

Editorial for the second international conference on energy-aware high performance computing

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The June 2011 TOP500 list unveiled an unexpected new parallel computer on rank No 1: the K computer by Fujitsu, which is operated at RIKEN/AICS. Not only does it outperform the former Chinese No 1 system Tianhe-1A by a factor of three in performance, it also sets a new landmark in energy consumption. With a power input of about 10 MW its operation would produce an annual electricity bill of more than 10 million Euros based on German price levels. At the same time, the U.S. Department of Energy publishes roadmaps in its Exascale Computing Initiative and puts 20 MW as a “practical power limit” for a future Exaflops computer by the end of this decade. We are thus more than a factor of 100 away from our performance goal but today’s technology uses already half of the acceptable power target.

This situation calls for an intensified research in the field of energy efficiency technology, also called Green IT which has found its way into High Performance Computing. Only a few years ago, the community considered HPC as the Formula 1 of computing and ignored the fact of dramatically rising operational costs. However, as with these race cars, we conceived means to reduce power consumption and even increase the speed. HPC also is beginning to learn from the field of embedded systems where battery-powered hardware always requires special mechanisms to reduce power consumption during phases of low performance demand.

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In 2010 we started this new conference series EnA-HPC in order to bring researchers, vendors, and HPC center administrators together. The point is to discuss the status and future of energy awareness in high performance computing.

Fields of interest cover all abstraction layers, from the lowest level of hardware technology, via operating system, compiler and application issues to facility technology like air conditioning, sensor technology and heat reuse. A comprehensive effort at all these levels is necessary to yield the overall energy reduction required to enable Exaflops computers to be operational by the end of this decade—as predicted by the TOP500 list.

For this second edition of our conference on Energy-Aware High Performance Computing we received 19 scientific submissions out of which 12 were selected for publication in this special issue. The submissions cover several of the abstraction levels mentioned above and thus represent world-wide research efforts in high performance computing: hardware architecture, application issues, heterogeneous programming, job scheduling, and modeling and evaluation of energy consumption. This variety guarantees a good coverage of crucial research questions. The ideas presented will trigger inspiring discussion during the two days of the conference. We hope to contribute to a successful co-operation between vendors and users of HPC equipment and foster more research in this field of green HPC.

The organizers express their gratitude to all contributors to this journal. Their research efforts will render High Performance Computing economically and ecologically sustainable. We thank the program committee members as well as all reviewers for their efforts in selecting an attractive content for this journal and for the conference.

Hamburg, September 2011
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Program committee members:

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- Timo Minartz (co-chair), University of Hamburg, Hamburg, Germany
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