High Speed and Large Scale Scientific Computing

Edited by

Wolfgang Gentzsch
DEISA Project and Open Grid Forum, Germany

Lucio Grandinetti
Center of Excellence on High Performance Computing, University of Calabria, Italy

and

Gerhard Joubert
Institute of Informatics, Clausthal University of Technology, Germany

IOS Press
Amsterdam • Berlin • Tokyo • Washington, DC
# Contents

Preface \hfill v  
*Wolfgang Gentzsch, Gerhard Joubert and Lucio Grandinetti*

Reviewers \hfill vi

## Chapter 1. Algorithms and Scheduling

Scheduling for Numerical Linear Algebra Library at Scale
*Jakub Kurzak, Hatem Ltaief, Jack J. Dongarra and Rosa M. Badia* 3

Algorithms and Scheduling Techniques for Clusters and Grids
*Anne Benoit, Loris Marchal, Yves Robert and Frédéric Vivien* 27

## Chapter 2. Architectures

High Performance Computing with FPGAs
*Erik H. D’Hollander and Kristof Beyls* 55

Nondeterministic Coordination Using S-Net
*Alex Shafarenko* 74

HPC Interconnection Networks: The Key to Exascale Computing
*Jeffrey S. Vetter, Vinod Tipparaju, Weikuan Yu and Philip C. Roth* 95

## Chapter 3. GRID Technologies

Using Peer-to-Peer Dynamic Querying in Grid Information Services
*Domenico Talia and Paolo Trunfio* 109

Emulation Platform for High Accuracy Failure Injection in Grids
*Thomas Herauld, Mathieu Jan, Thomas Largillier, Sylvain Peyronnet, Benjamin Quetier and Franck Cappello* 127

DEISA, the Distributed European Infrastructure for Supercomputing Applications
*Wolfgang Gentzsch* 141

UNICORE 6 – A European Grid Technology
*Achim Streit, Sandra Bergmann, Rebecca Breu, Jason Daivandy, Bastian Demuth, André Giesler, Björn Hagemeter, Sonja Holl, Valentina Huber, Daniel Mallmann, Ahmed Shiraz Memon, Mohammad Shahbaz Memon, Roger Menday, Michael Rambadt, Morris Riedel, Mathilde Romberg, Bernd Schuller and Thomas Lippert* 157
Chapter 4. Cloud Technologies

Cloud Computing for on-Demand Grid Resource Provisioning
  Ignacio M. Llorente, Rafael Moreno-Vozmediano and Rubén S. Montero

Clouds: An Opportunity for Scientific Applications?
  Ewa Deelman, Bruce Bertriman, Gideon Juve, Yang-Suk Kee, Miron Livny and Gurmeet Singh

Cloud Computing: A Viable Option for Enterprise HPC?
  Mathias Dalheimer and Franz-Josef Pfreundt

Evidence for a Cost Effective Cloud Computing Implementation Based Upon the NC State Virtual Computing Laboratory Model
  Patrick Dreher, Mladen A. Vouk, Eric Sills and Sam Averitt

Facing Services in Computational Clouds
  Thijs Metsch, Luis M. Vaquero, Luis Rodero-Merino, Maik Lindner and Philippe Massonet

Aneka: A Software Platform for .NET Based Cloud Computing
  Christian Vecchiola, Xingchen Chu and Rajkumar Buyya

Chapter 5. Information Processing and Applications

Building Collaborative Applications for System-Level Science
  Marian Bubak, Tomasz Gubala, Marek Kasztelnik and Maciej Malawski

Parallel Data Mining from Multicore to Cloudy Grids
  Geoffrey Fox, Seung-Hee Bae, Jaliya Ekanayake, Xiaohong Qiu and Huapeng Yuan

Processing of Large-Scale Biomedical Images on a Cluster of Multicore CPUs and GPUs
  Umit V. Catalyurek, Timothy D.R. Hartley, Olcay Sertel, Manuel Ujaldon, Antonio Ruiz, Joel Saltz and Metin Gurcan

System Level Accelerator with Blue Gene: A Heterogeneous Computing Model for Grand Challenge Problems
  Tim David

Grid Computing for Financial Applications
  Patrizia Beraldi, Lucio Grandinetti, Antonio Violi and Italo Epicoco

Chapter 6. HPC and GRID Infrastructures for e-Science

An Active Data Model
  Tim Ho and David Abramson

The Evolution of Research and Education Networks and Their Essential Role in Modern Science
  William Johnston, Evangelos Chaniotakis, Eli Dart, Chin Guok, Joe Metzger and Brian Tierney
The European Grid Initiative and the HPC Ecosystem
Per Oster 451

Grid and e-Science in Korea
Kihyeon Cho 464

Subject Index 483
Author Index 485