Academic Research | Chile

Supercharging research performance

Chile's National Laboratory for HPC

To support scientists across Chile, the country's national supercomputing lab doubled research performance per watt with an energy-efficient new HPC cluster based on Lenovo ThinkSystem servers, powered by AMD EPYC™ CPUs, AMD Instinct™ GPUs, and Lenovo Neptune® Liquid Cooling technology.

1 Customer background

Who is Chile's National Laboratory for HPC?

Chile's National Laboratory for High Performance Computing (NLHPC) is the country's premier supercomputing center. Hosted at the Mathematical Modeling Center of the University of Chile, it provides advanced computing resources to support scientific research, innovation, and technological development. NLHPC serves the national scientific community, government agencies, and industries, fostering collaboration and driving advancements in areas like climate modeling, astrophysics, and genomics. Its mission is to democratize access to HPC, enabling cutting-edge research and contributing to Chile's scientific and economic progress.

NLHPC
National Laboratory for High Performance Computing
Chile

2 The challenge

NLHPC has been providing computing resources to the scientific community in Chile for 15 years. The broad range of workloads—including big data analytics, simulation, and modeling as well as artificial intelligence (AI) and machine learning (ML)—makes the organization's infrastructure requirements complex.

"The number and diversity of users is challenging," confirms Ginés Guerrero, Executive Head of NLHPC. "Our 750 active users come from 40 different areas of research, such as quantum chemistry, bioinformatics, astronomy, nanotechnology, and physics."

2 The challenge

The most intense workloads include research into new materials to help address climate change.

Guerrero continues: “Some of our researchers are investigating a photovoltaic material that captures solar energy more efficiently. Chile also has one of the best skies to study the stars. Major international projects like ALeRCE [Automatic Learning for the Rapid Classification of Events] uses ML models to process images obtained from telescopes here in real time to detect changes to stellar phenomena such as supernovae.”

“As the National Lab of Computing in Chile, we must keep up to date with what's happening in HPC hardware. I often use the phrase: **‘if you don’t compute, you don’t compete.’** If we don't invest in computing and move forward, we will be less competitive on the world stage.”

Ginés Guerrero

Executive Head, NLHPC

3 The solution

Power meets efficiency

When NLHPC set out to refresh its cluster, performance and energy efficiency were the organization's key concerns.

NLHPC's new cluster runs 27 Lenovo ThinkSystem SR645 V3 servers powered by dual 128-core 4th Gen AMD EPYC™ 9754 CPUs, for a total of 6,912 cores for compute and access nodes. The cluster also includes two Lenovo ThinkSystem SR675 V3 servers, each equipped with dual-core 4th Gen AMD EPYC 9224 CPUs and six AMD Instinct™ MI210 GPUs, comprising 12 accelerators.

Hardware

Lenovo ThinkSystem SR645 V3
Lenovo ThinkSystem SR675 V3
Lenovo Neptune® Liquid Cooling
AMD EPYC™ 9754 CPUs
AMD EPYC 9224 CPUs
AMD Instinct™ MI210 GPUs

Software

AMD Infinity Hub
AMD Optimizing C/C++ Compiler
AMD ROCm™
GNU Complier Collection

3 The solution

Doubling performance per watt

The Lenovo ThinkSystem servers use Lenovo Neptune® Liquid Cooling technologies for efficient heat removal, helping to maintain CPU and GPU operating temperatures during intensive AI and ML workloads.

“When we were installing the servers and running the testing, we were surprised by the results,” says Guerrero. “Our testing was very diverse. We had compiled at least 100 workloads, and we also employed the LINPACK benchmark. When we ran this on the previous architecture, we saw that the performance was up to 60% lower than the maximum theoretical one. With the current cluster, we obtained more than 100% of the theoretical maximum. The energy that the previous cluster needed was also double the new one for the same results. With Lenovo ThinkSystem servers powered by AMD EPYC CPUs, we obtained four times more performance with LINPACK at just double the energy.”

3 The solution

Sharing resources

With an open and associative operating model, the NLHPC serves academia, government, and the private sector. Many of its partner institutions are interconnected through the REUNA (National University Network) high-speed network. Any Chilean institution, whether affiliated or not, can use the services of the NLHPC.

“The most important thing for us is to be able to contribute to Chile making scientific progress,” says Guerrero. “The more resources we can offer, the greater impact it has on the entire community.”

3 The solution

Advancing AI in Chile

Today, NLHPC provides the HPC infrastructure necessary for training AI and ML models. This will help partner institutions advance research and develop technological solutions for industry.

Building upon its established national mission, NLHPC has now secured the country's largest-ever investment in this field. It has been awarded a strategic USD$7 million grant from CORFO, the National Corporation for Economic Development, to create the SCAI-Lab: Supercomputing Laboratory for Artificial Intelligence. This project represents an unprecedented national alliance, uniting 65 academic and industrial institutions to build a robust ecosystem that will foster innovation, enhance productivity in key economic sectors, and accelerate AI adoption across Chile.

3 The solution

Guerrero comments: "This award culminates a 15-year journey of building trust and a national community. SCAI-Lab is not just about a new machine; it's a collaborative platform designed to connect our country's top research talent with real-world industrial challenges. We will democratize access to world-class AI tools, enabling our startups to scale, our industries to become more productive, and our government to deliver better services. This project is about building Chile's technological sovereignty and ensuring that we are active players, not just spectators, in the global AI revolution."

4 The results

Based on Lenovo and AMD technology, NLHPC's new cluster delivers exceptional performance while dramatically improving energy efficiency.

"By combining Lenovo Neptune® Liquid Cooling technology and high-performance AMD Instinct MI210 GPUs, we can run more floating-point operations per second with more energy efficiency," notes Guerrero. "This technology is particularly valuable for groups working on molecular dynamics simulations."

4 The results

Feedback from users across all disciplines has been overwhelmingly positive.

“A user running the Weather Research & Forecasting [WRF] Model told us that their workload was executing much faster than before,” says Guerrero. “The Nanoscale Molecular Dynamics [NAMD] model was another software application showing great performance improvement.”

- 6,912 high-performance AMD EPYC™ CPU cores
- Energy-efficient HPC with Lenovo Neptune® Liquid Cooling
- Twice the performance per watt compared to the previous cluster

“Our new HPC architecture is impeccable. The collaboration between the NLHPC, AMD, and Lenovo was the key to offering **the best solution with more performance and the best energy efficiency**. It has really been incredible.”

Ginés Guerrero

Executive Head, NLHPC

Why Lenovo and AMD?

Like every institution relying on public funding, NLHPC needs the best performance it can get while keeping within national goals for sustainability.

The combination of Lenovo Neptune® Liquid Cooling technology and energy-efficient AMD EPYC™ CPUs made Lenovo ThinkSystem SR645 V3 and SR675 V3 servers the ideal foundation for the organization's new HPC cluster.

"On the TOP500 list of all the supercomputers in the world, it's clear that AMD processors are gaining ground," adds Guerrero.

How can you make HPC more energy efficient?

Chile's National Laboratory for HPC doubled performance per watt with a new cluster based on Lenovo and AMD technology.

Explore Lenovo HPC Solutions