Case study

# Breakthroughs are business as usual

## University of Minnesota embraces the next generation of supercomputing to empower a new wave of research

**Industry**
Research

**Objective**
Design a highly flexible environment to accommodate a broad range of research fields while boosting performance

**Approach**
Engage with HP to discover emerging, purpose-built HPC solutions to drive the future of research at the university

**IT matters**
- Boosts performance twofold vs. competitive HPC solutions
- Integrates with existing storage and networking infrastructures
- Offers 4x dollar-per-watt performance improvement vs. blade servers

**Business matters**
- Delivers research-specific resources at 60% cost savings vs. traditional IT approach
- Enables broad adoption by traditional and nontraditional research groups
- Minimizes technology footprint, using 60% less floor space

**"When you're a major institution in the academic research field, you need to find ways to stay on the leading edge. By working closely and proactively with HP, we were able to boost our performance by a factor of two just by having access to the Apollo 6000 technology early."**

– Jorge Vinals, Director, Minnesota Supercomputing Institute, University of Minnesota

University of Minnesota launched the Minnesota Supercomputing Institute shortly after becoming the first American university to acquire a supercomputer in the early 1980s. Today, the institute is a world-leading research center with three high performance computing environments that serve thousands of end users and hundreds of groups around the world. The institute recently deployed its first the Apollo 6000 System by HP.

## Not your father's supercomputer

Mention supercomputing to the average person, and they'll probably return a blank stare. The term might conjure up vague images of enormous monoliths in underground catacombs, humming along in cold isolation. What they might not be aware of is the important role these seemingly impersonal racks of servers are playing in improving life on planet Earth.

In 1981, the University of Minnesota was the very first university in America to purchase a supercomputer that matches the above description. Shortly thereafter, the Minnesota Supercomputing Institute (MSI) was created, and is still based on the university's Twin Cities campus in Minneapolis.

Even though supercomputing, or high performance computing (HPC) environments have evolved considerably since those early days, the premise is still as compelling as ever: give researchers as much computational power as possible, and everybody wins.

## Number-crunching the big issues

"At MSI, our chief goal is to allow researchers to produce scientific breakthroughs and generally benefit the community through their advances," explains Jorge Vinals, director of the Minnesota Supercomputing Institute. "MSI plays a role in campus efforts to understand and cure cancer, in the facilitation of efficient sharing of information between researchers in remote locations, and in the understanding of weather and climate. In fact, MSI has a role in most scientific research that requires high-performance computation or the management and understanding of large amounts of scientific data."

For Vinals and his team at MSI, creating the ideal environment to deliver high performance compute capabilities for students and researchers takes a fair amount of research in itself. "We currently have three supercomputer environments, but we have a very large user base made up of 600 research groups and 3,500 end users," Vinals says. "These groups all have specific needs. Some are more traditional computational needs coming from aerospace and engineering, but we're getting more requests from biology and life sciences, which can be incredibly intensive from a memory perspective."

## Solving tomorrow's problems today

With a diverse range of needs, MSI needs to support existing research while paving the way for what's to come. It means Vinals is always thinking about what's next. "Every few years, we replace our top-performing HPC environment so that we can continue to offer the performance, capacity, and access that makes MSI a leader in the HPC landscape," Vinals explains.

Approaching its recent refresh cycle, Vinals and team researched offerings from seven major vendors. "We have to look at how our HPC systems are going to differentiate MSI on the world stage," Vinals says. "So we look at factors like how we can configure storage, the speed of the network, I/O speeds, memory speed and capacity, and of course, CPU speeds."

## Partners for a better future

There are other considerations as well. "Our main goal is not to design the fastest environment—we could have gotten higher numbers by designing specifically for speed," Vinals relates. "For us, the most important feature is flexibility, and that's what led us to HP."

According to Vinals, the HPC team at MSI meets with technology leaders regularly to stay updated on new technology. "The field changes so quickly, you need to have a relationship with leaders so you can stay on the leading edge. That's why we view HP as our technology partner."

## The next leap forward for HPC

The relationship with HP is what led MSI to an opportunity to deploy a supercomputing environment that would meet all its speed, storage, I/O, and memory targets while exceeding CPU and density requirements.

MSI chose the HP Apollo 6000 System—optimized for density, performance, and efficiency specifically for HPC workloads. With 140 nodes per 42U rack, two HP ProLiant XL220a Servers per tray, pooled power, and high performance per-core for single-threaded workloads like life sciences via the Intel® Xeon® Processor E3-1200 product family CPUs, with additional compute and accelerator trays to come, the University of Minnesota has an environment to power all of the needs of its varied research groups and beyond.

## Gets along well with others

The ability to easily integrate HPC compute resources with existing storage and network components was a key to the success of the new MSI supercomputer launch. "HP builds systems that encourage flexibility and integration, which is crucial for a research institution," Vinals says.

Another key component for MSI was the ability of its new HPC system to integrate with its water-cooling capabilities. "The majority of our HPC systems are water cooled, so having an environmentally friendly cooling option on our flagship supercomputer was important," Vinals relates.

## Green research on green machines

Until recently, MSI built its HPC environments with industry standard servers. The only problem is that most research workloads don't benefit from a traditional IT approach. Vinals and his team wanted to explore the capabilities of a purpose-built HPC system with their deployment.

In choosing the HP Apollo 6000 System, MSI made a conscious decision to offer its research groups access to resources that are optimized for single-threaded research applications. By doing so, Vinals and team invested in a solution that uses less floor space, delivers better performance on a dollar per watt, and ultimately costs less.

## Customer at a glance

**Hardware**

- HP Apollo 6000 System

## Increasing performance twofold

"When you're a major institution in the academic research field, you need to find ways to stay on the leading edge. By working closely and proactively with HP, we were able to boost our performance by a factor of two just by having access to the Apollo 6000 technology early," Vinals explains. "We now have a lot of people waiting to get their hands on this new system and its enhanced resources."

At the same time, the new environment gives the university an improved presence in facilitating university-industry collaboration and its own community outreach. "Having not only a leading edge HPC environment, but a very capable IT infrastructure that supports the research community, is a huge part of attracting new research and funding," Vinals says.

## Solving more problems faster

With the flexibility to deliver world-class research resources and the speed to open up those resources to more groups and end users, MSI is positioned to help the next generation of academic researchers make their scientific breakthroughs. "With computational research, you're always limited by resources, so for us, the HP Apollo 6000 System gives us a huge advantage that comes along with increased capacity," Vinals says. "The main benefit is that we've increased the range of problems people can solve."



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