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

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 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 agencies with grid computing and other high-performance computing (HPQ) 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.

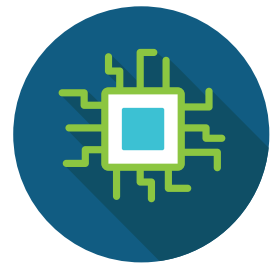## Government agencies confronting such challenges need solutions that can:

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 and 100 gigabit ethernet networks.

SOLUTION OVERVIEW

The solution is an HPC cluster comprised of 10 storage nodes, capable of handling 2-plus 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 aggregate, 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.
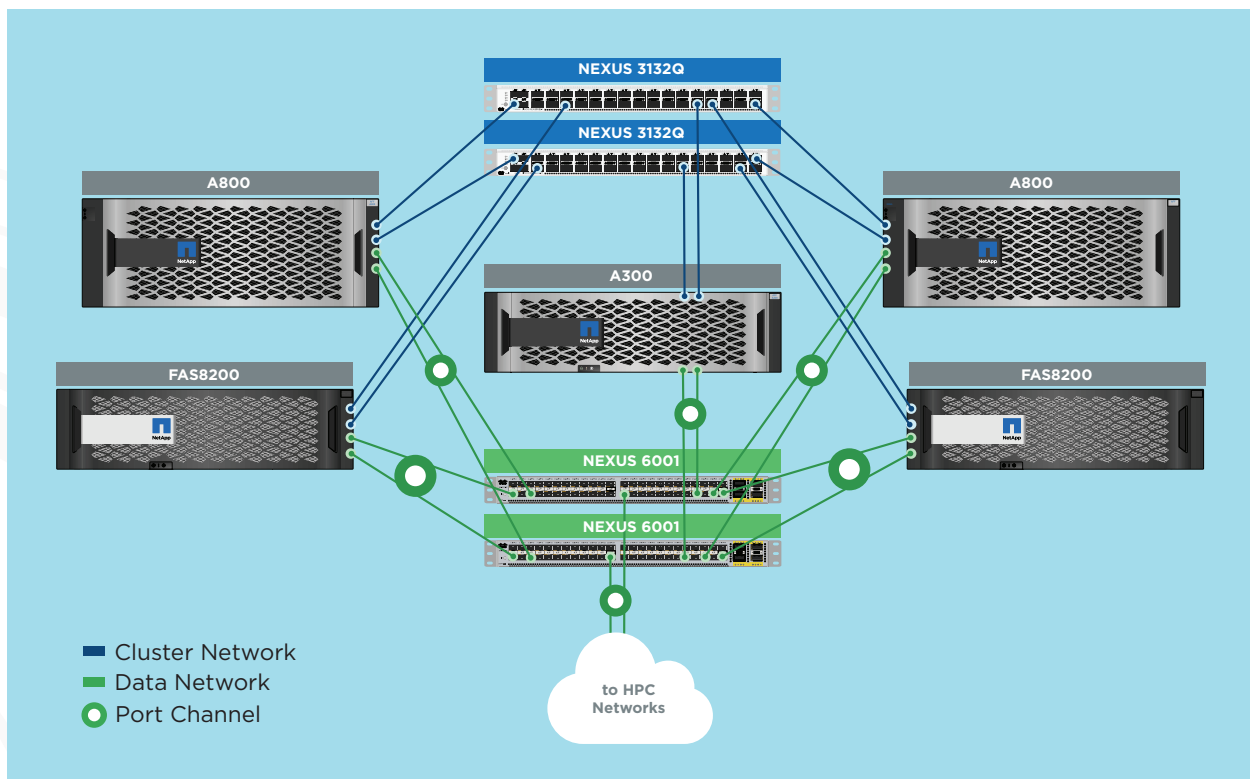
EXCEPTIONALLY FAST STORAGE

The storage can consist of solid-state disks (SSDs), capacity or spinning hard disk drives (HDDs), or both. For this solution, the storage consists of four NetApp FAS8200 hybrid-flash storage controllers (Fabric Attached Storage), two NetApp AFF A300 controllers (All Flash FAS) and four NetApp AFF A800 controllers. The Fabric Attached Storage

(FAS) 8200 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) A800 offers the fastest end-to-end NVMe all-flash array to accelerate critical workloads, including artificial intelligence and machine learning applications.

The ONTAP 9 operating system manages the storage nodes, unifying data management across flash, disk, and cloud to simplify the storage environment. Moreover, it bridges current enterprise workloads and new emerging applications. Importantly, it builds the foundation for a Data Fabric, making it easy to move your data where it is needed across flash, disk, and cloud resources.

NETWORK

The nodes within the storage cluster communicate via a redundant pair of high-speed Cisco Nexus 3132Q switches, while the clients connect to the storage through a redundant pair of Cisco Systems Nexus 6001 switches.

- ■ Cluster Network
- ■ Data Network
- ○ Port Channel

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 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**
  Agencies can add upgraded storage capacity to existing controllers to scale vertically (adding more capacity) as well as add more controllers to scale out horizontally (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**
  (40G/100G 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 links to improve performance and aggregate links to improve performance and prevent outages due to switch or network link failures.

- **DATA LOGICAL INTERFACES (LIFS)** on each storage node. If there is a component failure, a LIF can fail over to a different physical port or use ALUA 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 clients, 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 two federal 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, and escalations support services. In fact, CTG Federal staff help write the engineering certification exams for industry. 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 is a small business that serves dozens of federal defense, intelligence, and civilian organizations with IT expertise and solutions. We bring extensive expertise, experience, and professionalism in helping federal clients meet their IT modernization needs, such as VDI, cloud services, data storage, and hyperconverged infrastructure. Our experts keep current on where the leading edge in industry is today and where it is heading so that we can provide our clients with the best solutions to serve their specific IT goals and objectives most efficiently and effectively — and our past performance record backs that up. Headquartered in the greater Washington area, CTG Federal has satellite offices in throughout the United States.

Contracts

DUN & Bradstreet: 080932836
CAGE Code: 7ZHE9
NAICS Code(s): 541519

Available contracts via teaming:

SEWP • CIO-CS • GSA • FirstSource II • CHESS

Certifications:

- NetApp STAR Partner
- NetApp PS Certified
- NetApp FlexPod Certified
- NetApp A-Team Membership

CTG FEDERAL

A small business reseller specializing in Federal IT infrastructure that is scalable, secure, and at the right price.

(443) 270-6535
contact@ctgfederal.com
1818 Library Street, Suite 500,
Reston, VA 20190

www.ctgfederal.com