UNIVERSIDAD NACIONAL DE CÓRDOBA ACCELERATES RESEARCH WITH AMD EPYC™ CPUS

Groundbreaking supercomputing power for scientific discovery using AMD EPYC processors

CUSTOMER

UNC Universidad Nacional de Córdoba

INDUSTRY

Research and Education

CHALLENGES

Increase performance for computational science in Argentina

SOLUTION

Deploy HPC supercomputer cluster powered by AMD EPYC™ processors

RESULTS

50 percent more nodes for the budget, enabling up to three times the performance of the previous cluster

AMD TECHNOLOGY AT A GLANCE

2nd Gen AMD EPYC™ CPUs

TECHNOLOGY PARTNER

SUPERMICRO

High performance computing has caused a revolution in scientific discovery across the globe. In South America, the Argentina-based Universidad Nacional de Córdoba (UNC) has been pushing the boundaries of computational science for over a decade through its Centro de Computación de Alto Desempeño (CCAD). But computing power never stands still, and when UNC wanted to provide even more opportunities for research, Supermicro servers powered by AMD EPYC processors enabled the university to take its capabilities to the next level.

"AMD had outstanding pricing. Instead of just 40 nodes we were able to buy 60 nodes, so 50 percent more than expected."

Nicolás Wolovick, Professor of Computer Science, Universidad Nacional de Córdoba

Memory bandwidth essential

"We started in 2010 as a partnership with other universities," says Nicolás Wolovick, Professor of Computer Science member of the CCAD, Universidad Nacional de Córdoba. "We acquired a large computer with 60 nodes. It was the number one supercomputer in Argentina at the time. It was called Cristina, and it was decommissioned five years ago. Our university's HPC center was created after that. Our second computer was called Mendieta, fully loaded with GPUs. Our third computer was Mulatona, bought for the observatory here in Córdoba, which was then followed by our next computer called Eulogia."

"Our computing center is an open science one," explains Carlos Bederián, Research Software Engineer, Universidad Nacional de Córdoba. "We have a very diverse group of users with many workloads, although most of them do computational chemistry. We also have people doing machine learning, astrophysics, computational fluid dynamics, and computational physics. We try to cover everything, but we need to make the most of our budget, so we usually target a good price-performance compromise. That means that we must specialize, so we set a target for each cluster."

"We had the opportunity to apply for a fund of $386,000," says Wolovick. "We created a public tender and a Request for Proposal (RFP)." Bederián adds, "We wanted to build a fully CPU compute cluster and our RFP was for a compute cluster that had no GPUs. It needed to run applications like Gaussian, a computational chemistry software package. We targeted a platform with very good memory bandwidth to compute ratio, because most of the software that's running on our cluster is limited by memory bandwidth instead of compute. Compute has become ubiquitous, but it's always starved by memory bandwidth, so the RFP established the right ratio. One of our big stakeholders in the center is a group of astrophysicists, and they run memory-intensive simulations with huge datasets which we had to cover."

"We try to stay informed," says Bederián. "When 2nd Gen AMD EPYC processors came out, they came with exceptional floating-point compute and were a force to be reckoned with. We were reading announcements from leading HPC centers, and everyone was shipping 2nd Gen AMD EPYC CPU-based servers." AMD EPYC processors also offered the balance of computational power with memory bandwidth that UNC was looking for.

More nodes for the money

Thanks to its favorable performance balance, the AMD EPYC processor-powered tender won UNC's RFP, and the university then worked with a local Supermicro hardware partner on the deployment, Multitech. "We had a pretty good idea of what we wanted, and Supermicro optimized the setup for the best cost-performance ratio we could get," says Bederián. "We knew that the clusters wouldn't have more than 32 cores per socket to maximize the ratio of memory bandwidth to compute, and we wanted dual-socket servers because of latency and cost efficiency requirements. Supermicro had servers that adapted well to those requirements, so it lined up perfectly."

"AMD gave us an opportunity to have something that is more powerful and enables us to do more science."

