

A World-Class Solution for Enterprise High-Performance Computing (HPC)



WHITEPAPER

Today's Challenge for Enterprise HPC And Grid Engine Workloads: Subpar Performance and Capacity

Many of today's business missions are extraordinarily complex, whether they are plowing new fields of scientific discovery, curing disease, charting the next milestones in space, or designing more accurate models to predict the weather. U.S. Enterprise Organizations' compute-heavy workloads — such as research, data analytics, artificial intelligence, and modeling and simulation — are among the most demanding anywhere.

Grid computing, for example — in which thousands of interlinked client computers run countless calculations in parallel, which are then collated to produce results that spawn subsequent calculations — requires responsive and robust IT infrastructures. But many businesses with grid computing and other high-performance computing (HPC) workloads struggle with subpar performance and capacity. They see their storage environments max out, unable to accommodate future growth and workloads. They find themselves hobbled by fragmentation or overextended by increasingly large and complex workloads. And for organizations opting to make bandwidth investments, many find themselves incapable of fully exploiting those investments.

Enterprise Organizations confronting such challenges need solutions that can:



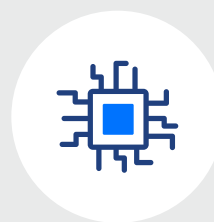
**Deliver needed
performance
and capacity**



**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 storage with an integrated combination of high-performance hardware and adaptive, scalable storage software. The approach needs to support existing workloads as well as adapt and scale quickly to address new applications and evolving IT models.

CTG National/NetApp Storage Solutions for High-Performance Computing

CTG National, a small business that serves dozens of Enterprise Organizations with IT expertise and solutions, has teamed up with NetApp, a leading storage provider of accessibility for multiple types of clients, to deliver Enterprise Organizations a high-performance storage solution that is exceptionally efficient, highly scalable, and capable of fully leveraging 40, 100 and even 200 gigabit Ethernet networks.

SOLUTION OVERVIEW

The solution is an HPC cluster comprised of I/O storage nodes, capable of handling multiple petabytes of storage for the most demanding HPC and Grid Engine workloads. The nodes are synchronized and 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.

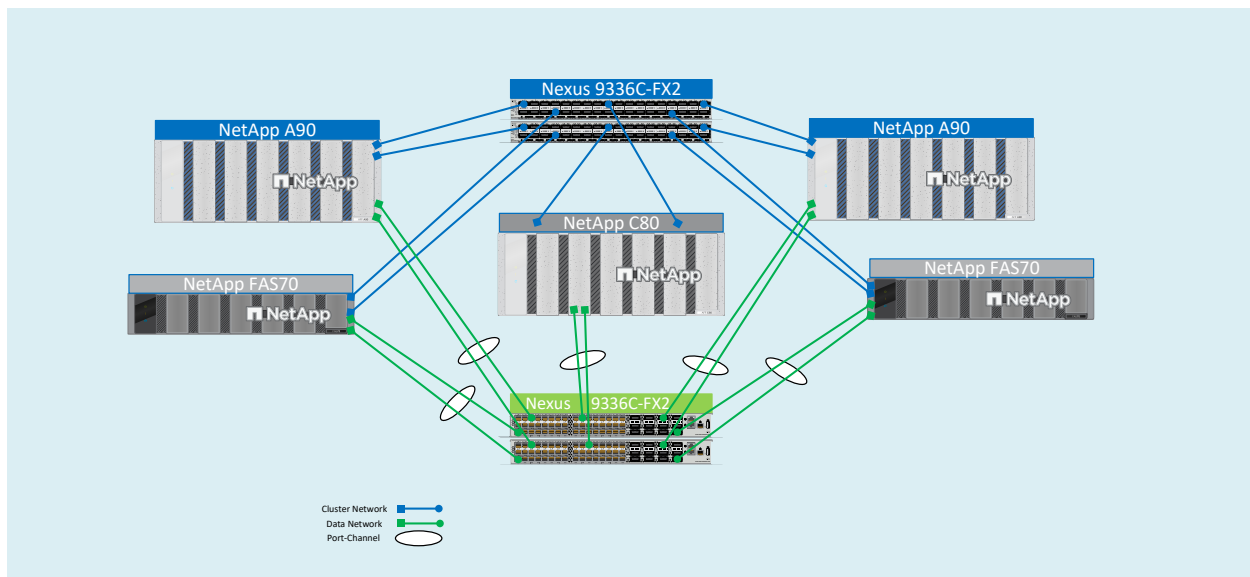
Each node within the cluster consists of a controller, the NetApp ONTAP 9 operating system, its storage, and its network connectivity. Nodes are paired for high availability (HA) and, collectively, they comprise the cluster and communicate with each other over a private, dedicated cluster interconnection.

