Accelerate Life Sciences and Healthcare Research on Campus

PIER Group
Partners In Education & Research

HPE and PIER Group Bring the Power and Speed of Supercomputing to Higher Education

Higher education stands at the center of scientific discoveries. From the accelerated discovery of COVID-19 treatments and the creation of treatments that attack the genetic codes of infectious diseases, to the use of geospatial data to identify and prevent health risks at a global scale, the life sciences and healthcare disciplines on college campuses have led the charge toward creating solutions for some of the world's biggest health problems.

But none of this would be possible without world-class technology at the backbone, helping to process and analyze the massive amounts of data collected by campus researchers as quickly and accurately as possible. That's why higher education is one of the largest consumers of high performance computing (HPC). In fact, in 2018, colleges and universities around the world collectively invested $6 billion in HPC technology,[1] with investments expected to grow.[2]

This White Paper examines three important topics for higher education decision-makers considering HPC technology investments to provide their campuses with a leading edge:

- How HPC can contribute to the continued success of faculty research in life sciences and healthcare, especially when combined with artificial intelligence (AI) solutions, by accelerating research outcomes
- How HPC infrastructure on campus can help colleges and universities secure grants that support faculty research in life sciences and healthcare, as well as further development of HPC resources
- How cooling technologies are necessary to keep energy and maintenance costs low for campus data centers running HPC

Additionally, this White Paper introduces the Hewlett Packard Enterprise Apollo 6500 Gen10 Systems as the ideal HPC and AI solution for colleges and universities, with its energy efficiency, ease of deployment and maintenance, and flexibility to meet data center requirements. Finally, learn how PIER Group, with its over 25-year commitment to the research and education market, is uniquely positioned to help higher education institutions implement HPC technology for success.

The HPC market is expected to grow from $37.8 billion in 2020 to $49.4 billion by 2025.[2]

HPC Improves Research Outcomes for Life Sciences and Healthcare

Using HPC, faculty researchers in life sciences and healthcare can benefit from a combination of advanced computing power, scalable network infrastructure, a flexible software environment, and strong reliability to bring their research to entirely new levels. That's because powerful computing infrastructure like HPC, especially when it's combined with an AI solution, can improve the quality of research by processing massive amounts of data faster and more efficiently and accelerating the time to outcomes, compared with legacy data center infrastructure.[3]

For example, a medical researcher at Ghent University turned a previously time-consuming task of analyzing MRI scans into a process that was conducted overnight with help from the university's supercomputer.[3]

Access to increased performance speed and faster findings is essential for research related to developing new pharmaceuticals and therapies, visualizing and identifying areas around the world at high risk of disease, and discovering optimal treatment plans for patients. In fact, in a study funded by the National Science Foundation, a team from Clemson University discovered higher education institutions with locally available supercomputers were more efficient in producing research in these critical fields than those without, allowing colleges and universities to achieve greater research impact.[4]

Ninety percent of higher education respondents to a Forrester Consulting survey said their AI initiatives increase the need to modernize servers and HPC.[6]

The Benefits of HPC for AI

HPC is best equipped to support AI workloads on a number of fronts:[5]

Processing power: Graphics processing units (GPUs) are an essential part of a modern HPC infrastructure for AI, as they can process AI-related algorithms more efficiently than most central processing units (CPUs). Additionally, GPUs are developed and optimized for deep learning.

Speed: The parallel processing and coprocessing of HPC resources significantly accelerates computational processes, allowing researchers to process data sets and run experiments in less time, ultimately achieving faster insights.

Volume: The significant amount of storage and memory available in HPC resources enables researchers to run longer analyses and process massive data volumes, helping to improve overall accuracy.

Resource efficiency: With HPC, researchers can distribute AI workloads across available computing approaches and resources to maximize usage.

Cost: HPC systems can deliver colleges and universities cost-effective access to AI and big data. Consumption models allow higher education institutions to pay only for the resources they use.

Technology Grants Bring Benefits Beyond Dollars

The availability of HPC resources on campus can help life sciences and healthcare faculty secure grants and other funding that advances their research and the HPC infrastructure in support of that research. Several sources for supplemental funds exist, from the many private organizations working outside of higher education that are equally invested in participating in and benefiting from groundbreaking research, to federal instrumentation grants and philanthropic foundations.

The importance of grants can be significant: A 2017 study by Educause found 13% of doctoral institutions primarily funded their HPC initiatives with chargeback to research grants. Since 2014, the University of Miami has supported its research with $120 million in grants due to the HPC resources available on campus.[7]

Grant money for HPC and AI solutions is particularly important for the life sciences and healthcare disciplines at public colleges and universities, which had previously relied on state and local governments for funding. Consider, for example, the 22 states that removed a combined $1.9 billion from public higher education funding over the past year. That translates to about 3% of what those states had spent on public colleges and universities prior to the COVID-19 pandemic.[8]

The value of grants often goes beyond their continued support of faculty research. Grant money can provide an additional competitive edge to colleges and universities, as grants entice top talent not only at the faculty researcher level, but also at the incoming student level. The potential for increased student enrollment is of great importance to higher education, which experienced a 3.5% drop in enrollment in 2021, compared with the previous year.[9]

Cooling Is Key for Low Energy Costs and Strong HPC Performance in Campus Data Centers

Implementing the right cooling technology in campus data centers is of equal importance to selecting the best-suited HPC hardware and software to meet user needs. Without it, colleges and universities face the threat of escalating maintenance costs for HPC resources and skyrocketing energy bills.

