ONE BILLION UNKNOWNS SOLVED WITH THE FINISTERRAE

HEMCUVE GROUP BEATS AGAIN THE WORLD RECORD IN COMPUTATIONAL ELECTROMAGNETISM

- **It was one of the big scientific challenges of the 21st century.**

Santiago, August 18th , 2010.- Last August 15th the HEMCUVE team, formed by scientists of the universities of Extremadura and Vigo, with the collaboration of the technical personnel of the Galicia Supercomputing Centre, CESGA, have analyzed with the supercomputer FinisTerrae, the major electromagnetic problem of the history, containing **more than ONE BILLION unknowns**. The attainment of this new mark overcomes one of the big scientific challenges of the computational electromagnetism of the 21st century.

The problem analyzed is the RCS (radar cross section) of the NASA Almond (a typical surface oblong-shaped for electromagnetic analysis) to the approximate frequency of 3.5 THz. For the analysis, were used a total of **1,024 Itanium processors, 4.3 TB of RAM and less than 24 hours total count** in the Supercomputer FinisTerrae. The storage of the amount of information required for a system of one billion unknowns would require an amount of DVD's that would cover the distance between Earth and Moon.

The algorithm used in the challenge, **HEMCUVE++**, is able of use efficiently a large number of processors with large amount of memory, taking advantage of the power of large supercomputers. It is the result of a process of continuous development, initiated in 1999 through a project funded by NAVANTIA. The development of this algorithm and the collaboration of technicians and researchers from the supercomputing centres of Galicia, CESGA, and Extremadura, CenitS, have enabled the group to successively break several world records in this field.

The work has been carried out through an access to the ICTS CESGA funded by the Spanish Ministry of Science and Innovation, (reference ICTS-2009-40). This action responds to several of the milestones that the team is developing in the Project **Consolider-Ingenio TERASENSE**, where they are developing new methodologies and equipment in the field of terahertz and nanotechnology.

The range of possible applications is very broad as well and goes from the electromagnetic problems in the design of large structures with radio systems, such as ships, aircraft and land vehicles to the application of computational electromagnetism in areas like Biomedicine, metamaterials design or development of ground penetrating radars for landmine detection, underground geological structures, etc.

The HEMCUVE group have received international awards like the Itanium Innovation and PRACE 2009 for its contributions to electromagnetism in supercomputing. The group is led by professors José Manuel Taboada and Luís Landesa at the University of Extremadura and Fernando Obelleiro and José Luis Rodríguez and the University

of Vigo. Technicians and researchers from CESGA and CenitS have participated in the development of the subsequent challenges.

The Galicia Supercomputing Centre (CESGA) is a non-profit Foundation at the service of scientific research since 1993. CESGA has the mission of contributing to the advancement of science and technology through research and application of High Performance Computing and Communications, in collaboration with other institutions, for the benefit of society. The Regional Government of Galicia (Xunta de Galicia) and the Spanish National Research Council (CSIC) participate as partners in CESGA. CESGA's infrastructures have been partially funded by the European Union through the European Regional Development Fund (ERDF) and by the Government of Spain through the Ministry of Science and Innovation (MICINN) as well as by the Xunta de Galicia and CSIC.

More information:
www.cesga.es
http://icts.cesga.es/index.php
http://iqbriu.uvigo.es/index.php
http://recordmundo.blogspot.com/2010/08/billion-one-challenge.html

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