

## JSCNews

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Centre

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### **JURECA: Successor to JUROPA**

Since 2009, the JUROPA cluster has been an invaluable research tool for many projects at JSC and many outstanding scientific results have been obtained on the system. Now, after more than five years of successful operation, the end of life of JUROPA is approaching.

In spring 2015, JUROPA will be succeeded by a new system JURECA (Jülich Research on Exascale Cluster Architectures). This supercomputer will be provided by T-Platforms who won a competitive procurement process. JSC and the companies ParTec and T-Platforms will be engaged in a cooperative project to further improve the JURECA operation after installation and to address important research questions for next-generation cluster architectures.

Once fully installed, JURECA will consist of about 1,700 compute nodes and will have a peak performance of at least 1.6 petaflops. The majority of the compute nodes will feature two Intel Haswell E5-2680 v3 12 core CPUs and 128 GB DDR4 RAM. For applications that require even higher memory per node, the system will additionally feature about 100 nodes with double memory and about 50 nodes with 512 GB main memory each. Several visualization nodes with large memory configurations and latest-generation NVIDIA GPUs will complement the JURECA configuration and enhance the pre- and post-processing capabilities for the users.

In comparison to the JUROPA architecture, each JURECA compute node features

three times the number of cores – each with a slightly lower clock frequency but improved microarchitecture – resulting in an improvement by a factor of 10 in terms of peak floating-point performance. While JURECA – like its predecessor – has been designed by JSC as a general-purpose supercomputer to serve a wide variety of user needs, users will have to optimize their codes (e.g. by improving vectorization) to take full advantage of the performance increase offered by the new system. At the same time, the architectural changes, such as the increased core count per node, open up new possibilities for code scalability using mixed-mode parallelization techniques.

The JURECA compute nodes will be interconnected with a cutting-edge Mellanox 100 Gbps EDR InfiniBand network organized in a full fat-tree topology. JURECA will connect to the central storage cluster JUST and mount the GPFS home and work filesystems from there. This consolidation of the storage filesystems on the different compute platforms at JSC will allow users to work more easily with their data on several systems and will reduce the necessity for data movement. The filesystem bandwidth on work is projected to reach about 800 Gbps.

In addition to the major hardware improvements, JURECA will be launched with a state-of-the-art software stack such as an up-to-date Enterprise Linux distribution and a ParaStation MPI with MPI-3 support. It will also be the first large-scale system at JSC to use the open-source Slurm batch

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system in combination with the ParaStation resource management system, which has a proven track record on JUROPA and JUDGE.

In order to minimize service interruption for users, JURECA will be installed in two phases. The first phase – to be available in the second quarter of 2015 – will reach a performance level equivalent to the JUROPA system with a significantly reduced floor and energy footprint. Once users have successfully transitioned to the new machine, JUROPA will be decommissioned and the second stage of JURECA will be installed.

Until JURECA is available, JUROPA users can use the Haswell test system JUROPATEST to port and optimize their applications and prepare their workflows for the new system. Users will be informed when data migration from the work filesystem on JUROPA should begin. Information on JURECA will be available at

<http://www.fz-juelich.de/ias/jsc/jureca>.

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## Successful Scientific Visualization Contest at IEEE VIS Conference

The SimLab Climate Science at JSC and the Virtual Reality Group at RWTH Aachen hosted the Scientific Visualization contest at IEEE VIS 2014. The SimLab provided two of its satellite data products based on very recent research on volcanic emissions. The SimLab also assisted in designing the tasks and acted as jury members during the evaluation. The contestants were asked to use their state-of-the-art visualization techniques to provide new insights into the transport pathways of volcanic emissions, their potential impact on aviation safety and recent scientific questions on vertical transport mechanisms. After nine months of processing time, six submissions finally were evaluated by a jury consisting of visualization experts and domain scientists. In November 2014, the winner was announced in a dedicated session at the IEEE VIS conference in Paris and the publication by the winning team from the Visual Computing Group at the University of Magdeburg will soon appear in IEEE Computer Graphics and Applications. All entries (videos and corresponding papers) are now available at <http://www.viscontest.rwth-aachen.de/results.html>.

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## Guest Student Programme 2015

In summer 2015, JSC will again offer a guest student programme supported by CECAM and IBM. In this programme, students majoring in the natural sciences, engineering, computer science or mathematics will be given the opportunity to familiarize themselves with different aspects of scientific

computing. Together with local scientists, the participants will work on various current topics in research and development. Depending on previous knowledge and on the participant's interest, an assignment can be chosen from different areas. These fields include mathematics, physics, chemistry, neuroscience, software development tools, visualization, distributed computing, operating systems and communication. Special emphasis is placed on the use of supercomputers.

The participants are expected to have some experience in the computer-oriented branches of their subjects. The students should have completed their first degree but not yet finished their master's course. Additionally, a letter of recommendation from a university lecturer or professor is required. The programme will last ten weeks from 3 August to 9 October 2015. Students are encouraged to apply for the programme online. The closing date for applications is 31 March 2015. Further information can be found on the website at <http://www.fz-juelich.de/ias/jsc/gsp/>.

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## Jülich Researcher Bernd Mohr to Chair SC17

Jülich Supercomputing Centre proudly announces that Bernd Mohr has been elected General Chair of the SC17 Conference. This is the first time that a computer scientist from outside the USA will chair the most important conference for high-performance computing, which has been running for the last 26 years.

Mohr, who worked in the USA from 1993 to 1995, has been actively involved in the conference since 2003. In 2011, he was the first European to be elected to the SC Steering Committee. At the end of last year, in a complex application procedure, he became the first non-American to impress his peers and was elected SC17 General Chair. The venue for 2017 is Denver, Colorado.

SC, the International Conference for High-Performance Computing, Networking, Storage, and Analysis, was established in 1988 and it has taken place every year in November in various US cities since then. The conference is sponsored by the Association for Computing Machinery (ACM) and the Institute of Electrical and Electronics Engineers (IEEE). Today, SC, which is organized by volunteers, attracts about 10,000 participants from all over the world; 5,000 people alone are involved in the technical programme.

## Events

### Parallel I/O and Portable Data Formats

Instructors: JSC staff members

Date: 16-18 March 2015, 09:00-16:30

Venue: Jülich Supercomputing Centre, Ausbildungsraum 1

Registration: <http://www.fz-juelich.de/ias/jsc/events/parallelio>

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