The selection of cooling technology depends on a number of variables: the infrastructure of the data center, the server density, the overall cost of the cooling technology, and the data center's power consumption.

Liquid cooling is the industry's most frequently implemented cooling technology. Water is the standard for many HPC resources, because it provides a balance between performance and cost of setup and infrastructure. Water is potentially a higher-performing system, but it requires colleges and universities to invest in building raised floors into their data centers.

To keep the costs of HPC resources within budget, higher education data centers must focus on maximizing the efficiency and performance of their selected cooling technology.[10]

HPC Challenges for Higher Education Institutions

Despite the unquestionable benefits that HPC can bring to higher education, a few challenges may surface within the IT organizations responsible for maintenance and implementation:[11]

- Some IT teams may have little to no experience supporting HPC resources.
- Many already overburdened IT teams may not have enough resources to design, deploy, or manage HPC deployments.

These potential obstacles highlight the need for campuses to explore solutions that simplify the design, configuration, and maintenance of HPC resources. To ease the burden, the adoption of flexible, scale-out building blocks – a preferred data center strategy for both higher education and enterprise use cases alike – can provide a consolidated experience, bringing together the technology necessary to run AI workloads.

HPE Apollo 6500 Gen10 Systems Unleash Revolutionary HPC and AI for Higher Ed

HPE Apollo 6500 Gen10 Systems meet the HPC needs of higher education, with the exceptional performance and reliability required by life sciences and healthcare faculty researchers to advance their progress on discoveries that can solve the world's most complex health problems. HPE Apollo delivers full flexibility that allows colleges and universities to scale up and out as needs vary and provides high-density solutions that use accelerated computing to process AI workloads on GPU architectures.

With a 37% market share of HPC installations, Hewlett Packard Enterprise is the market leader, featuring a comprehensive end-to-end portfolio across compute, storage, software, networking, and services.[12]

HPE Apollo Benefits Breakdown

HPE Apollo 6500 Gen10 Systems deliver several benefits to higher education institutions, including:

- **Scalability.** Campus data centers can experience quicker deployments and faster time to value, support new workloads, and unlock the power of research data in real time, with fewer IT resources needed and on tight budgets.
- **High-density compute.** Colleges and universities can increase their return on IT investment by boosting the performance of their data center workloads with up to eight GPUs or coprocessors. With high-powered analysis and prediction, life sciences and healthcare research faculty can reach outcomes in the shortest amount of time.
- **Pay per use.** HPE GreenLake for HPC can deliver superior flexibility and control of HPC solutions to higher education with a cloud service consumption model on premises. Avoid overprovisioning by paying only for the resources consumed. Plus, built-in buffer capacity provides the ability to handle steady growth and unanticipated spikes in demand.

HPE Cooling Technology Options

HPE offers cooling technologies to help colleges and universities keep their energy costs low and their HPC speed and efficiency levels high.

HPE Adaptive Rack Cooling System (ARCS)

HPE ARCS makes way for increased computing power without adding heat to campus data centers. Using a closed-loop, room-agnostic design, HPE ARCS can cool fully populated racks, even with top bin processors, and ensures horizontal airflow. By increasing power density without the need for extensive cooling upgrades, HPE ARCS can lengthen the lives of data centers in a cost-effective manner.

HPE ARCS offers the following features and benefits:

- Simultaneous cooling of up to four racks and 150 kW of IT capacity when used in conjunction with the HPE ARCS 42U or 48U racks
- Advanced condensate management
- Underfloor and overhead plumbing capabilities

HPE Apollo Direct Liquid Cooling System

With plug-and-play cooling to reduce power usage effectiveness, the HPE Apollo Direct Liquid Cooling system enables HPE Apollo Gen10 Systems to support processors over 240W, so the highest-performing CPUs and GPUs can be deployed. HPC resources cooled by the HPE Apollo Direct Liquid Cooling system experience fewer component failures, resulting in increased availability, higher infrastructure performance, and better reliability.

Here are additional benefits of the HPE Apollo Direct Liquid Cooling system:[15]

- Consumes up to 81% less fan power at the server
- Fully integrated, installed, and supported by HPE
- Doesn't demand a centralized pumping unit, so price scales linearly

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Delivering HPC and AI Tech to Enable Research and Education Advancement

PIER Group has been entrenched in the research and education (R&E) market for over 25 years, so they speak the language of higher education and the life sciences and healthcare disciplines.

A Hewlett Packard Enterprise Gold Solution Provider, PIER Group formed as the result of the group's passion for the R&E industry. A team of professionals with vast experience serving the R&E community, PIER Group is passionate about research and education, working hard every day to continue delivering the best possible technology for the best possible value to R&E customers across the country.

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Why Colleges and Universities Choose HPE Apollo 6500 Gen10 Systems[13,14]

- Accelerated performance for the most complex HPC and AI applications
- Easy deployment and manageability for IT teams
- Flexibility to meet data center requirements
- Customized design for lower costs, better reliability, and unmatched serviceability
- Energy-efficient computing, with air cooling and liquid cooling system options
- Comprehensive server security and management

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[7] TechRepublic, "How Higher-Ed Researchers Leverage Supercomputers in the Fight for Funding," Nov. 2019.
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[13] HPCwire, "Meeting AI/ML Compute Needs with the HPE Apollo 6500 Gen10 Plus," Aug. 2021.
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- Networking Specialist