

CESGA extends supercomputing beyond “the end of the earth” with powerful Linux cluster of HP Integrity servers



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—Javier Garcia Tobio, Managing Director, CESGA



HP customer case study: the Supercomputing Center of Galicia (CESGA)

Industry: scientific and academic research

Reaching for the beginning of the unknown

Santiago de Compostela, the capital of Galicia in northwest Spain, attracts visitors from all over the world to view its beautiful historical monuments. Surrounded by the past, the Supercomputing Center of Galicia (CESGA) is now home to the future of technical and scientific innovation, driven by one of the largest and fastest supercomputers in the world called Finis Terrae. In fact, Finis Terrae is one of the 500 fastest supercomputers in the world according to TOP500.org. Powering this massive machine is a sophisticated HP Cluster Platform 6000 driven by HP Integrity servers with Intel Itanium processors.

“Finis Terrae is a Latin phrase that means ‘the end of the earth,’ which is also the beginning of the unknown,” explains Salustiano Mato de la Iglesia, President, CESGA. “It’s a fitting name for our supercomputer, because the powerful system is opening up new research frontiers—allowing us to make known what is currently unknown.”

Enabling more comprehensive research and faster discoveries

As a major center for high-performance computing (HPC) and communications, CESGA provides a wide range of advanced services used by the scientific and academic communities of Galicia and the Spanish National Research Council. CESGA is also working closely with other research centers throughout Europe. Physicists, chemists, engineers, and earth and life scientists in these organizations rely on the speed and capacity of Finis Terrae to conduct highly complex research and analysis that lead to bold new discoveries—and do so faster than ever before.

Objective

Become a world-class center of high-performance computing (HPC) and advanced communication for research, development, and innovation

Approach

- Build one of the largest shared-memory supercomputers in the world called Finis Terrae
- Implement a powerful HP Cluster Platform 6000 supercomputing solution
- Engage HP Consulting & Integration Services to design the data center and deploy the sophisticated cluster

Business technology improvements

- Reduced time to perform complex calculations from days to minutes
- Improved system availability to support 24x7 services
- Simplified computing environment by running multiple processors and large amounts of memory on a single system
- Gained a reliable and adaptive infrastructure for ever-changing research requirements

Business outcomes

- Opened up vast new opportunities for discovery while reducing researchers’ time-to-solution
- Enabled researchers to define problems with dimensions that were previously unimaginable
- Achieved faster scientific discoveries, enabling real-time analysis and decision-making
- Expanded the frontiers of knowledge and deepened the transfer of technology to contribute to society’s well-being



To meet these needs, Finis Terrae is built on a high-performance computing cluster made up of 142 HP Integrity rx7640 Servers and three HP Integrity Superdome Servers, primarily running Novell SUSE Linux Enterprise Server 10, along with HP-UX 11i. This adaptive infrastructure delivers the power required to perform computations on massive volumes of data.

“It is essential for researchers to develop and define their algorithms using the most advanced hardware and software available,” explains Javier Garcia Tobio, managing director, CESGA. “Thanks to this new Finis Terrae architecture with HP Integrity servers and Intel Itanium technology, our researchers have broadened their horizons and can define their problems with dimensions that were previously unimaginable. These capabilities are enabling more comprehensive research and faster discoveries.”

Meeting diverse research requirements

Working with HP Services and Intel to design and deploy Finis Terrae, CESGA has achieved a precise balance between very high computing speed and problem size, tailored to the diverse needs of the research community. The HP Integrity solution includes more than 2,500 processors and nearly 20 terabytes of main memory, which allows CESGA to address major computing challenges as well as the typical problems that researchers face every day. Case in point: radiotherapy research.

“One of our main problems when simulating radiotherapy treatments is understanding how a patient handles a certain radiation dose,” notes Faustino Gomez, researcher, Santiago de Compostela University. “With CESGA, calculations that used to take several days can be done in minutes, so radiotherapists can adjust prescriptions almost in real time. This has a huge impact on the effectiveness of life-saving cancer treatment.”

The power of Finis Terrae and HP Integrity servers is also critical to time-sensitive services such as weather reporting. Clients such as MeteoGalicía require the machine to be stable and operational 365 days a year, 24 hours a day.

