

European fusion computer comes to Jülich

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A new supercomputer will help us to understand the complex physical effects taking place inside the ITER fusion reactor. The computer known as HPC-FF will deliver computing power of about 100 teraflop/s and is optimally suited for the fusion scientists' simulation programs. The European Fusion Development Agreement (EFDA) has charged its member Forschungszentrum Jülich, one of the world's leading supercomputing centres, with constructing and operating the computer.

"We are proud that EFDA has chosen to make use of Jülich's know-how," says Prof. Achim Bachem, Chairman of the Board of Forschungszentrum Jülich. "Jülich will show what Europe can do as a supercomputing site for energy research." The concept for the supercomputer Bull HPC-FF was drawn up by the team headed by Thomas Lippert, director of the Jülich Supercomputing Centre, and optimized and implemented together with the partner companies Bull, Intel, Mellanox and ParTec. "HPC-FF will be closely coupled to the Jülich 200-teraflop system, JuRoPA, so that if required fusion researchers can access computing power totalling 300 teraflop/s," says Lippert.

"The new supercomputer in Jülich will help us to deal with the groundwork for the first fusion reactor more quickly since expensive large-scale experiments can now be complemented by intelligent and relatively cheap computer models," says Prof. Ulrich Samm, head of the Jülich nuclear fusion project. "The Jülich HPC-FF will decisively strengthen Europe's leading role in nuclear fusion research."

Fusion researchers intend to use HPC-FF's computing capacity to better understand the complex mechanisms in the fusion matter, the plasma, that reaches a temperature of 100 million degrees Celsius inside ITER. They will develop computer simulations that can reproduce important physical effects more realistically than is yet possible. Supercomputing is indispensable, for instance, for understanding the turbulent processes which determine the extraction of energy from the plasma at the material surfaces of the first wall of the burn chamber.

The HPC-FF (High Performance Computing - for Fusion) supercomputer is a best-of-breed system. It will consist of 1,080 computing nodes each equipped with two Nehalem EP Quad Core processors from Intel. The grand total of 8,640 processors will have a clock rate of 2.93 GHz each, they will be able to access 24 gigabytes of total main memory and will be water-cooled. Their total computing power of 101 teraflop/s corresponds at the present moment to 30th place in the list of the world's fastest supercomputers.

Infiniband ConnectX QDR from the Israeli company Mellanox will be used as the network. The administrative infrastructure is based on servers of the type NovaScale R422-E2 from the French supercomputer manufacturer Bull, who will supply the system and integrate it at Jülich. The cluster operating system "Parastation" will be supplied by the Munich software company ParTec. HPC-FF is being funded by the European Commission (EURATOM), the member institutes of EFDA and Forschungszentrum Jülich.

ITER will go into operation in 2018 and will be the first fusion reactor to generate at least 500 megawatts of excess power. It will thus pave the way for future fusion power plants and will make a decisive contribution to creating a carbon-dioxide-free energy supply. ITER - Latin for "the way" - will be constructed in Cadarache, in the south of France, by a consortium consisting of the European Union, Japan, the USA, China,

Russia, India and South Korea.

EFDA (European Fusion Development Agreement) is an agreement between European fusion research institutions. As the link to the European Commission, EFDA coordinates research and technological development in Europe as well as EU contributions to international projects. EFDA also very successfully operates the European fusion experiment JET in the UK, which has been existence since the mid-eighties and in which Jülich plays a major role. All EFDA member institutes will have access to the new Jülich supercomputer.

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