End of an Era at Jülich Supercomputing Centre as JUQEEN End-of-Life approaches

In spring 2018, the Blue Gene/Q system JUQUEEN at Jülich Supercomputing Centre (JSC) is being decommissioned and dismantled. This event marks the end of a 13-year era at JSC in which the leadership-class system in Jülich was based on IBM's Blue Gene technology. The Blue Gene architectures were defined by a unique combination of energy-efficient embedded processor technology, a well-balanced node and network design, advanced packaging for industry-leading density, and an uncompromised focus on the highest scalability throughout the hardware and software layers.

JSC operated and, in cooperation with vendor IBM, shaped all three generations of the Blue Gene product line for the benefit of its user communities.

In 2005, the first Blue Gene/L system in Germany was installed in Jülich. The system, named JUBL (Jülich Blue Gene/L) consisted of one rack with 1,024 compute nodes and provided a peak performance of 5.7 TFLOP/s. JUBL immediately attracted a large number of users and, despite its specialized architecture, showed promise as an enabler of breakthrough science in a large number of different science disciplines. Consequently, already shortly after its commissioning date, JUBL was extended to an 8-rack system with 16,348 CPUs and a peak performance of 45.6 TFLOP/s. In June 2006, JUBL was the fastest system in Germany and eighth-fastest system worldwide according to the Top500.

The successor system, JUGENE [1], a second-generation Blue Gene/P system, was installed in 2007 with 16 racks, 65,536 compute cores and a peak performance of 222.8 TFLOP/s. In November 2007, JUGENE entered the Top500 list on the second spot and was the fastest open-science supercomputer worldwide. The system was formally inaugurated in February 2008. To accommodate the increasing demand from national and European users, JUGENE was later upgraded in 2009 to 72 racks and 294,912 compute cores, making it the third-fastest system worldwide. With a peak performance of more than one PFLOP/s, JUGENE was the first European petaflop system.

In 2012 and 2013, the current Blue Gene/Q system JUQUEEN [2] was deployed in two phases. JUQUEEN now consists of 28 racks with 458,752 compute cores, 1.8 million hardware threads and a peak performance of 5.9 PFLOP/s. In November 2012, JUQEEN was the 5th fastest supercomputer in the world and the fastest European supercomputer. Together with its user base, JSC tackled the challenge of exploiting the massive parallelism of this architecture. The continuous growth of the High-Q Club [3], a list of applications capable of efficiently using the whole JUQUEEN system, showed the success of these efforts. Currently 31 applications from numerous domains have reached High-Q Club status.

The road of Blue Gene systems' architectural evolution in Jülich is paved by numerous

high-grade scientific discoveries and publications, many of which were widely recognized for their breakthrough character. The list of major research fields using the systems included elementary particle physics, engineering, earth systems modeling, chemistry, condensed matter, plasma physics, and astrophysics. Only two of the breakthrough science examples from the fields of nuclear and particle physics [4] as well as chemistry [5] are referenced here.

Despite its age, JUQUEEN's popularity did not decrease. The system once more showed its superior stability and scalability in the last "Big Blue Gene Week" in early 2018. Between 29.01.2018 and 05.02.2018, the system was solely reserved for large-scale simulations. The third realization of this event was well-received by the users. A total of 14 projects took advantage of the possibility. A staggering 72% of the executed jobs used the full machine.

Since 2006, following JSC's dual architecture approach, the leadership class system was augmented by a general-purpose architecture targeting a broader user base with less scalable applications. With the JUQUEEN successor system JUWELS, JSC is now looking forward to bringing these complementary systems closer together and leveraging the centre's own computing architecture developments for its modular supercomputing infrastructure. This architecture will enable an even broader class of applications to use massively parallel architectures efficiently.

JUQUEEN at Forschungszentrum Jülich.

References

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