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Supercomputing Beyond the Horizon

ITER uses Intel® technology to position the Canary Islands as a European leader in high-performance computing

ITER Instituto Tecnológico y de Energías Renovables S.A.

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Jesús Rodríguez Álamo,
Chief Information Officer,
ITER

The Technological Institute of Renewable Energies (ITER) was founded by the Island Council of Tenerife in 1990. Its purpose is to conduct research into ways of reducing the island's dependency on externally-supplied energy by maximizing its own clean, natural energy resources (such as wind and geothermal activity). It is also committed to making a contribution to the island's society through other activities such as seismic-volcanic surveillance, environmental control and the development of information and communication technology (ICT).

Challenges
- **Local power.** ITER helps Tenerife generate energy from natural resources as effectively and cost efficiently as possible
- **Optimize investment.** Following data center upgrades and the laying of a new fiber optic cable to the mainland, ITER had an opportunity to boost its computing capabilities further
- **Support business.** It wanted to share any new ICT resources with the Canarian business community to enhance the region's international competitiveness

Solutions
- **Intel advantage.** The chosen platform is powered by Fujitsu PRIMERGY* CX250 servers with Intel® Xeon® processors E5 family. Intel® Compilers enhance application performance
- **Cost effective.** The combination of energy efficiency and performance enabled the solution provided by Atos, Fujitsu and Intel to deliver the most compelling total cost of ownership (TCO)

Impact
- **Energy savings.** According to internal tests, more accurate weather predictions enable ITER to save nearly 75 percent of the costs associated with deviations from energy-production forecasts
- **Diverse users.** Local organizations including universities and audiovisual companies can now access advanced high-performance computing resources
- **European player.** Atos plans to connect the supercomputer to the Helix Nebula* European Cloud Partnership

Harnessing island energy

Energy production is a constant challenge, particularly for island communities that often have to rely on distant mainland supplies. Wanting to avoid the high costs and complex logistics involved in drawing its energy from the Spanish national grid, the Island Council of Tenerife in the Canary Islands is committed to generating as much of its own power as possible. ITER's task is to ensure that its own energy-providing resources are identified and used in the most efficient way possible. This involves extensive, ongoing research and complex calculations.

A connected island

The team at ITER invested heavily in upgrading various parts of its data centers and ICT resources to ensure it can continue to meet the computational demands placed upon it. This investment even extended to installing a new submarine cable to deliver superior levels of Internet connectivity to the island. With these new resources in place, ITER wanted to take one final step and create its own supercomputer.

"We wanted to make the most of our improved connectivity and data centers to build a powerful, European-class supercomputer that would benefit not only our own researchers, but also any other organizations in the Canary Islands that need enhanced computing power to make them more competitive," explains Jesús Rodríguez Álamo, chief information officer, ITER. "Being separated from the European mainland presents a challenge for many businesses in the Canaries, so we want to help the region become more connected and better equipped to participate in the European economy."

Intel® technology powers Spain's second largest supercomputer

Complex user needs

Given that it planned to make its new high-performance computing platform available to a variety of users, ITER needed to ensure that whatever solution it chose would offer the flexibility and performance necessary to handle a complex range of applications. As an energy-focused organization, it also prioritized power efficiency. Having secured a loan from the Spanish government to invest in the new platform, ITER also needed to ensure that the total cost of ownership was reasonable.

After assessing a range of technology vendors, processor technologies and systems integrators, the organization chose Atos to manage the project, using Fujitsu servers powered by the Intel Xeon processor E5 family. "We felt that this combination offered us all the features we needed," says Rodríguez Álamo. "With Intel® technology, we benefit from advanced performance and energy efficiency. Intel Compilers, which are included in the solution, enable us to make sure all applications function optimally as well. All these advantages combine to make this solution the most cost effective in the long term."

The supercomputer that Atos delivered for ITER was named TEIDE (after Tenerife's primary volcano and the highest point in Spain). It includes 1,100 Fujitsu PRIMERGY CX250 servers, powered by dual-core Intel Xeon processors E5 family. It also features three types of connectivity, including InfiniBand* for supercomputing, double 1GB Ethernet for each server and 10GB Ethernet for each node. Advanced cooling capabilities, extensive storage capacity and high power density are also featured. TEIDE is the second largest supercomputer in all of Spain, and ranks 138th internationally on both the Top 500 and Green 500 lists. All the energy used by TEIDE HPC and the D-ALiX Datacenter that houses it comes from renewable sources, combining both the power of wind farms and photovoltaic plants located at ITER.

Performing internationally

With the implementation complete, ITER can now offer its supercomputing platform to a range of users. Its own researchers can now run their simulation and research applications much more efficiently, generating more accurate results more quickly. "We're able to be much more accurate in our weather predictions for the region now, for example," explains Rodríguez Álamo. "Given that so much of our energy comes from weather-dependent sources, like wind power, this is a great advantage. Any electricity that we need in addition to what we can generate ourselves needs to be drawn from the Spanish national grid. The grid requires us to predict in advance how much energy we'll produce and consume from the grid, and we're fined if we get our predictions wrong. So the more accurate we can be about our anticipated power needs, the more we save. In fact, internal estimates indicate that we are now paying just 25 percent of what we used to due to these deviations."
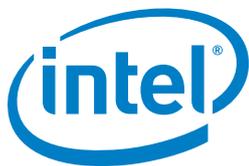
Meanwhile, a number of local organizations are also hiring computing resource from ITER. These include a diverse mix, from local university scientists to audiovisual companies needing to develop advanced graphics and special effects.

Lessons Learned

Building a high-performance computing platform is no simple task. It requires coordination, investment and careful planning. Getting the best possible return on all this is important. By carefully selecting a flexible, efficient Intel® technology-powered platform, ITER ensured that the TEIDE supercomputer delivered value not only for its own employees, but also for the wider Canarian business community and its international research peers.

Atos also has big ambitions for TEIDE. It is planning to take advantage of the superior connectivity provided by the new submarine fiber optic cable to link ITER's platform to the Helix Nebula European Cloud Partnership. This high-performance computing collaboration includes other leading organizations such as CERN and the European Space Agency. Rodríguez Álamo concludes: "By participating in this community of ground-breaking research institutions, we're able to take our place among the supercomputing leaders in our region. And we look forward to playing a role in opening up advanced computing capabilities for western Africa as well. Furthermore, we've provided a route for other organizations in the Canaries to operate at a European, even global, level."

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