

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



WHITEPAPER

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

Many of today's federal 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. The government's 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 customer 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 agencies 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 agencies opting to make bandwidth investments, many find themselves incapable of fully exploiting those investments.

Government agencies confronting such challenges need solutions that can:



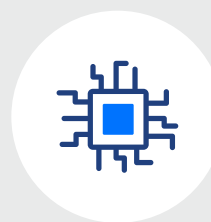
**Deliver needed
performance
and capacity**



**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 Federal/NetApp Storage Solutions for High-Performance Computing

CTG Federal, a small business that serves dozens of federal defense, intelligence, and civilian organizations with IT expertise and solutions, has teamed up with NetApp, a leading storage provider to the U.S. government, to deliver federal agencies 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.

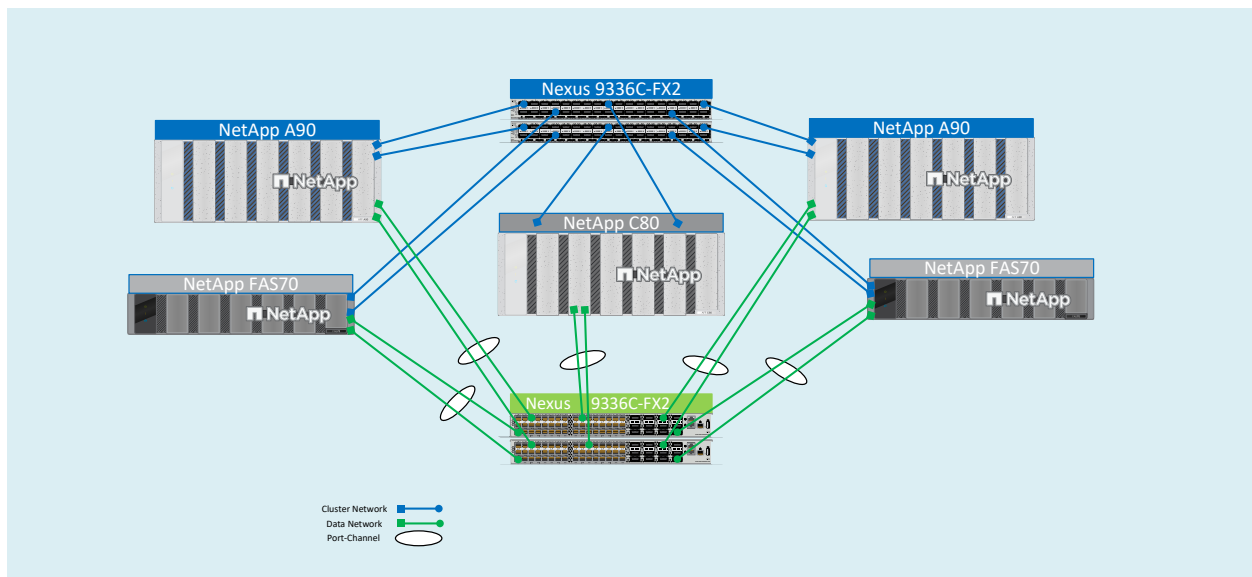
Each node within the cluster consists of a controller, the NetApp ONTAP 9 operating system, its storage, and its network connectivity. Nodes are paired for high availability (HA) and, collectively, they comprise the cluster and communicate with each other over a private, dedicated cluster interconnection.

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 Federal/NetApp HPC storage solution delivers numerous significant benefits to federal agencies. 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 CUSTOMERS

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

MINIMAL STAFF SUPPORT

Due to extensive automation features and operational efficiencies.

HIGH SCALABILITY UP AND OUT, WITH EASE

Agencies 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 CUSTOMER SUPPORT

A Premier HPC Solution Deployed Using Industry Best Practices

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

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

Federal agencies 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 premier NetApp integrator and value-added reseller in the federal marketplace, CTG Federal delivers such a solution that employs exceptional operational efficiencies, industry best practices, and system features for improved performance and resiliency.

CTG Federal: An Indispensable Agency Partner For NetApp Modernizations

Having deployed more than 120 integrated NetApp solutions to federal customers, CTG Federal delivers unrivaled expertise and value to federal agencies 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 Federal has access to privileged product roadmap information, product and corporate engineering. In fact, CTG Federal staff help write NetApp certification exams. In addition, CTG Federal 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 agencies future-proof their modernization plans.
- Promotional pricing, discount programs, and value-added price breaks.
- Speed, efficiency, and accuracy in booking, shipping, and tracking customer 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 Federal

CTG Federal, a Cohesive Technology Group company, is an SBA-certified small business that excels in servicing dozens of federal defense, intelligence, and civilian 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 customers. Headquartered in Virginia, we have dedicated resources in all regions across the continental United States.

Contracts

DUN & Bradstreet: 080932836

UEI: G2D4Q7UKR5P5

CAGE Code: 7ZHE9

NAICS Code(s): 541519

NASA SEWP V

Contract Number: NNG15SD12B

Group: Group B_Small Business

GSA Multiple Award Schedule (MAS)

Contract Number: 47QTCA25D003P

DOE ICPT

Contract Number: ICPT CISCO BOA 4I-30062-0008A

Dell Technologies ICPT Agreement

Contract Number: 4I-31841 Small Business

Horizon ELA

Contract Number: W519TC-25-D-A005



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(703) 278-3885

contact@ctgfederal.com

1818 Library Street, Suite 500

Reston, VA 20190

www.ctgfederal.com