JÜLICH Forschungszentrum | JÜLICH SUPERCOMPUTING CENTRE

JSC @ SC18

SC18, the leading international exhibition and conference on high-performance computing, networking, storage, and analysis, will take place in Dallas, Texas, USA, from 11 to 16 November 2018. This year's central topic at JSC booth #3453 will be the concept of modular supercomputing and the presentation of the new modular supercomputer JUWELS. One application focus will be earth system modelling (ESM). Videos showing results of multi-scale climate simulations will be presented and the distribution and climatic effects of volcanic ash in the atmosphere will be visualized using an augmented reality system. Other topics include JSC's involvement in the FENIX infrastructure for the Human Brain Project, its cooperation with RWTH Aachen University in the Jülich Aachen Research Alliance (JARA), and activities in the field of deep learning. In addition, HPC tools developed in-house, like LLview, SIONlib, JUBE, and Scalasca, will be demonstrated and JSC's support infrastructure will be presented. The DEEP projects will also be featured at the JSC booth.

As part of the conference programme, JSC employees will give a tutorial entitled "Application Porting and Optimization on GPU-Accelerated POWER Architectures", present talks, and participate in numerous special interest group sessions and associated workshops. JSC staff will also be present at PRACE booth #2033. Detailed information can be found at http://fz-juelich.de/ias/jsc/sc18.

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New JSC Portal JuDoor

In order to provide users with a single interface for all available supercomputer services, JSC is introducing a new portal called JuDoor.

Starting in December, all users will have access to the portal and can manage their personal data as well as their accounts and project memberships via JuDoor. A big advantage is that account creation on a supercomputer system takes a matter of minutes. This is possible thanks to a fully online process involving the user and the project's principle investigator (PI); paper forms will no longer be used. Please note that JuDoor will be the only way to create accounts on the JSC systems. PIs can manage their project members online themselves, and also have the option of assigning a project administrator (PA) who can manage accounts on their behalf. PAs can also be assigned directly in the portal.

The portal will be enhanced further over the next few months. For example, it is planned to provide a full overview of projects for PIs, including consumed resources and monthly reports. Documentation on JuDoor can be found at http://fz-juelich.de/ias/jsc/judoor.

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CroMa Project: Crowd Management in Transport Infrastructures

On 4 September 2018, the new CroMa project (Crowd Management in Transport Infrastructures) was officially launched at a kick-off meeting in Wuppertal. The CroMa project is funded by the German Federal Ministry of Education and Research (BMBF) over three years as of August 2018 as part of the Research Programme for Civil Security.

Public transport strongly relies on railway systems. Due to constantly growing passenger volumes, new concepts are needed in order to increase the efficiency of railway and underground stations. The CroMa project is focused on the development and enhancement of different strategies, such as building regulations, crowd management, and innovative action strategies. These strategies aim to increase the robustness and efficiency of railway stations during peak load and to avoid crushes in the event of critical crowd densities.

Research within the framework of CroMa includes the investigation of pedestrian traffic in traffic facilities and the study of pedestrian behaviour within dense crowds. These research fields will be assessed by means of field studies at railway stations as well as large-scale experiments in which several outer and inner parameters will be varied on a controlled basis.

The partners in the joint research project are the University of Wuppertal, Forschungszentrum Jülich

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(IAS-7 – Civil Safety Research), Ruhr-Universität Bochum, and Düsseldorf Congress GmbH. The associated partners include representatives of several public transport services, federal police, firefighters, equipment suppliers, and security services.

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New Security Project KapaKrit

In August 2018, the project "KapaKrit – Optimization of the Traffic Capacity of Railway Stations in Crisis and Disaster Scenarios" was launched. The project, which will run for three years, is funded by the Federal Ministry of Education and Research (BMBF) as part of the Civil Security – Transport Infrastructures programme. The project will be coordinated by the newly established IAS-7 (a former JSC division). The partners involved are Bochum University of Applied Sciences and engineering company bueffee from Wuppertal. Further institutions, like Deutsche Bahn AG and the non-state National Express Rail GmbH (NEX), are involved as associated partners.

In crisis and disaster situations, such as chemical or nuclear accidents, railway stations become safety-critical transport hubs for large-scale evacuation. However, the day-to-day capacity of the stations is not sufficient to meet requirements in case of evacuation. Maximizing transport capacities and ensuring a guaranteed as well as effective operations transfer to crisis mode are essential. The KapaKrit project will investigate how in such scenarios people can be brought to safe areas via the railway network. This will cover the investigation of the macroscopic traffic flows towards the stations as well as the microscopic dynamics inside the stations and on the platforms. All studies will be carried out in conjunction with the public safety authorities and organizations involved to ensure realistic scenarios and practical approaches. The methods developed will be evaluated at the main train station in Dortmund as a case study, with a view to its central role in the Ruhr area.

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SAGE2: Hierarchical Object Stores for Exascale

Following the successful completion of the EU-funded SAGE project, development efforts towards novel HPC storage architectures are continuing within the SAGE2 project. Known bottlenecks of today's storage architectures will make it difficult to realize the targeted 50- to 100-fold performance improvement needed to progress towards exascale. Storage architectures need to become hierarchical in order to provide both high performance and large capacity. Furthermore, they need to be based on object stores overcoming the scalability limitations associated with POSIX file systems.

SAGE addressed these key challenges and demonstrated the benefits and usability of the object store Mero and its capabilities in managing multiple storage tiers. The storage tiers integrated in the SAGE prototype were based on disks and non-volatile memory (NVM) devices with different performance characteristics. In the three-year SAGE2 project, further efforts are planned to support new NVM solutions. While SAGE considered storage and compute as separate subsystems, SAGE2 will enable the usage of compute node local storage resources and thus progress towards tighter integration of these subsystems. The most important new aspect of the SAGE2 project is the support of the Arm ecosystem. Arm-based processors are expected to play an increasingly important role in (European) supercomputing.

The project consortium, with members from four European countries, continues to be led by Seagate. The other industrial players involved in SAGE2 are Arm and Atos-Bull. Furthermore, several universities and research labs are involved, including CEA (France), KTH (Sweden), FZJ (Germany), and the University of Edinburgh (UK). Finally, the SME Kitware is also involved, thus adding visualization as a topic to the project. For further information, visit http://www.sagestorage.eu.

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JSC Coordinates Maestro Project

The transport of data through modern and future HPC architectures is increasingly becoming a key bottleneck. The software stacks currently in use still lack data awareness. This becomes more crucial as memory and storage hierarchies become more complex. This lacking memory awareness, as well as the lacking data awareness, is at the focus of the Maestro project. Together with partners from five European countries, JSC started the three-year EU-funded Maestro project with the goal of providing consistent data semantics to multiple layers of the stack, including both systems software and applications.

The key idea is to introduce a data model where data objects are annotated and the semantics of the data is communicated. Expanding this concept to multiple layers of the HPC software stack enables middleware to handle data transport and manage data transformations transparently to the user at different hardware layers. This will allow application developers to remain insulated from hardware details despite the latter becoming more complex.

The project has adopted a co-design methodology, i.e. applications that are in need of high-performance compute and storage architectures will guide the development work and will be used to demonstrate the benefits and usability of the developed technology. Application areas range from numerical weather prediction, climate and earth system modelling, and materials science to computational fluid dynamics.

The project consortium comprises two leading industrial providers of HPC solutions, namely Cray and Seagate, several leading supercomputing centres, namely CEA, CSCS, and JSC, the European Centre for Medium-Range Weather Forecasts (ECMWF), and the SME Appentra. For further information, visit https://www.maestro-data.eu.

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