(intel®)

New Possibilities for the Data-Driven Organization

HPE and Intel deliver breakthrough high-performance computing solutions with HPE Apollo* Server Family and Intel® Scalable System Framework

This solution brief describes how to solve business challenges through investment in innovative technologies.

If you are responsible for…

- **Business strategy:** You will better understand how a high-performance computing solution will enable you to successfully meet your business outcomes.
- **Technology decisions:** You will learn how a high-performance computing solution works to deliver IT and business value.

Hewlett Packard Enterprise

Executive Summary

High-performance computing (HPC) is an important tool in scientific and industrial research, advancing the pace of discovery and providing a sharp competitive edge. But the components of HPC—compute, memory/storage, fabric, and software— have evolved at varying rates, causing increasingly imbalanced systems. Developing next-generation balanced systems requires more than new technologies. It requires breakthrough technologies combined with tighter ecosystem collaboration to address increasingly complex modeling and simulation workloads, as well as emerging machine learning, high-performance data analytics, and visualization workloads.

The HPE and Intel® HPC Alliance brings together two market leaders to advance the state-of-the-art in HPC. This alliance extends the HPC market leadership of HPE and Intel by jointly creating new technologies, solutions, and service capabilities that will help advance HPC for enterprises, academia, and government organizations, making HPC more accessible to organizations of all sizes. The alliance consists of HPE Solutions Frameworks*, Intel® Scalable System Framework (Intel® SSF), and HPC Centers of Excellence (CoEs).

HPE Apollo* Systems, using Intel SSF, are built for the highest levels of performance and efficiency and are density-optimized for HPC, big data, and machine learning applications. These HPC systems overcome the challenges of computing in the modern world, improving decision making and helping organizations maintain a competitive advantage.
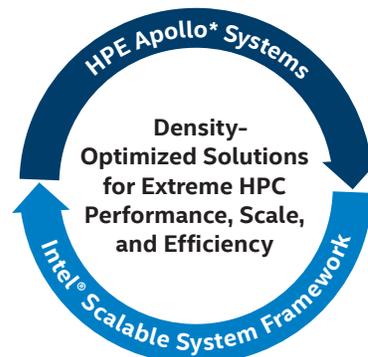

HPE Apollo* Systems

Density-Optimized Solutions for Extreme HPC Performance, Scale, and Efficiency

Intel® Scalable System Framework

Figure 1. Intel® Scalable System Framework with HPE Apollo* Systems advance the state-of-the-art in high-performance computing (HPC).

Industry Challenges

Staying ahead of the competition requires finding solutions first. For example, an oil company may need to increase the success rate of wells, a pharmaceutical company may need to quickly identify effective medical treatments, and a financial institution may need to find a way to better manage risk. In today's increasingly data-intensive world, processing massive amounts of data to quickly gain meaningful insights can be complex and costly. For many businesses focused on staying competitive, HPC offers a solution that translates to accelerating discoveries and reducing time to solution.

Implementing and optimizing HPC can be challenging, though. System bottlenecks in areas such as memory, I/O, and storage can impose limitations. Diverse workload requirements can create a need for divergent system infrastructures. For example, a business may choose to implement specialized architectures for high-performance data analysis, machine learning, or visualization. These factors, combined with software that may not take advantage of new hardware features and functionality, can make it difficult to achieve the necessary economies of scale with HPC.

Reducing the complexity of creating, deploying, and using HPC systems is the key to making HPC's innovative and competitive benefits more widely available.

Alliance Delivers Innovations in HPC

Overcoming the challenges of HPC and gaining new insights requires new system design approaches and tighter ecosystem collaboration to address increasingly complex modeling and simulation workloads, as well as emerging machine learning, high-performance data analytics, and visualization workloads.

