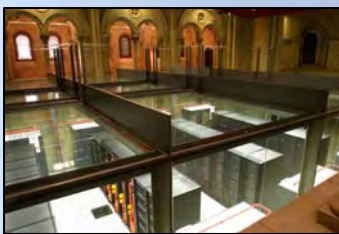


### KEY FACTS

#### Overview:

BSC, The Barcelona Supercomputing Center, is a public research center located in Barcelona, Spain. It houses MareNostrum, Europe's most powerful (and the world's fifth most powerful) super-computer.



#### Challenges:

- Resource allocation
- Failure handling
- Data staging
- Resource utilization

#### Solution:

Moab Cluster Suite was selected by BSC to optimize scheduling, workload, & resource management of all research projects running on MareNostrum.

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## MareNostrum Utilizes Moab and SLURM for Enhanced Performance

*THE BARCELONA SUPERCOMPUTING CENTER USES MOAB SCHEDULING & RESOURCE MANAGEMENT SOFTWARE TO BOOST EFFICIENCY LEVELS*

### ABOUT BARCELONA SUPERCOMPUTING CENTER (BSC)

The Barcelona Supercomputing Center (BSC), or Centro Nacional de Supercomputación (CNS), is a public research center located in Barcelona, Spain. It houses MareNostrum, Europe's most powerful (and the world's fifth most powerful) supercomputer as of the November 2006 Top500 list.

In 2004 the Ministry of Education (Spanish Government), Generalitat de Catalunya (local Catalan Government), and Technical University of Catalonia (UPC) took the initiative to create the Supercomputing Center. BSC is a research center focused in Computer Sciences, Life Sciences and Earth Sciences. BSC brings together a critical mass of researchers, high performance computing experts, and cutting-edge supercomputing technologies to foster scientific progress.

### CHALLENGE

The Barcelona Supercomputing Center had four key issues that they needed to address: resource allocation with regard to policies and politics, failure handling, data staging and resource utilization.

### SOLUTION

BSC selected Moab Cluster Suite and SLURM to optimize the scheduling, workload and resource management of all research projects running on MareNostrum. The Moab-SLURM solution adds significant manageability and optimization to MareNostrum.

Moab Cluster Suite from Cluster Resources is an advanced workload manager and scheduler capable of optimizing node allocation and scheduling decisions. The software allows BSC to gain extensive control over which jobs are considered eligible for scheduling, how the jobs are prioritized, and where the jobs will run. Moab also simplifies and unifies management and acts as a flexible policy engine that guarantees service levels and speeds job processing.

Moab is used as an external scheduler for the SLURM resource manager. SLURM, developed at Lawrence Livermore National Laboratory, is an open-source resource manager utilized on some of the most powerful supercomputers including BlueGene/L and ASC Purple (both of which also are Moab licensed systems).

*“One of the important characteristics of the Moab-SLURM solution is its ability to handle applications running simultaneously across a very large number of MareNostrum’s processors...”*

— Sergi Girona  
BSC Operations Director

The combination of Moab and SLURM optimizes the system performance of MareNostrum, allowing BSC to conduct scientific projects more efficiently. "One of the important characteristics of the Moab-SLURM solution is its ability to handle applications simultaneously running across a very large number of MareNostrum's processors..." noted Sergi Girona, BSC Operations Director.

With a Linux based operating system, the supercomputer takes up 120 square meters and weighs in at 40,000 kilograms (approximately 44 tons). It consists of 2,560 JS21 blade computing nodes, each made up of 2 dual-core 2.3 gigahertz IBM 64-bit PowerPC 970 processors (10,240 compute cores).



In November 2006, MareNostrum's capacity was increased due to the large demand of scientific projects. BSC increased the calculation capacity of the MareNostrum supercomputer to 94.21 Teraflops (94.21 trillion operations per second), almost doubling its previous capacity. It went from 4,812 processors to 10,240 processors.

Research projects for the human genome project, weather forecasting, protein research, and pharmaceutical research all use MareNostrum. The overall goal of this supercomputer, like many others of its class, is to increase human knowledge in all of these areas. Questions that have baffled scientists for centuries can now be organized and studied in a compute environment, increasing the chances of discovering new technologies and answers to scientific questions.

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