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“Helios” supercomputer excels in acceptance tests and gets ready to perform complex plasma calculations.

The supercomputer is operational according to schedule at the International Fusion Energy Research Centre (IFERC) hosted by the Japanese Atomic Energy Authority (JAEA) in Rokkasho, Japan. The machine that was manufactured by Bull and whose mission is to perform complex calculations for plasma physics and fusion technology, has passed its acceptance tests achieving 1,132 Petaflops LINPACK performance. The Computer Simulation Centre (CSC), where “Helios” operates, is an important component of Europe’s contribution to the Broader Approach (BA), an agreement signed between Europe and Japan to complement the ITER project through various R&D activities in the field of nuclear fusion. The European participation to the BA is coordinated by Fusion for Energy (F4E), the European Union’s organisation managing Europe’s contribution to ITER. The supercomputer was provided by France as a part of its voluntary contribution to the BA, through a contract between the Commissariat à l’Energie Atomique et aux Energies Alternatives (CEA) and Bull.

The acceptance tests of the supercomputer were carried out between 13-22 December 2011 in Rokkasho, Japan. The tight construction schedule was successfully met offsetting any disruptions caused by the great East-Japan earthquake in March 2011. It’s a first for a large piece of equipment stemming from an international scientific collaboration, to be procured by a European team and get assembled in Japan. The installation of the equipment was completed in early December and by the end of the month a 1.132 Petaflops LINPACK¹ performance was achieved, ranking “Helios” on the fifth position of the TOP-500 November 2011 list.

The operation of the supercomputer will kick off with four high-visibility runs otherwise known as “lighthouse projects” which are expected to shed light on plasma calculations. From January to March 2012, the four selected codes will run one at a time to test-drive the capacities of the supercomputer and achieve maximum performance. The first call for proposals has attracted high numbers from both European and Japanese researchers, and submissions are under review. It is expected that routine operation will start in April 2012.

Based on the number of proposals submitted to the first call, there has been an oversubscription by a factor of three of the computer’s time, demonstrating the great interest from the European and Japanese fusion communities to use the supercomputer facility. The majority of proposals address issues related to plasma physics (turbulence, MHD, edge physics and integrated modeling) together with

¹ The LINPACK benchmark is a measure of a computer’s floating point rate of execution. It is the performance parameter used to classify the TOP 500 list of supercomputers.

an important number of proposals addressing technology issues. Click [here](#) to view the distribution chart.

Background information

The Broader Approach Agreement

The Broader Approach Agreement between Europe and Japan is a partnership in the field of fusion energy that currently lasts until 2017 and to which both Parties contribute equally. It aims to complement the ITER project, and accelerate the realisation of fusion energy by carrying out R&D and developing advanced technologies for the future demonstration power reactor, DEMO. The EU resources for the implementation of the Broader Approach represent about 340 million EUR of European investment, mainly in-kind, and are largely provided on a voluntary basis by EU countries, under the coordination of Fusion for Energy. The supercomputer will also be used for calculations on how structural materials would behave in a fusion reactor in order to enhance their future design.

<http://www.fusionforenergy.europa.eu/understandingfusion/broaderapproach.aspx>

Helios

The supercomputer Helios, made by Bull, contains more than 70000 CPU cores linked together with a very fast interconnection network. The supercomputer, with a memory exceeding 280 TB and high speed storage system exceeding 5 PB, is complemented by a medium term storage system and a pre/post-processing and visualization system. Its memory is large enough to host a meaningful simulation of ITER.

Helios is located in Rokkasho, Japan, and will be freely available to a scientific community of more than 1,000 European and Japanese fusion researchers for five years starting from January 2012. The supercomputer is currently ranked 28th in the November 2011 list of TOP-500, with a performance of 0.360 Petaflops, obtained when only 1/3 of its cores had been assembled. It has since achieved 1.2 Petaflops, and is expected to rank in the top 20 in the June 2012 list.

<http://www.iferc.org/csc/about-csc/about-csc.htm>

Fusion for Energy

Fusion for Energy (F4E) is the European Union's organisation responsible for Europe's contribution to ITER. One of the main tasks of F4E is to work together with European industry, SMEs and research organisations to develop and provide a wide range of high technology components together with engineering, maintenance and support services for the ITER project.

F4E supports fusion R&D initiatives through the Broader Approach Agreement signed with Japan and prepares for the construction of demonstration fusion reactors (DEMO).

F4E was created by a decision of the Council of the European Union as an independent legal entity and was established in April 2007 for a period of 35 years.

Its offices are in Barcelona, Spain.

<http://www.fusionforenergy.europa.eu/>

ITER

ITER is a first-of-a-kind global collaboration. It will be the world's largest experimental fusion facility and is designed to demonstrate the scientific and technological feasibility of fusion power.

Fusion is the process which powers the sun and the stars. When light atomic nuclei fuse together to form heavier ones, a large amount of energy is released. Fusion research is aimed at developing a safe, limitless and environmentally responsible energy source.

Europe will contribute almost half of the costs of its construction, while the other six Members to this joint international venture (China, Japan, India, the Republic of Korea, the Russian Federation and the USA), will contribute equally to the rest.

The site of the ITER project is at Cadarache in the South of France.

<http://www.iter.org/default.aspx>

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