



## EDITORIAL

Dear Readers,

welcome to the second issue of the **Exa2Green** newsletter. It is our pleasure to keep you up to date with the progress of our project and to make you aware of news and activities around energy-efficient high performance computing.

In the last issue of our newsletter, the principal researchers of the Exa2Green project have presented themselves. In this issue, we turn our focus on the technical staff. Furthermore, we look back to two conferences in the area of green HPC: the PASA workshop in Lyon and the EnA-HPC conference in Dresden.

We also look forward to the first international workshop on energy efficient supercomputing (E2SC), which will take place on November 17th in Denver (USA).

We hope that you will enjoy reading and we also kindly invite you to visit our website at [www.exa2green.eu](http://www.exa2green.eu) which will also keep you updated about all activities around the **Exa2Green** project.

Yours sincerely,

The **Exa2Green** consortium



Energy-aware numerics  
[www.exa2green.eu](http://www.exa2green.eu)

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### Exa2Green ID

**Title**

*Energy-Aware Sustainable Computing on Future Technology —Paving the Road to Exascale Computing*

**Programme**

Seventh Framework Programme, Collaborative Project

**Project No.**

318793

**Duration**

01/11/2012-31/10/2015

**Main objective**

*Exa2Green aims at developing a radically new energy-aware computing paradigm and programming methodology for exascale computing.*

**Partner countries**

Germany, Switzerland and Spain

## EXA2GREEN CONSORTIUM

**Exa2Green** Project Partners:

**Coordinator:**

Engineering Mathematics and Computing Lab (EMCL)  
Interdisciplinary Center for Scientific Computing (IWR)  
Heidelberg University - Germany

High Performance Computing and Architectures Group  
Universitat Jaume I de Castellon - Spain

IBM Research - Zurich - Switzerland

Institute for Meteorology and Climate Research  
Karlsruhe Institute of Technology - Germany

Scientific Computing Group, Department of Informatics  
Universität Hamburg - Germany

Steinbeis-Europa-Zentrum - Germany

Swiss Federal Institute of Technology Zurich

Swiss National Supercomputing Centre - Switzerland



## INTRODUCTION: THE EXA2GREEN TECHNICAL STAFF

### Dr. Samo Jordan, Heidelberg University



**Role in the project:** Technical Contact for WP4; involvement in coordination activities at technical level

**Background:** M.Sc. in Theoretical Physics and Ph.D. in the area of Monte Carlo simulations in Quantum Gravity

**Current position:** Scientific researcher at the Engineering Mathematics and Computing Lab (EMCL), delegated to the Heidelberg Institute of Theoretical Studies

**Major research interests:** HPC, hardware-aware programming, energy-efficient software engineering

### Dr. Joseph Charles, ETH Zurich / CSCS



**Role in the project:** Reduction of energy-to-solution for the COSMO-ART-M7 on existing CPUs, extension and investigations of COSMO-ART-M7 for multi-core architectures and for future energy-efficient architectures respectively.

**Background:** Engineering degree in Mathematical and Mechanical Modeling, M.Sc. in Mechanics and Engineering and Ph.D. in Mathematics

**Current position:** Computational Scientist in the Scientific Community Engagement Group

**Major research interests:** HPC, energy-aware computing, manycore, multicore and parallel computing, software engineering, numerical simulation, mathematical modeling

### Manuel Dolz, Universitat Hamburg



**Role in the project:** Leader of WP1: Design of tools for power and energy analysis on HPC systems

**Background:** M.Sc. in Parallel and Distributed Computing, pursuing Ph.D. degree at the Department of Computer Science Engineering at Universitat Jaume I

**Current position:** Main research assistant of WP1 at Universität Hamburg

**Major research interests:** Energy efficiency in the high performance computing field

### Dr. Rafael Mayo, Universitat Jaume I



**Role in the project:** The development of energy-aware numerical algorithms and the design of energy-saving policies

**Background:** M.Sc. and Ph.D. both in Computer Science

**Current position:** Associate Professor in Computer Architecture at the Department of Computer Science and Engineering at UJI since 2002

**Major research interests:** Optimisation of numerical algorithms for general processors, specific accelerators, clusters and shared-memory multiprocessors

