Universidad Nacional de Córdoba Utilizes High-Performance Supermicro A+ Servers to Advance Scientific Research

Supermicro BigTwin® Systems Create the Most Powerful Open Science Computer in Argentina

INDUSTRY

Scientific Research

CHALLENGES

- Simulations were taking too long to complete.
- Applications required the entire cluster to complete, forcing out other simulations.

Introduction

The Universidad Nacional de Córdoba (UNC) is a centuries-old institution of higher learning located in Córdoba, Argentina. The Universidad Nacional de Cordoba offers undergraduate and graduate degrees in over 92 majors. In addition, as part of the national research program, the Universidad Nacional de Cordoba is conducting leading edge research in domains such as astronomy, chemistry, biotechnology, social sciences, statistics, physics, and engineering. UNC's Centro de Computacion de Alto Desempeno (CCAD) has acquired a new system from Supermicro, and it is part of the University's High Performance Computing (HPC) center within (CCAD).

Challenges

Researchers at the UNC were reaching a limit in their research activities as the existing HPC systems could not produce results fast enough from their various simulations. Not only did the numerical simulations take too long to complete, but it was also necessary to increase the resolution in the models that most research fields require to obtain more information. Clients of the CCAD perform both basic and applied research. Currently, the CCAD provides applications for popular independent software vendors (ISV) products such as GROMACS, QE, LAMMPS, and OpenFOAM. In addition, a combination of

homegrown and ISV applications enables researchers to develop specific new applications for their ongoing research.

Many of the applications at UNC required several days to obtain results. This was simply too long for gaining the desired research insight. So, a new, faster cluster was required. In addition, many applications only used 16-32 cores per run, which limited the scalability, increasing run times. However, due to performance limitations of the previous cluster, some applications required the entire cluster, even over off peak hours and vacation time. This overutilization required other important research projects to wait.

Solution

Working with our leading local partner Multitech engineers, UNC investigated several solutions that would enable their community of researchers to get results faster. Ultimately UNC decided on the Supermicro A+ AS-2124BT-HTR with four dual processor compute nodes each. UNC acquired 15 of these systems, each configured with dual AMD EPYC™ 7532 CPUs with 32 cores, each running at 2.4 GHz. Additionally, each system includes 128GB of RAM and a 1.92TB SSD of NVMe M.2 storage. The overall cluster also consists of a management/head node that is also based on the AMD EPYC™ processor. Finally, the new Supermicro servers include a PCI-E 4.0 I/O system to enable higher throughput communication with storage and networking sub-systems.

SOLUTION

Supermicro A+ BigTwin servers with 4 nodes per chassis.

AMD EPYC™ 7532 CPUs with 32 cores each.

BENEFITS

Faster completion of HPC simulations.

Larger scalability to reduce simulation time.

More researchers can use the cluster concurrently.

> "We are glad to see how Supermicro and AMD have a strong momentum in the R&D and HPC areas in Argentina,"
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> ***- Diego Lavalle, CEO Multitech Argentina, Supermicro local distributor.***

The Supermicro BigTwin® servers contain four separate nodes, which are housed in a 2U chassis. This novel design leads to an increased density of the CPUs per rack-unit (RU) compared to traditional single-node systems. Furthermore, each of the nodes can be hot-swapped, reducing overall system downtime. Power consumption is also reduced compared to industry standard rackmount servers by sharing power supplies and cooling fans.

