JUGENE: Jülich's Next Step towards Petascale Computing

When IBM Blue Gene technology became available in 2004/2005, Forschungszentrum Jülich recognized the potential of this architecture as a leadership-class system for capability computing applications. A key feature of this architecture is its scalability towards petaflop computing based on low power consumption, small footprints and an outstanding price-performance ratio.

In early summer 2005, Jülich started testing a single Blue Gene/L rack with 2,048 processors. It soon became obvious that many more applications than expected could be ported and efficiently run on the Blue Gene architecture. Due to the fact that the system is well balanced in terms of processor speed, memory latency and network performance, many applications can be successfully scaled up to large numbers of processors. In January 2006, the system was therefore upgraded to eight racks with 16,384 processors using funding from the Helmholtz Association.

The eight-rack system has been in operation successfully for two years now. Today, about 30 research projects, which were carefully selected based on their scientific quality, run their applications on the system using between 1,024 and 16,384 processors. During a Blue Gene Scaling Workshop in Jülich, experts from Argonne National Laboratory, IBM and Jülich helped to further optimise some important applications. It was also shown that all of these applications make efficient use of all 16,384 processors.

Computational scientists from many research areas took the chance to apply for significant shares of Blue Gene/L computer time in order to tackle issues that could not be resolved in the past. Due to a large user demand and in line with its strategy to strengthen leadership-class computing, Forschungszentrum Jülich decided to procure a powerful next-generation Blue Gene system. In October 2007, a 16-rack Blue Gene/P system with 65,536 processors was installed. This system was mainly financed by the Helmholtz Association and the State of North Rhine Westphalia. With its peak performance (Rpeak) of 222.8 TFlop/s and a measured LINPACK computing power (Rmax) of 167.3 TFlop/s, Jülich's Blue Gene/P – dubbed JUGENE – was ranked second in the TOP500 list of the fastest computers in the world which was released in November 2007 in Reno, USA.

The main differences between Blue Gene/P and Blue Gene/L concern the processor and networks. The principal design of Blue Gene/L remained unchanged. The key features of Blue Gene/P are: four PowerPC 450 processors combined in a four-way SMP (node) chip. This allows a hybrid programming model with MPI and OpenMP (up to four threads per node). The network interface is DMA-capable (direct memory access), which increases the performance while reducing the processor load during message handling. The available memory per processor has been doubled. The external I/O network has been upgraded from 1 to 10 Gigabit Ethernet.

These improvements are also reflected in the application performance. A code from theoretical elementary particle physics, for example, runs at 36.8 % of the peak performance on Blue Gene/P compared to 26.3 % on Blue Gene/L. Furthermore, the increased memory of 2 GB per node will allow new applications to be run on Blue Gene/P.

JUGENE is part of the dual supercomputer complex in Jülich, embedded in a common storage infrastructure which has also been expanded. A key part of this infrastructure is the new Jülich storage cluster (JUST), which was installed in the third quarter of 2007. JUST increases the online disk capacity by a factor of ten to around one petabyte. The maximum I/O bandwidth of 20 GB/s is achieved with 29 storage controllers combined with 32 IBM Power 5 servers. JUST is connected to the supercomputers via a new switch technology based on the 10 Gigabit Ethernet. The system takes on the fileserver function for GPFS (General Parallel File System) and is used by clients in Jülich as well as clients within the international DEISA infrastructure.

With the upgrade of its supercomputer infrastructure, Forschungszentrum Jülich has taken the next step towards petascale computing and has strengthened Germany's position in the competition for one of the future European supercomputer centres.

For more detailed information about JUGENE, see *http://www.fz-juelich.de/jsc/jugene*.
Contact: Klaus Wolkersdorfer, ext. 6579

Inauguration of the Supercomputer JUGENE

The new supercomputer JUGENE will be officially inaugurated on 22 February 2008 in the presence of Ministerpräsident Dr. Jürgen Rüttgers of North-Rhine Westphalia in the auditorium at Forschungszentrum Jülich. Several rounds of discussion will highlight the importance of supercomputing with respect to scientific simulations and imbedding the Jülich supercomputers in a European supercomputer infrastructure. Participation in the inauguration is by invitation only. If you would like to attend, please contact Mrs. Lamberz de Bayas (*i.lamberz@fz-juelich.de*, ext. 3008).

"Global" Certification Authority Operational

On 19 December 2007, a new Certification Authority (CA) for Forschungszentrum Jülich was put into operation. The new "global" CA replaces the former "classic" CA and supports some important service extensions.

Since the root authority for signing "global" certificates, a CA of Deutsche Telekom, is included in the certificate stores of current versions of MS Internet Explorer, the handling of certificates has become much easier. When using Windows products, it is no longer necessary to manually include root certificates. According to DFN, the Mozilla family of products are to follow this policy in the near future.

Another improvement is the extended validity period of the new certificates. User certificates are now valid for three years and server certificates for five years. Existing "classic" certificates can still be used until they expire.

For information about certificates at Forschungszentrum Jülich, see *http://www.fz-juelich.de/jsc/zertifikate/*.
Contact: Martin Sczimarowsky, ext. 6411

Institute for Advanced Simulation (IAS) Established

On 1 January 2008, Forschungszentrum Jülich established the Institute for Advanced Simulation (IAS). Prof. Dr. Dr. Thomas Lippert was appointed director of the institute. The Jülich Supercomputing Centre (JSC) is now a division – IAS-1 – of the new institute. Prof. Lippert will continue to be head of IAS-1. The John von Neumann Institute for Computing (NIC) will also be integrated into IAS.

NIC Symposium 2008

The 4th NIC Symposium will be held at Forschungszentrum Jülich from 20 - 22 February 2008. The talks will inform a broad audience of scientists and interested members of the public about the activities and results obtained in the last two years at the John von Neumann Institute for Computing (NIC). Fifteen invited lectures will cover selected topics in the fields of astrophysics, biophysics, chemistry, condensed matter, material science, elementary particle physics, polymers, environmental research and nuclei, atoms, plasmas, and patterns.

To accompany the conference, an extended proceedings volume (NIC Series Volume 39) will also be published. It will provide an overview of a larger range of projects that have used the IBM supercomputers JUMP and JUBL in Jülich and the APE topical computer at DESY-Zeuthen.

The detailed programme and the registration form are available at: *http://www.fz-juelich.de/nic/symposium*.

Events

NIC Symposium 2008
Date: 20 - 22 February 2008
Venue: Auditorium, Forschungszentrum Jülich
Registration: *http://www.fz-juelich.de/nic/symposium*

Inauguration of JUGENE
Date: 22 February 2008, 11:00
Venue: Auditorium, Forschungszentrum Jülich
Request invitation: *i.lamberz@fz-juelich.de*

Further events, talks, and training courses:
JSC: *http://www.fz-juelich.de/jsc/news/calendar*
NIC: *http://www.fz-juelich.de/nic/Aktuelles/*

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