The HPE and Intel® HPC Alliance brings together top market leaders to advance the state-of-the-art in HPC. The alliance jointly creates new technologies, solutions, and service capabilities that help advance the state of HPC for enterprises, academia, and government organizations, making HPC more accessible to organizations of all sizes. This alliance consists of the following (see Figure 2):

- **Intel® Scalable System Framework (Intel® SSF).** Intel SSF is a holistic solution for developing high-performance, scalable, balanced HPC systems. It uses a broad software ecosystem that enables organizations to gain insight through compute- and data-centric workloads, as well as advanced machine learning. Intel SSF spans the range of HPC systems from small clusters to the world's largest supercomputers and is designed to run multiple workloads on one framework.
- **HPE Solutions Framework*.** HPE Solutions Framework delivers purpose-built solutions for HPC that use and extend the capabilities of Intel SSF. This framework improves systems design optimization and integration for extreme performance, scale, and efficiency with density optimization, energy efficiency, and reliability. It also enables workload optimization with a broad partner ecosystem for HPC solutions with code modernization and performance benchmarking capabilities.
- **HPC Centers of Excellence (CoEs).** CoEs is a consortium of engineers from HPE and Intel who plan, develop, deploy, and manage HPC solutions and work closely with HPC customers and requirements. These resources operationalize the combined technologies of Intel and HPE to deliver unmatched capabilities and advisory services for customers to address their most pressing HPC challenges in a comprehensive manner.

HPE and Intel are focusing, initially, on the energy, financial services, life sciences, and government and academia sectors.

Enabling Industry Transformation

In recent years, the healthcare industry has made breakthrough discoveries in human genes, leading to better treatments for a myriad of common diseases. Genome mapping is poised to deliver unprecedented information that may lead to further treatment and even cures. DNA sequencing and analysis is a compute-intensive process that presses the limits of today's supercomputing. HPE Apollo* Systems, using Intel SSF, eliminates the traditional HPC barriers, offering a more powerful and cost-effective solution for scientists.
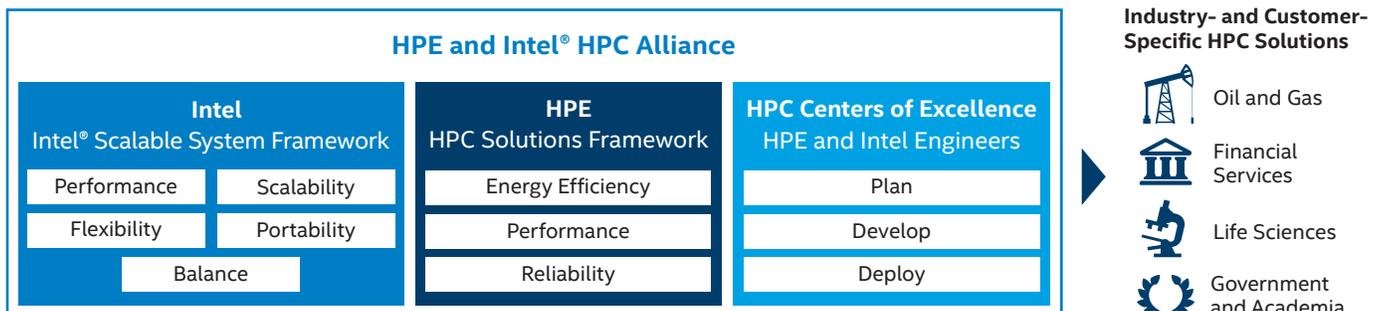

Figure 2. The HPE and Intel® HPC Alliance brings together scalability and performance with purpose-built solutions based on common high-performance computing (HPC) goals.

But science is not the only industry that can benefit from these new technologies. The financial services industry (FSI), for example, is highly regulated, and compliance with the US Securities and Exchange Commission (SEC), as well as new and proposed legislation, place a significant burden on the industry to collect and store massive amounts of transactional data. The cost of storing this data can add up, but dense storage from HPE allows FSI companies to comply with these regulations at a substantially reduced cost compared to other solutions.

Regardless of whether an organization is engaged in weather forecast modeling to predict storms, developing self-driving automobiles, or mapping seismic data to locate hidden oil reserves, hyper-scalable storage solutions from HPE, using Intel SSF, can help speed discovery, improve performance, and reduce costs.

Solution Architecture: HPE Apollo Server Family and Intel® Scalable System Framework

HPE Apollo Systems, using Intel SSF, provide breakthrough performance with economies of power and cooling in less space. The HPE Apollo high-density portfolio is built for the highest levels of performance and efficiency and is density-optimized for HPC, big data, and machine learning applications. HPE Apollo Systems are rack-scale compute, storage, networking, power and cooling (massively scale-up and scale-out) solutions for big data analytics, object storage, and HPC workloads. From water cooling that's 1,000x more efficient than air to "right-sized scaling" with two times the compute density for workgroup workloads,[1] the HPE Apollo portfolio is a dense, high-performance, tiered approach for organizations of all sizes.

