storage capacity to existing controllers to scale up (which increases capacity) as well as add more controllers to scale out (which increases capacity and performance). Additionally, this solution scales linearly—meaning two nodes will deliver two times the performance, and four nodes will deliver four times the performance. Because ONTAP's virtualized storage infrastructure makes it easy to move data non-disruptively, the solution scales with zero downtime.

PEERLESS CLIENT SUPPORT

NetApp and CTG National offer personalized, follow-the-sun support for clients in any location.

A Premier AI Solution Deployed Using Industry Best Practices

In delivering this AI solution to Enterprise Organizations, CTG National employs numerous industry best practices and system features to ensure top performance and system resiliency for our clients.

To optimize performance and efficiency, this solution utilizes:

THE FASTEST NETWORKS AVAILABLE

10G/25G/40G/100G/200G Ethernet

JUMBO FRAMES

These data packets are six times the standard size—making data transmissions far more efficient and improving performance.

THIN PROVISIONING ON THE NETAPP ALL FLASH CONTROLLERS

Data storage is provisioned dynamically, improving data storage utilization and efficiencies.

FLEXGROUPS

These highly scalable, single-namespace NAS containers provide automated load distribution and scalability, supporting higher performance and simpler management.

To optimize system resiliency, this solution utilizes:

PORT CHANNELS ON THE CONTROLLERS

These are used to aggregate physical network links to improve performance and prevent outages due link failures.

DATA LOGICAL INTERFACES (LIFS) ON EACH DATA STORAGE NODE

If there is a network component failure, a LIF serving NFS or SMB can fail over to a different physical port anywhere in the NetApp cluster. A LIF serving SAN protocols will use host-based standards to be redirected to a functional port, maintaining availability.

Conclusion

Enterprises with cutting-edge AI/ML workloads need best-in-class data storage solutions that perform quickly and reliably—while scaling up and out as needed. As a Prestige NetApp integrator and value-added reseller in the enterprise market-place, CTG National delivers a solution that employs exceptional operational efficiencies, industry best practices, and system features for improved performance and resiliency.

CTG National: An Indispensable Enterprise Partner for NetApp Modernizations

Having deployed hundreds of integrated NetApp solutions, CTG National delivers unrivaled expertise and value to businesses looking to simplify, streamline and modernize their data infrastructures with NetApp solutions. We are one of only a handful of value-added resellers that carry NetApp A-Team membership.

As NetApp A-Team members, CTG National has access to privileged product roadmap information, product and corporate engineering. In fact, CTG National staff help write NetApp certification exams. In addition, CTG National offers:

- A century of combined NetApp experience within our sales, engineering and operations staff.
- A sales and engineering staff that is fully certified and NetApp-accredited on the full portfolio of NetApp solutions and products.
- Best practices on the design, architecture, and sizing of NetApp solutions.
- NetApp product updates and NDA (non-disclosure agreement) roadmaps to help organizations future-proof their modernization plans.
- Promotional pricing, discount programs and value-added price breaks.
- Speed, efficiency and accuracy in booking, shipping and tracking client purchases.
- Dedicated and knowledgeable post-sales and logistical support.
- NetApp-certified and accredited engineering staff for pre-sales support and post-sales implementation and migration work.
- U.S. citizen, U.S.-based, DoD TS- and DoE Q-cleared personnel at all levels of sales and engineering.

About CTG National

CTG National, a Cohesive Technology Group company, is an SBA-certified small business that excels in servicing dozens of Enterprise Organizations with best-in-class information technology. Our experienced team of sales and engineering professionals design and deliver IT hardware and software solutions that save time and money for our clients. Headquartered in Virginia, we have dedicated resources in all regions across the continental United States.

Contracts

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