EXCEPTIONALLY FAST STORAGE

The storage may consist of solid-state disks (SSDs), capacity or spinning hard disk drives (HDDs), or both. For this solution, the storage consists of four NetApp FAS70 hybrid-flash storage controllers (Fabric Attached Storage), two NetApp C80 controllers (All Flash FAS with Capacity NVMe SSDs) and four NetApp AFF A90 controllers. The Fabric Attached Storage (FAS) FAS70 uses NVMe (non-volatile memory express) flash to accelerate storage area network (SAN) and network-attached storage (NAS) workloads. 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) A90 and C80 offers the fastest end-to-end NVMe all-flash array to accelerate critical workloads, including artificial intelligence and machine learning applications.

NETWORK

The nodes within the storage cluster communicate via a redundant pair of high-speed Cisco Nexus 9336C-FX2 switches, while the clients connect to the storage through a redundant pair of Cisco Systems Nexus 9000 series switches.



Key Benefits

This CTG National/NetApp HPC storage solution delivers numerous significant benefits to Enterprise Organizations. This solution delivers:

EXCEPTIONAL OPERATIONAL EFFICIENCIES

In-line data compression, data deduplication, and data compaction significantly shrink the amount of physical storage space needed as data is generated and stored. These storage efficiency technologies help contain costs and enable users to store the maximum amount of data for the lowest possible cost.

ACCESSIBILITY FOR MULTIPLE TYPES OF CLIENTS

With the solution's multi-protocol access, it accommodates virtually any type of client, including Windows, Linux, and Unix.

MINIMAL STAFF SUPPORT

Due to extensive automation features and operational efficiencies.

HIGH SCALABILITY UP AND OUT, WITH EASE

Organizations can add upgraded storage capacity to existing controllers to scale up (adding more capacity) as well as add more controllers to scale out (to increase capacity and performance). Moreover, this solution scales in a linear fashion, meaning that two nodes will deliver two times the performance and four nodes will deliver four times the performance. And because ONTAP's virtualized storage infrastructure makes it easy to move data non-disruptively, the solution scales with zero downtime.

PEERLESS CLIENT SUPPORT

A Prestige HPC Solution Deployed Using Industry Best Practices

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

For improved performance and efficiency, this solution utilizes:

THE FASTEST NETWORKS AVAILABLE

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

JUMBO FRAMES

which are data packets that are six times the standard size. Jumbo frames make data transmissions far more efficient, thus improving performance.

THIN PROVISIONING ON THE AFF CONTROLLERS

which allows for improved storage utilization and efficiencies.

FLEXGROUPS

which deliver high scalability, improved performance, and simplified management. FlexGroups are highly scalable, single-namespace NAS containers that provide automated load distribution and scalability.

For improved system resiliency, this solution utilizes:

PORT CHANNELS ON THE CONTROLLERS

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

DATA LOGICAL INTERFACES (LIFS)

on each storage node. If there is a component failure, a LIF serving NFS or SMB can fail over to a different physical port anywhere the NetApp cluster. A LIF serving SAN protocols will use host-based standards to be redirected to a functional port, thereby continuing to communicate with the cluster.

Conclusion

Enterprise Organizations with cutting-edge HPC workloads need best-in-class storage solutions that perform fast and reliably and that scale up and out as needed. As a Prestige NetApp integrator and value-added reseller in the marketplace, CTG National delivers such 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 more than 120 integrated NetApp solutions to enterprise clients, CTG National delivers unrivaled expertise and value to Enterprise Organizations 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, TS-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 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

DUN & Bradstreet: 080932836

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NAICS Code(s): 541519



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(703) 278-3885

contact@ctgnational.com

1818 Library Street, Suite 500

Reston, VA 20190

www.ctgnational.com