“As a weather service, we cannot fail to provide a forecast every single day,” says Vicente Perez Munuzuri, director of MeteoGalicía. “Needless to say, meteorology has seen exponential growth in recent years. We therefore require ever more supercomputing resources to improve meteorological and oceanographic models by increasing their resolution, thus improving our predictions. With the enormous capacity, performance, and high availability of its HP Integrity infrastructure, CESGA enables us to perform highly complex calculations and modeling to deliver forecasts that are more accurate and timely than ever before.”

Soaring to new heights with cloud-enabled computing

In many ways, CESGA represents the future of supercomputing, delivering levels of speed and capacity that have opened up vast new opportunities for academic and scientific research. For example, CESGA has long been a pioneer in the concept of cloud-enabled computing. To achieve this computing approach effectively, it is essential to mask the underlying complexity and provide end users with the precise computing and data resources they need at any given moment. HP Integrity servers running Linux enable CESGA to do just that.

“The combination of Linux and HP Integrity [servers] is perfect for researchers, as they can use the machine to solve problems in a way that’s familiar,” says Ignacio Lopez, CESGA’s Technical Director. “There is no need for them to invest a lot of time in learning a new system. In addition, the HP solution provides the flexibility to adapt the machine’s set-up to changing user requirements.

“The HP solution has several features that benefit us,” adds Lopez, “including the fact that you can put a large number of processors and lots of memory on the same box, and the architecture is not confusing to the user. HP has demonstrated expertise in the systems and the technologies required to set up a solution of this kind.”

CESGA also requires a cost-effective tool that can expand to accommodate future growth. With an adaptive infrastructure built on the Linux-based Integrity server cluster from HP, CESGA has gained the ideal combination of high performance, high availability, and scalability required to meet its current and future needs.

Customer solution at a glance

Primary applications

- The Supercomputing Center of Galicia (CESGA) is a center for high-performance computing, communications, and advanced services used by the scientific community of Galicia, the Galicia university system, and the Spanish National Research Council (CSIC).
- Through its advanced supercomputing system, Finis Terrae, CESGA provides high-performance computing technologies, open source applications, and advanced communication for research, development, and innovation in the fields of high-energy physics, nanotechnology, life sciences, weather forecasting, climate modeling, molecular design, and others.

Primary hardware

- HP Cluster Platform 6000 delivering 16 teraflop/s by leveraging:
 - Three HP Integrity Superdome Servers with Intel Itanium processors with 1.3 terabytes (TB) of memory
 - 142 HP Integrity rx7640 Servers with Intel Itanium processor 9100 series (each with 8 Intel Itanium dual-core processors and 128 GB of memory)
 - Over 19 TB of shared memory
 - 20 Gigabits-per-second (Gbps) high-speed, low-latency InfiniBand cluster interconnect
 - HP StorageWorks Scalable File Share (SFS) parallel file system that manages 390 TB of storage, including 219 TB on HP StorageWorks Modular Smart Array systems

Primary software

- HP-UX 11i v2
- Novell SUSE Linux Enterprise Server 10
- HP StorageWorks Scalable File Share

Services from HP

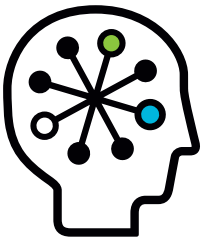
- HP Consulting & Integration Services to design data center and deploy cluster

Exploring beyond the end of the earth

As CESGA continues to evolve, it can do so with confidence that the underlying HP infrastructure will adapt with the full support and continued collaboration of the company standing behind it.

Javier Garcia Tobio summarizes his satisfaction and pride in the long-term value of Finis Terrae and the technology HP implemented at CESGA: "Our future will always be dependent on the evolution of technology. Through our partnership with HP, we have access to information and expertise that helps us to better define our future steps. The collaboration has been excellent."

Salustiano Mato de la Iglesia agrees and concludes that CESGA has the solution it needs to take advanced research beyond the end of the earth. "HP provided us with an amazing capacity for technological development and a novel supercomputing architecture that is redefining academic and scientific research," he says. "The first computing challenges we have run demonstrated its capacity. And thanks to its advanced capabilities, some of the most difficult mathematical problems of the century are being tackled today. The CESGA-HP collaboration will continue to make us stronger and help us reach our goal of becoming the supercomputing leaders in Europe."



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