Nicolás Wolovick, Professor of Computer Science, Universidad Nacional de Córdoba

"The cost was amazing," says Wolovick. "AMD had outstanding pricing. Instead of just 40 nodes we were able to buy 60 nodes, so 50 percent more than expected. Our main units of measure are teraflops per dollar and bandwidth per dollar, and both were amazing."

"The second offer in the tender was between 20 and 30 percent slower," says Bederián. "EPYC servers had a core count advantage, and although Rome has narrower vector units compared to the competition, when you calculate the compute power, it's similar. However, EPYC servers have much higher memory bandwidth, so that settled it. For Intel servers, most of the workloads would be constrained by memory bandwidth."

Much faster research results

"The computers arrived at UNC in February 2021 and the data center was ready by August," says Wolovick. "Since then, the cluster, called Serafín, has been producing science at 100 percent capacity." The deployment consists of 60 dual-socket Supermicro A+ Server 2124BT-HTR systems powered by 32-core 2nd Gen AMD EPYC 7532 processors.

UNC was able to move its workloads to the new system with ease. "The transition was seamless," says Bederián. "AMD had very early support for the Spack package manager, and we were already using Spack in our earlier clusters, so the transition was just porting our environments to a new cluster, running Spack, and building everything. It went without a hitch. We were up and running in less than two months."

"Our researchers are extremely happy," says Wolovick. "Serafín is devouring every job you throw at it. Because people knew it runs fast, they started to migrate from our other clusters to Serafín. It is now the preferred cluster. We usually count the papers that are published with our resources. Serafín is dominating the computation by high margins. We are already at 30 papers this year, and last year had 47 in total. I think that we are going to surpass 47 by a wide margin of papers in 2022. It's a solid indication that we are giving a lot of compute power to the scientific community."

"Serafín is two to three times faster than our previous compute nodes," says Bederián. "We have used that to lower turnaround times, and that's why users are happier now. Instead of giving users four-day time limits, we lowered it to two days so jobs would cycle faster, and users are much happier with that."

"AMD EPYC CPUs are the best bang for the buck right now. They are ideal for CPU-only scientific applications. When you need to optimize for cost, like we do, that's truly awesome."

Carlos Bederián, Research Software Engineer, Universidad Nacional de Córdoba

"AMD gave us an opportunity to have something that is more powerful and enables us to do more science," says Wolovick. "We are now looking for funding to increase to eight nodes more. We recommend everybody switch to AMD. Supermicro is also a great vendor for countries like us. The combination of AMD and Supermicro is perfect."

"The AMD EPYC roadmap continues to lead the compute to memory bandwidth ratio, so we'll keep buying AMD in the future," says Bederián. "The superior memory bandwidth is unbeatable. AMD EPYC CPUs are the best bang for the buck right now. They are ideal for CPU-only scientific applications. When you need to optimize for cost, like we do, that's truly awesome."

About Universidad Nacional de Córdoba

Established in 1613, Universidad Nacional de Córdoba (UNC) is one of the oldest and most prestigious universities in Latin America. The colonial university buildings located downtown were declared a World Heritage Site by UNESCO in 2000. UNC has played a vital role in Argentina's national and regional history. Its faculties cover all areas of knowledge, and it has over one hundred research centers, 25 libraries, 17 museums and two astronomical observatories. These are all living proof of the thriving force of a university conceived as a combination of tradition, innovation and excellence. For more information visit unc.edu.ar.

About AMD

For more than 50 years AMD has driven innovation in high-performance computing, graphics, and visualization technologies. Billions of people, leading Fortune 500 businesses, and cutting-edge scientific research institutions around the world rely on AMD technology daily to improve how they live, work and play. AMD employees are focused on building leadership high-performance and adaptive products that push the boundaries of what is possible. For more information about how AMD is enabling today and inspiring tomorrow, visit the AMD (NASDAQ: AMD) website, blog, LinkedIn, and Twitter pages.

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