The product portfolio (see Figure 3), which includes support for Intel® Solid State Drives, includes:

- **HPE Apollo 2000* System.** HPE's enterprise bridge to HPC scale-out architecture accommodates up to four independent, hot-pluggable 2P servers in 2U of rack space. Taking advantage of both Intel® Xeon® processors and Intel® Omni-Path Architecture (Intel® OPA) the HPE Apollo 2000 supports a wide range of configurations for many workloads, while increasing data center space, improving performance, and lowering energy consumption.

- **HPE Apollo 4520* System.** The HPE Apollo 4520 System is a high-density storage server with Intel® Enterprise Edition for Lustre* software that delivers a high-bandwidth, scalable storage solution, giving customers the ability to tune the software to suit their exact needs and workloads. The system is fully supported by HPE and comes with Intel® Manager for Lustre* software to help simplify solution installation, configuration, and management.

- **HPE Apollo 6000* System.** The HPE Apollo 6000 System is for HPC workloads at rack scale with Intel Xeon processors, Intel® Xeon Phi™ processors and Intel OPA. The new ProLiant* XL260a server tray with the Intel Xeon Phi processor can be mixed and matched with traditional server trays based on the Apollo 6000 and Intel Xeon processors within the same infrastructure. This assemblage creates a dense system with 60 servers in 6 chassis, leaving 6U for power and switches.

- **HPE Apollo 8000* System.** A high-performance, energy-efficient HPC solution for customers who need more than 250 teraflops, the HPE Apollo 8000 System delivers faster, more efficient supercomputing with its warm-water cooled design and Intel Xeon processors.

HPE Apollo* Product Portfolio for HPC

HPE Apollo 2000* Enterprise Bridge	**HPE Apollo 4000*** Big Data Analytics	**HPE Apollo 6000*** Air-Cooled, Rack Scale HPC	**HPE Apollo 8000*** Warm-Water Supercomputing
• Intel® Xeon® Processor Family • Intel® Omni-Path Architecture	• Intel® Xeon® Processor Family • Intel® Omni-Path Architecture • Intel® Enterprise Edition for Lustre* Software	• Intel® Xeon® Processor Family • Intel® Omni-Path Architecture • Intel® Xeon Phi™ Processor	• Intel® Xeon® Processor Family

Increasing Density, Performance, and Efficiency

Figure 3. Intel® Scalable System Framework and HPE Apollo* Systems deliver reliable, scalable performance on one platform.

Intel OPA, available throughout the HPE ProLiant XL (Apollo) and DL server lines, delivers low latency and up to 100 Gbps bandwidth, which is ideal for performance-driven server and storage clustering applications in HPC data centers. The Intel OPA x16 adapter can be ordered on HPE Apollo 2000, Apollo 4200, the Apollo 4500 family, Apollo 6000, HPE ProLiant DL360, DL380, DL560, and DL580 Gen9 servers. The Intel OPA x8 adapter can be ordered on the Apollo 4500 family, HPE ProLiant DL360, and DL380 Gen9 servers.

Conclusion

Organizations from across the spectrum of energy, financial services, life sciences, and government and academia rely on HPC to maintain a competitive edge in a rapidly changing world. These organizations are facing ever-increasing data volumes and workload complexity and need systems with breakthrough performance and economies of power and cooling in less space.

HPE Apollo Systems, using Intel SSF, are built for the highest levels of performance and efficiency and are density-optimized for HPC, big data, and machine learning applications.

Together, these systems overcome the challenges of computing in the modern world, improving decision making and helping organizations maintain a competitive advantage.

Find the solution that is right for your organization. Contact your HPE representative or visit **hpe.com/info/ hpcalliance** and **intel.com/ssf**.

Learn More

You may also find the following resources useful:
- HPE and Intel HPC Alliance
- HPE Apollo Systems
- Intel® Scalable System Framework

Solution Provided By:

Hewlett Packard Enterprise

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