The PRACE Project and the Spanish Supercomputing Network (RES): SUPERCOMPUTERS COMPETING WITH THE FASTEST IN THE WORLD

RedIRIS's advanced communications network is capable of transmitting huge amounts of data generated by supercomputers that perform more than one billion operations per second.

Among the European e-infrastructure projects, PRACE (Partnership for Advanced Computing in Europe) stands out, linking together several major supercomputers in Europe. Its mission is to provide resources and services to top-level international scientific research (specifically European) related to areas of great impact for the benefit of society, such as genomics, materials science, meteorology and biomedicine.

Furthermore, at a national level, it has launched the Spanish Supercomputing Network (RES), a set of supercomputers distributed throughout the country and connected by high-capacity links such as those of RedIRIS, which aims to meet the growing research computing needs in Spain.

PRACE and RES have the same objectives (providing high-capacity computing services to accommodate R&D+i activity), and both work with the Barcelona Supercomputing Centre-National Supercomputing Centre (BSC-CNS). The mission of this centre is key to this area, since it is responsible for MareNostrum (the most powerful science supercomputer in Spain), and it actively participates in managing PRACE and is the coordinator of the RES.

PRACE Project

In 2007, Spain (through the BSC-CNS), France, Italy and Germany planned a pan-European infrastructure for HPC (High Performance Computing) to share resources throughout the European scientific community. In 2010, the four countries (hosting members) founded PRACE AISBL (Association for Advanced Computing in Europe) in Belgium with an expected cost of €400 million for 2010-2015.

PRACE is a distributed infrastructure of six interconnected supercomputers with category Tier0 and processing capabilities measured in Petaflops. These supercomputers are called Marenostrum (Spain), FERMI (Italy), Hermit, JUQUEEN and SuperMUC (Germany) and CURIE (France).

MareNostrum Supercomputer, inside the Torre Girona Chapel (Barcelona)

→ "The collaboration with RedIRIS allows us to connect and coordinate with the Spanish nodes of the RES project and with the PRACE project network in which the most powerful supercomputers in Europe are found and can be interacted with. Thanks to this, we can actively participate in large-scale European supercomputing and data management projects like EUDAT, Human Brain Project and CLL Genome, always with the highest capacity and security guarantees".

Sergi Girona, Operations Director at the Barcelona Supercomputing Centre (BSC-CNS) and Director of PRACE aisbl

→ "The direct fibre optic connection of the IFCA to RedIRIS-NOVA allows scientists from around the world to connect and work on the Altamira supercomputer as if the computer was in their own research centre. Furthermore, its high capacity allows the IFCA to exchange a high volume of scientific data, hundreds of Terabytes, with other national and international research centres.

Jesús Marco de Lucas. Head of the Altamira node, Institute of Physics of Cantabria (IFCA)

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PRACE manages the network, distributes computational hours requested by scientists (of competitive access), dedicates resources to education and coordinates the HPC resources of national Tier1 nodes. According to 2012 data, Spain was assigned more than 341 million hours of computing for R&D projects that same year.

Since its inception, 20 other European states have joined PRACE as non-hosting members, including the United

Spanish Supercomputing Network

Among the centres that house supercomputers in the RES system is the Institute of Physics of Cantabria (IFCA), which manages the Altamira node. The IFCA is a centre from both the Spanish National Research Council (CSIC) and the University of Cantabria, with its main research areas being Astrophysics and Structure of Matter. Altamira, which can perform up to 74 trillion operations per second, has become a powerful driver for the scientific activities of the University and the region as a whole.
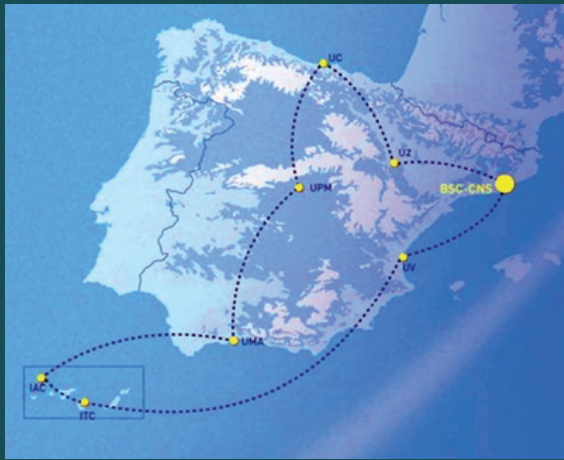
Kingdom, the Netherlands, Portugal and Switzerland. This rapid growth demonstrates the huge interest generated for PRACE as the main computing tool for scientific and industrial innovation in Europe.

Spanish Supercomputing Network

The Spanish Supercomputing Network (RES), created in 2006 by the former Ministry of Education and Science, is made up of a set of supercomputers distributed and interconnected by high-capacity links, such as those of RedIRIS, whose mission is to satisfy the computing needs of R&D groups led by researchers with Spanish nationality.

The network consists of ten supercomputers: MareNostrum, MinoTauro and SGI Altix, managed by the BSC-SCN (Barcelona), Magerit (CeSViMa. Supercomputing and Visualisation Centre of Madrid, Polytechnic University of Madrid), Altamira (IFCA Institute of Physics of Cantabria, University of Cantabria), LaPalma (Astrophysics Institute of the Canary Islands), Picasso (University of Malaga), Tirant (University of Valencia)

CaesarAugusta (BIFI. Institute for Biocomputation and Physics of Complex Systems, University of Zaragoza) and Atlante (Technological Institute of the Canary Islands, University of Las Palmas de Gran Canaria). All use the GNU/Linux free software operating system.

Resource allocation is carried out on a quarterly basis and applications are evaluated by an Access Committee organised into four panels: Astronomy, Space and Earth Sciences; Biomedicine and Life Sciences; Mathematics, Physics and Engineering; Chemistry, Science and Technology of Materials.

The RES is coordinated by the BSC-CNS, a consortium formed in 2005 by the Ministry of Education and Science, the Generalitat de Catalunya and the Polytechnic University of Catalonia. The centre provides powerful computing infrastructure which serves the science and technology community, both national and international, and public and private, connected to other centres and institutions in their field through high-capacity communications networks such as RedIRIS.