Barcelona Supercomputing Center
Pushing the boundaries of human knowledge

Climate change. Energy security. Fighting disease. Air quality. To help scientists turn mountains of data into accurate models of our complex world, BSC has powered up a Lenovo supercomputer capable of performing trillions of computations per second.

More than 10,000 people visit the Chapel Torre Girona in the outskirts of Barcelona every year, many traveling far and wide from all across Europe to get there. But this is a pilgrimage with a difference. They're here to visit MareNostrum 4, one of the most powerful supercomputers in the world, and take advantage of its next-generation, high performance computing resources.

Supercomputers are critically important to scientific research today – computation is often called the third fundamental pillar of science, after theory and experimentation. By accelerating complex calculations and enabling the creation of detailed models and simulations, supercomputers can help scientists understand and then predict the outcomes of massive, complex, nonlinear data sets.

For the researchers visiting Barcelona, one thing's for sure: the more computing power, the better. That's why BSC teamed up with Lenovo and IBM to replace its existing supercomputer, MareNostrum 3, with a bigger, better, more powerful system.

MareNostrum 4 is made up of 48 racks with 3,456 Lenovo ThinkSystem SD530 nodes connected by more than 60km of high speed Intel® OmniPath® network cabling. Powered by the Intel Xeon® Platinum processor family, each node performs more than 3.2 trillion calculations per second, providing a total cluster capacity of 11.1 petaFLOPS. This means it will be able to perform more than 11 billion operations per second – ten times more than the MareNostrum 3, which was installed between 2012 and 2013. At the time of this writing, MareNostrum 4 is the highest performing supercomputer in the world based on the next generation of x86 servers.

"The newly launched x86 ThinkSystem platform provides us with ten times more processing power than the previous MareNostrum supercomputer, allowing BSC to continue the type of scientific research that enhances humanity's efforts to seek new knowledge and drive progress," says Sergi Girona, Operations Director, BSC.

According to the TOP500 ranking published in June 2017, MareNostrum 4 is the third most powerful supercomputer in Europe and the 13th in the world. The TOP500 list is based on how quickly supercomputer execute the high-performance LINPACK benchmark.

Despite being ten times faster than its predecessor, MareNostrum 4 uses only 30 percent more energy at 1.3 MW a year. It has been recognized as one of the top ten systems in Europe on the GREEN500 list of most energy-efficient supercomputers.

Potentially ground-breaking research is being conducted under the arches of the Torre Girona: a divine setting for scientists striving to change the world for the better.

Today, scientists from across Europe are using MareNostrum 4 to support research in fields as diverse as genome sequencing and linguistics, geophysics and pharmaceuticals. Some major projects going on right now include research into the causes and effects of climate change, and trying to find solutions to global challenges around energy security, air quality and fighting disease.

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