Image 1 - Supermicro AS-2124BT-HTR

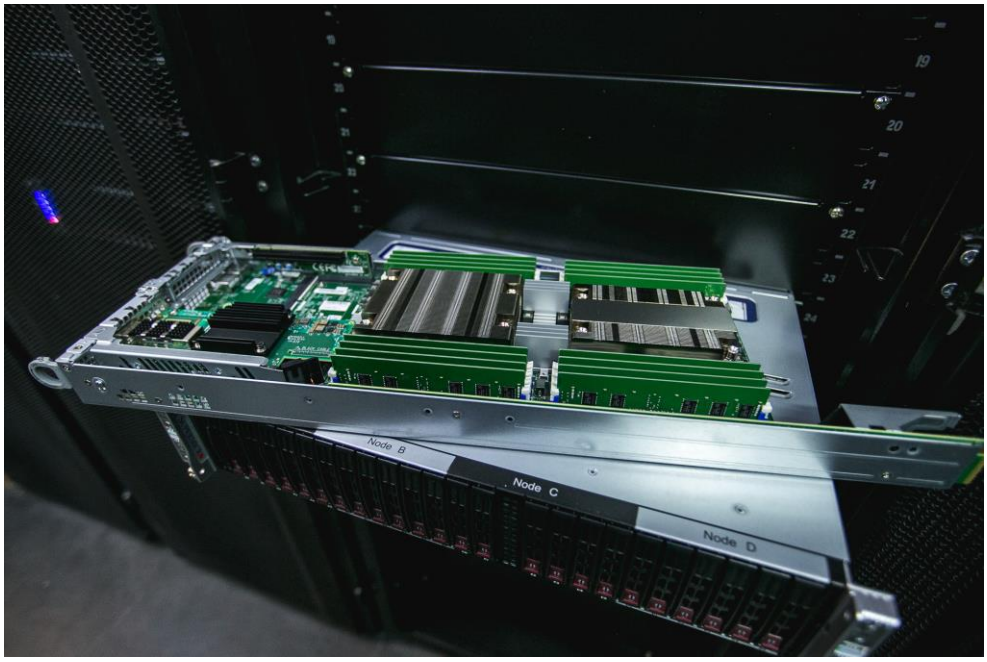

Image 2 - Single Node in a Multi-Node System

For fast networking between the nodes for applications requiring the computing power of multiple servers, an NVIDIA Mellanox InfiniBand network interface card (NIC) is part of the solution, and the cards that are internal to each of the compute and management servers. In addition, UNC chose a networking system that delivers up to 200Gbits per second for demanding multi-node applications.

UNC has named this new HPC solution the Serafin cluster. Overall, Serafin contains 60 servers with 120 of the AMD EPYC™ 7532 CPUs. The overall performance of the cluster, running compute intensive benchmarks, is over 147 Teraflops. This compute cluster is recognized as the most powerful HPC system for open research in Argentina.

Image 3 - Supermicro systems at The Universidad Nacional de Córdoba

"On the AMD side with our EPYC server processor, the challenge posed by the UNC led us to work with Supermicro and Multitech, on an HPC platform that will deliver the best teraflop-per-dollar ratio in the market, and also allow us to support the development of the scientific community of Argentina and the region."

Juan Moscoso, Regional Datacenter Sales, AMD

Benefits

Researchers are now able to run larger models and get results in less time than ever before. Many simulations can now be run with more fidelity or resolution, leading to more accurate results. Serafin built by Supermicro can deliver 5X the performance of the previous HPC cluster at UNC.

Initial testing using a handful of applications showed that applications ran from 2X to 5X faster than previously. This means that simulations that once took 24 hours to complete can now deliver results in as little as four to five hours. Also, the applications will run with more inputs and larger amounts of data due to the memory bandwidth increases and the I/O speeds. Developers realized that scaling up a simulation was easy, and much faster results could be obtained by simply using the new Supermicro cluster.

"We knew we had a limited budget, and we also knew this was a one-in-five-years opportunity of financial support. Supermicro and AMD together provided us with outstanding value for the money. We bought 50% more processing power of what we originally envisioned."

-Oscar Reula, PhD,CCAD HPC Center Director, Universidad Nacional de Córdoba.

Summary

With the additional computing power of the Serafin cluster, all state-run scientific and technological organizations will be given time on the cluster. For other entities, such as government and private companies, a simple price per core hour is available, which allows the UNC to maintain the new cluster.

Further Resources

1. Cluster Serafin - https://ccad.unc.edu.ar/equipamiento/cluster-serafin/

2. https://www.unc.edu.ar/comunicaci%C3%B3n/con-una-nueva-supercomputadora-la-unc-alcanza-el-mayor-poder-de-c%C3%B3mputo-de-argentina

SUPERMICRO

Supermicro is a global leader in high performance, green computing server technology and innovation. We provide our global customers with application-optimized servers and workstations customized with blade, storage, and GPU solutions. Our products offer proven reliability, superior design, and one of the industry's broadest array of product configurations, to fit all computational need.

For more information, visit https://www.supermicro.com

3. https://www.clarin.com/tecnologia/cordoba-inaugura-serafin-nueva-supercomputadora-homenajea-fontanarrosa_0_a2HtpBtpOc.html

4. www.supermicro.com/aplus