### Sandra Catalán, Universitat Jaume I



**Role in the project:** Supporting Universitat Jaume I research activities

**Background:** Pursuing M.Sc. in Intelligent Systems

**Current position:** Ph.D. Student at Institute of High Performance Computing and Architectures at Universitat Jaume I

**Major research interests:** Multi-core GPU platforms

### Dr. Costas Bekas, IBM Research Zurich



**Role in the project:** Design of energy-aware performance metrics and energy-efficient algorithms for HPC systems

**Background:** M.Sc. and Ph.D. in Computer Engineering & Informatics

**Current position:** Research staff member at IBM Research Zurich

**Major research interests:** HPC, massive analytics, energy-aware algorithms, architectures

### Dr. Cristiano Malossi, IBM Research Zurich



**Role in the project:** Design of energy-aware performance metrics and energy-efficient algorithms for HPC systems

**Background:** M.Sc. in Aeronautical Engineering, Ph.D. in Applied Mathematics

**Current position:** Postdoctoral Researcher at the Mathematical and Computational Sciences Group at IBM Research Zurich

**Major research interests:** HPC, parallel algorithms, numerical analysis, applied mathematics



## PAST EVENTS

### 2nd International Workshop on Power-aware Algorithms, Systems and Architectures (PASA) in Lyon, France

The workshop was held on 1st October 2013 in Lyon, France in conjunction with the 42<sup>nd</sup> International Conference on Parallel Processing (ICPP 2013).

Power-aware computing is one of the top emerging research priorities for a large variety of systems, including large-scale high performance computers and corporate data centers. More efforts are expected to be invested in power-aware computing and the research requires both software and architecture innovation to improve power efficiency while sustaining high performance. This workshop provides a forum to discuss novel ideas about building power-aware software systems and architectures. The workshop presents researchers with an opportunity to develop new perspective on power-aware hot topics.

Topics of interest include (but not limited to):

- Power-aware runtime systems

- Power and performance modeling and evaluation
- Tools for power profiling, accounting and measurement
- System-level cross-layer coordination
- Hardware/software co-design to improve power efficiency
- Emerging power efficient storage device such as Solid-State Device
- Power-aware programming scheme
- Power-aware resource management strategies
- Novel architecting that assists in power management
- Thermal control and reduction

For more details:

<https://sites.google.com/site/icpppasa13>



## PAST EVENTS

### Fourth International Conference on Energy-Aware High-Performance Computing, Dresden, Germany

The fourth International Conference on Energy-Aware High-Performance Computing, held in Dresden from Sep. 2nd to Sep. 3rd 2013, has been organized by the Zentrum für Informationsdienste und Hochleistungsrechnen (ZIH) of the TU Dresden in close cooperation with the DKRZ and the University of Hamburg at the Department of Informatics of the Technische Universität Dresden.



In this last edition of the conference, the 52 participants discussed the analysis and optimization of energy efficiency in hardware and software, modeling the power consumption of applications as well as ecological and economic aspects of the operation of data centers.

For more information:

<http://www.ena-hpc.org>

While hardware technology advances towards more energy-efficient devices, solving the power challenge for exascale needs holistic solutions, which must include power-efficient system software. In response to this, the EnA-HPC conference devotes at bringing together researchers, developers, vendors and users to discuss the energy consumption challenge that HPC is facing.





## UPCOMING EVENTS

### **First International Workshop on Energy-Efficient Supercomputing (E2SC) in Denver, Colorado, USA**

To be held in conjunction with SC13: The International Conference for High Performance Computing, Networking, Storage and Analysis in Denver, Colorado, USA on 17<sup>th</sup> November 2013.

With exascale systems on the horizon, we have ushered in an era with power and energy consumption as the primary concerns for scalable computing. To achieve viable high performance computing, revolutionary methods are required with a stronger integration among hardware features, system software and applications. Equally important are the capabilities for fine-grained spatial and temporal measurement and control to facilitate energy-efficient computing across all layers.

Current approaches for energy-efficient computing rely heavily on power-efficient hardware in isolation. However, it is pivotal for hardware to expose mechanisms for energy efficiency to optimize power and energy consumption for various workloads. At the same time, high fidelity measurement techniques, typically ignored in data-center level measurement, are of high importance for scalable and energy-efficient inter-play in different layers of application, system software and hardware.

This workshop seeks to address the important energy efficiency aspects in the HPC community that have not been previously addressed by aspects covered in the data center or cloud computing communities. Emphasis is given to the applications view related to significant energy efficiency improvements and to the required hardware/software stack that must include necessary power and performance measurement and analysis harnesses.

Current tools are often limited by hardware capabilities and their lack of information about the characteristics of a given workload/application. In the same manner, hardware techniques, like dynamic voltage frequency scaling, are often limited by their granularity (very coarse power management) or by their scope (a very limited system view). More rapid realization of energy savings will require significant increases in measurement resolution and optimization techniques. Moreover, the interplay between performance, power and reliability add another layer of complexity to this already difficult group of challenges.

Date: 17th November 2013

For more details:

<http://hpc.pnl.gov/conf/e2sc/2013/>