NEW NOTRE DAME HPC EPYC™ CPU PERFORMANCE AND LOW LATENCY

The University of Notre Dame Center of Research Computing leverages AMD EPYC™ processor powered HPE ProLiant DL385 Gen10 servers to drive better HPC density and faster results.

The University of Notre Dame is a private research and teaching university inspired by its Catholic mission. Located in South Bend, Indiana, its researchers are advancing human understanding through research, scholarship, education, and creative endeavor in order to be a repository for knowledge and a powerful means for doing good in the world. The university’s Center for Research Computing (CRC) supports a diverse research infrastructure across key areas—including cancer, environmental change, global health, and more—within a broad range of applications.

Notre Dame’s Center of Research Computing (CRC) supports about 2000 active user accounts supporting 200 different software applications. To support their researchers, the CRC’s staff of 50 engineers and developers manage 30,000+ compute nodes, with between 3 and 4 petabytes of data across 20 different architectures.

Key CRC applications and software in this HPC environment are the WRF, Fluent, OpenFOAM, ANSYS and MATLAB. Critical for the CRC was a solution that included expert HPC support that HPE and AMD delivered.

DELIVERING ON PERFORMANCE REQUIREMENTS

Notre Dame’s CRC needed a platform that supported a diversity of software and delivered on its high memory capability requirements for fluent, fluid dynamics and weather modeling. The HPC environment they needed would support 500 cores per job and the ability to scale beyond that, with 2GB to 3GB of memory requirement per core.

The cores needed to have direct and rapid access to memory and the HPE ProLiant DL385 Gen10 powered by AMD EPYC™ processors with a high bandwidth to high speed RAM was a great fit.

“The AMD and HPE systems gave us performance that allows larger analytics,” said Paul Brenner, Associate Director of the Notre Dame Center for Research Computing. “A lot of these are memory-bound applications, fluid dynamics specifically, so [the systems] gave us a nice architecture upon which we could perform larger memory, high-performance calculations with good performance between the cores and the memory itself.”

“It provided us with additional capabilities that we didn’t have before, with systems that yield high performance via tightly coupled compute cores and large bandwidth high-speed RAM,” said Brenner.

“Performance was very important, and the HPE/AMD solution delivered on the savings for performance that Notre Dame expected. Brenner stated that “Having additional cores for these applications in a single box that I can then lower my cost and lower my latency as I was hopping around all my InfiniBand switches was really great.”

"This chipset [AMD EPYC] was different than anything we’d seen before. This was a major architectural upgrade and change, across the board."

Prof. Paul Brenner, Associate Director, Notre Dame Center for Research Computing
COLLABORATION COUPLED WITH COMPREHENSION

The Notre Dame CRC worked with both AMD and HPE on the solution, involving regular conversations as well as onsite interactions with engineers and others. “Having those interactive design discussions were very fruitful,” said Brenner. “It simplified the process with a lot of back-and-forth open communications.” Brenner also pointed out the team’s understanding of the CRC’s scientific computing requirements. “There were lots of contributions from both HPE and AMD in terms of what we needed to do to get our applications running. We felt that they had a strong knowledge of the application set...that was extremely helpful for them to understand differences between, say, a fluid dynamics application and a molecular modeling application, and what needed to happen in the system architecture to make the system as high performance as possible.”

The team collaborated on the design of the cluster, deciding which AMD chipsets would integrate best for its computational workload, as well as the ideal interconnect, memory, and server form factor. “It was exciting to look at a new architecture,” said Brenner. “This chipset [AMD EPYC™ processors] was different than anything we’d seen before. This was a major architectural upgrade and change, across the board.”

SOLVING COMPLEX PROBLEMS FASTER

Indeed, the AMD EPYC™ processor is a system on chip (SoC) that is designed from the ground up to deliver innovation that efficiently supports both existing and future data center needs. The AMD EPYC™ processor family offers the flexibility to choose from 8 to 32 cores, 64 threads, and 8 memory channels with up to 2TB of memory per socket. The AMD EPYC™ processor-based HPE ProLiant DL385 Gen10 servers give the CRC the memory capacity, bandwidth, and processor cores to cost-effectively and efficiently run memory-intensive workloads. They also enable its researchers to collect and analyze larger data sets much faster, helping them solve complex problems in a significantly accelerated manner.

And that’s exactly what’s happening at the CRC, which is experiencing outstanding performance and faster results within its scientific applications. “We felt that the quantifiable performance to price ratio was outstanding and that’s why we selected HPE and AMD,” said Brenner. “And that has proved to be true across multiple applications already and in a month or so of production utilization...the ultimate metric for us is being able to have those scientific outputs for all of those different models, faster.” The CRC plans to continue adding and tuning more applications as needed. In fact, the solution has been such a success that it’s attracting the interest of faculty members beyond the initial research applications. “Faculty are contributing additional hard-earned grant money and funds to grow this cluster,” said Brenner. “They’re excited about the capabilities of this system.”

ABOUT THE CENTER FOR RESEARCH COMPUTING

The Center for Research Computing at the University of Notre Dame is an innovative and multidisciplinary research environment that supports collaboration to facilitate discoveries in science and engineering, the arts, humanities and social sciences, through advanced computation, data analysis and other digital research tools. The Center enhances the University’s cyberinfrastructure, provides support for interdisciplinary research and education, and conducts computational research.

ABOUT AMD

For more than 45 years AMD has driven innovation in high performance computing, graphics, and visualization technologies— the building blocks for gaming, immersive platforms, and the datacenter. Hundreds of millions of consumers, leading Fortune 500 businesses, and cutting-edge scientific research facilities around the world rely on AMD technology daily to improve how they live, work, and play. AMD employees around the world are focused on building great products that push the boundaries of what is possible. For more information about how AMD is enabling today and inspiring tomorrow, visit amd.com/epyc