

22

ADVANCES IN PARALLEL COMPUTING

Applications, Tools and Techniques on the Road to Exascale Computing

Edited by
Koen De Bosschere
Erik H. D'Hollander
Gerhard R. Joubert
David Padua
Frans Peters

IOS
Press

APPLICATIONS, TOOLS AND TECHNIQUES ON THE ROAD TO EXASCALE COMPUTING

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Volumes 1–14 published by Elsevier Science.

ISSN 0927-5452 (print)
ISSN 1879-808X (online)

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Edited by

Koen De Bosschere

Ghent University, Belgium

Erik H. D'Hollander

Ghent University, Belgium

Gerhard R. Joubert

TU Clausthal, Germany

David Padua

University of Illinois, USA

and

Frans Peters

Philips Research, Netherlands

Co-edited by

Mark Sawyer, UK

IOS
Press

Amsterdam • Berlin • Tokyo • Washington, DC

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ISBN 978-1-61499-040-6 (print)

ISBN 978-1-61499-041-3 (online)

Library of Congress Control Number: 2012936903

Publisher

IOS Press BV

Nieuwe Hemweg 6B

1013 BG Amsterdam

Netherlands

fax: +31 20 687 0019

e-mail: order@iospress.nl

Distributor in the USA and Canada

IOS Press, Inc.

4502 Rachael Manor Drive

Fairfax, VA 22032

USA

fax: +1 703 323 3668

e-mail: iosbooks@iospress.com

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PRINTED IN THE NETHERLANDS

Preface

This volume of the book series “Advances in Parallel Computing” contains the proceedings of ParCo2011, the 14th biennial ParCo Conference, held from 31 August to 3 September 2011, in Ghent, Belgium.

In an era when physical limitations have slowed down advances in the performance of single processing units, and new scientific challenges require exascale speed, parallel processing has gained momentum as a key gateway to HPC (High Performance Computing).

Historically, the ParCo conferences have focused on three main themes: Algorithms, Architectures (both hardware and software) and Applications. Nowadays, the scenery has changed from traditional multiprocessor topologies to heterogeneous manycores, incorporating standard CPUs, GPUs (Graphics Processing Units) and FPGAs (Field Programmable Gate Arrays). These platforms are, at a higher abstraction level, integrated in clusters, grids, and clouds. This is reflected in the papers presented at the conference and the contributions as included in these proceedings. An increasing number of new algorithms are optimized for heterogeneous platforms and performance tuning is targeting extreme scale computing. Heterogeneous platforms utilising the compute power and energy efficiency of GPGPUs (General Purpose GPUs) are clearly becoming mainstream HPC systems for a large number of applications in a wide spectrum of application areas. These systems excel in areas such as complex system simulation, real-time image processing and visualisation, etc. High performance computing accelerators may well become the cornerstone of exascale computing applications such as 3-D turbulent combustion flows, nuclear energy simulations, brain research, financial and geophysical modelling.

The exploration of new architectures, programming tools and techniques was evidenced by the mini-symposia “Parallel Computing with FPGAs” and “Exascale Programming Models”. The need for exascale hardware and software was also stressed in the industrial session, with contributions from Cray and the European exascale software initiative.

Our sincere appreciation goes to the keynote speakers who gave their perspectives on the impact of parallel computing today and the road to exascale computing tomorrow. Our heartfelt thanks go to the authors for their valuable scientific contributions and to the programme committee who reviewed the papers and provided constructive remarks. The international audience was inspired by the quality of the presentations. The attendance and interaction was high and the conference has been an agora where many fruitful ideas were exchanged and explored.

We wish to express our sincere thanks to the organizers for the smooth operation of the conference.

The University conference centre *Het Pand* offered an excellent environment for the conference as it allowed delegates to interact informally and easily. A special word of thanks is due to the management and support staff of *Het Pand* for their proficient and friendly support.

The organizers managed to put together an extensive social programme. This included a reception at the medieval Town Hall of Ghent as well as a memorable confer-

ence dinner. These social events stimulated interaction amongst delegates and resulted in many new contacts being made.

Finally we wish to thank all the many supporters who assisted in the organization and successful running of the event.

Erik D'Hollander, *Ghent University, Belgium*

Koen De Bosschere, *Ghent University, Belgium*

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