JÜLICH
FORSCHUNGSZENTRUM

JSCNews
Jülich
Supercomputing
Centre

No. 244 • Oct. 2016

Path Finders for Future Supercomputing Deployed

This summer, pilot systems from Cray and a consortium consisting of IBM and NVIDIA were deployed at JSC. Their installation is part of an innovative procurement of R&D services started within the Human Brain Project (HBP) for developing technologies needed to realise future supercomputers for brain research. This application domain foresees a future need for the interactive steering of these computers. This not only leads to new usage models, but also different architectural requirements. One particular challenge is that large data volumes need to be rapidly analysed and visualized in parallel to an ongoing simulation. This means that the computers of the future must handle even more data than the enormous amounts they currently have to.

By means of a pre-commercial procurement tender, Forschungszentrum Jülich, supported by different HBP partners, awarded contracts to competing suppliers to develop new solutions. To evaluate the suitability of these solutions for brain research within a relevant environment, the contractors had been asked to design and deploy pilot systems.

Cray installed JULIA (a name derived from Jülich and glia cell), a system based on the latest generation Xeon Phi processors interconnected via Intel's new network technology Omni-Path, in July. By integrating DataWarp nodes with large amounts of non-volatile memory, the system is able to retain large amounts of data within the system. In September, IBM and NVIDIA installed JURON (derived from Jülich and neuron), a system based on fat nodes with new versions of the POWER8 processors and multiple NVIDIA GPUs of the new Pascal generation. Within a node they are all interconnected via the new NVLink technology. In this system, non-volatile memory is distributed across all nodes, but can be addressed globally through a newly developed software layer. For details, see *http://www.fz-juelich.de/ias/jsc/hbppilots*.

Having completed the installation, both systems will now be evaluated by neuroscientists within the HBP and experts from the supercomputing centres involved.
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JSC @ SC16

SC16, the leading international exhibition and conference on high-performance computing, networking, storage, and analysis, will take place in Salt Lake City, Utah, USA, from 13 to 18 November 2016. JSC will present its supercomputing activities at booth #2413. JSC employees will demonstrate scientific simulations on supercomputers and the supercomputing tools LLview, Scalasca, SIONlib, and UNICORE, all developed in-house. JSC's involvement in current European supercomputing activities will also be showcased, particularly its role in the Human Brain Project. Another major topic will be the enhancement of JSC's dual architecture strategy named Modular Supercomputing. The HPC section of the Jülich Aachen Research Alliance (JARA-HPC) and the DEEP

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projects will be guests at JSC's booth. JSC employees will also be on hand at the PRACE (#3000) and UNICORE (#3366) booths. As part of the conference programme, JSC employees will offer a tutorial on "Practical Hybrid Parallel Application Performance Engineering", present talks, and participate in numerous special interest group sessions and attached workshops. Detailed information on JSC's contribution to SC16 can be found at *http://www.fz-juelich.de/ias/jsc/events/sc16*.
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EUDAT Collaborative Data Infrastructure

JSC is one of fifteen European partners that recently founded the EUDAT Collaborative Data Infrastructure (EUDAT CDI). The partners consist of European data centres and operators of community repositories. EUDAT CDI is a partnership agreement that evolved from the EUDAT2020 project, funded by the Horizon 2020 programme. The goal of EUDAT CDI is to offer a long-term perspective beyond current project funding for managing scientific data, thus becoming a reliable infrastructure for scientific communities and researchers. EUDAT CDI was launched at the first EUDAT CDI Council meeting, which took place on 27 September 2016 in Krakow. At this meeting, three new partner applications for joining EUDAT CDI were accepted.

The infrastructure comprises generic or multi-domain data centres, such as JSC, and community-specific data centres. The infrastructure services are co-designed by community scientists and data service developers. EUDAT CDI offers tailored services for large research communities and generic services for small research groups and individual scientists. JSC currently operates the central user identification, a generic service for data synchronization and exchange, and community-specific services. More information on *http://www.eudat.eu*.
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A Look Back at Workshop QuAASI'16

The international workshop "Quantum Annealing and its Applications in Science and Industry (QuAASI'16)" took place from 26 to 28 July 2016 at Jülich Supercomputing Centre. The goal of the two-day workshop, followed by a D-Wave Exploration Day, was to bring together researchers from different communities to discuss both the challenges in using quantum annealing to approach the solutions of real-world problems and the requirements for the optimization and design of existing and future quantum annealing hardware.

About 60 researchers from Germany, Switzerland, the Netherlands, the United Kingdom, the United States, and Canada participated in the workshop. The talks highlighted the history of quantum annealing and the design of first quantum processors, the implementation of various optimization problems and machine learning, the study of the behaviour and performance of quantum computers (e.g. D-Wave systems), as well as the various approaches designed to extend the applicability of these devices to larger, more connected optimization problems. The D-Wave Exploration Day provided detailed insights into the hardware architecture. Programming techniques and tools available were demonstrated by remotely running examples on one of the D-Wave 2X^{TM} quantum computers with more than 1,000 qubits located at the headquarters of D-Wave Systems in Burnaby, Canada.

Today, the range of optimization problems that potentially can be solved on such a machine is still limited. Exploring the potential of quantum annealing on this operational prototypic hardware for a number of real world problems is therefore a challenge that should be taken up.
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News from MATSE Education

On 1 September 2016, 29 new students started their bachelor's course in Scientific Programming at Aachen University of Applied Sciences in combination with a training course as a MATSE (mathematical-technical software developer) at Forschungszentrum Jülich. Of these students, 25 will conduct their practical training in various institutes at Forschungszentrum Jülich, while 4 students have been placed with external partners (industrial companies). Both the vocational training and academic studies are designed to last three years. The curriculum and further information can be found at *http://www.fz-juelich.de/matse*. The application procedure for 2017 has already started.

At the end of August 2016, all 30 MATSE trainees, who started their vocational training in 2013, passed their final examinations. During a ceremony on 31 August in the auditorium, they were warmly congratulated by Heinz Gehlen from the Aachen Chamber of Commerce (IHK), Prof. Volker Sander from the Aachen University of Applied Sciences (FH Aachen), and Ulrich Ivens from the Vocational Training Centre at Forschungszentrum Jülich. The best result was achieved by Julia Valder (JSC), who achieved 96 %, the highest mark of all 137 examinees in the district of Aachen. Since 1964, more than 1,080 trainees have successfully completed this course at JSC.

As they were also enrolled on the bachelor's course in Scientific Programming at Aachen University of Applied Science (FH Aachen) at the same time, 60 % of the MATSE trainees from Forschungszentrum Jülich also graduated with a bachelor's degree, thus finishing their course in the prescribed timeframe.
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