

Making Grids Work

Making Grids Work

*Proceedings of the CoreGRID Workshop on
Programming Models
Grid and P2P System Architecture
Grid Systems, Tools and Environments
12-13 June 2007, Heraklion, Crete, Greece*

Edited by

Marco Danelutto

*University of Pisa
Pisa, Italy*

Paraskevi Fragopoulou

*Foundation for Research and Technology - Hellas and
Technological Educational Institute of Crete, Heraklion, Greece*

Vladimir Getov

*University of Westminster
London, UK*



Springer

Editors:

Marco Danelutto
University of Pisa
Pisa, 56127, Italy
marcod@di.unipi.it

Paraskevi Fragopoulou
Foundation for Research and Technology - Hellas (FORTH)
Institute of Computer Science
N. Plastira 100 Vassilika Vouton
GR-700 13 Heraklion, Crete, Greece
fragopou@ics.forth.gr

Department of Applied Informatics and Multimedia
Technological Educational Institute of Crete, Greece

Vladimir Getov
University of Westminster
London, HA1 3TP, UK
V.S.Getov@westminster.ac.uk

Library of Congress Control Number: 2008932401

ISBN-13: 978-0-387-78447-2

e-ISBN-13: 978-0-387-78448-9

© 2008 Springer Science+Business Media, LLC.

All rights reserved. This work may not be translated or copied in whole or in part without the written permission of the publisher (Springer Science+Business Media, LLC, 233 Spring Street, New York, NY 10013, USA), except for brief excerpts in connection with reviews or scholarly analysis. Use in connection with any form of information storage and retrieval, electronic adaptation, computer software, or by similar or dissimilar methodology now known or hereafter developed is forbidden. The use in this publication of trade names, trademarks, service marks and similar terms, even if they are not identified as such, is not to be taken as an expression of opinion as to whether or not they are subject to proprietary rights.

Printed on acid-free paper.

springer.com

Contents

Preface	ix
Contributing Authors	xi
Part I Component Programming Models	
Behavioural skeletons for component autonomic management on grids <i>Marco Aldinucci, Sonia Campa, Marco Danelutto, Patrizio Dazzi, Domenico Laforenza, Nicola Tonellootto, Peter Kilpatrick</i>	3
Towards GCM re-configuration - extending specification by norms <i>Alessandro Basso, Alexander Bolotov</i>	17
A Flexible Model and Implementation of Component Controllers <i>Francoise Baude, Denis Caromel, Ludovic Henrio and Paul Naoumenko</i>	31
Analysis of Component Model Extensions to Support the GriCoL Language <i>Hinde Bouziane, Natalia Currel-Linde, Christian Perez and Michael Resch</i>	45
Part II Resource Discovery and Scheduling	
Peer-to-Peer Approaches to Grid Resource Discovery <i>Ann Chervenak and Shishir Bharathi</i>	59
GRID superscalar and job mapping on the reliable grid resources <i>Ani Anciaux-Sedrakian, Rosa M. Badia, Raul Sirvent and Josep M. Pérez, Thilo Kielmann and Andre Merzky</i>	77
Implementation of a Hybrid P2P-based Grid Resource Discovery System <i>Harris Papadakis, Paolo Trunfio, Domenico Talia, Paraskevi Fragopoulou</i>	89
Backfilling Strategies for Scheduling Stream of Jobs on Computational Farms <i>R. Baraglia, G. Capannini, M. Pasquali D. Puppin, L. Ricci, A.D. Techiouba</i>	103
Part III Development and Runtime Environments	
Component-Based Development Environment for Grid Systems <i>Artie Basukoski, Vladimir Getov, Jeyarajan Thiyagalingam, Stavros Isaiadis</i>	119

Grid-enabling a Problem Solving Environment: Implementation Everyday Use <i>Konstantinos Georgiou, Giorgos Kollias and Efstratios Gallopoulos</i>	129
A Component-Based Integrated Toolkit <i>Enric Tejedor and Rosa M. Badia, Thilo Kielmann, Vladimir Getov</i>	139
Overlay Services for Dynamic VOs <i>Per Brand, Joel Hoglund and Konstantin Popov, Noel de Palma, Fabienne Boyer and Nikos Parlavantzas, Vladimir Vlassov and Ahmad Al-Shishtawy</i>	153
Carrying the Crash-only Software Concept to the Legacy Application Servers <i>Javier Alonso and Jordi Torres, Luis Silva</i>	165
Bounded Site Failures: an Approach to Unreliable Grid Environments <i>Joaquim Gabarro, Alina Garcia, Maurice Clint, Peter Kilpatrick, Alan Stewart</i>	175
Part IV Workflow Programming	
Programming e-Science Gateways <i>Dennis Gannon</i>	191
Re-evaluating the Grid: the Social Life of Programs <i>David De Roure, Carole Goble</i>	201
Workflows on macro data flow through aspects <i>Marco Danelutto, Patrizio Dazzi</i>	213
Heterogeneous Data Sources in GRID Workflows <i>Tamas Kiss, Alexandru Tudose, Gabor Terstyanszky, Peter Kacsuk, Gergely Sipos</i>	225
Part V Checkpointing and Monitoring	
Result Error Detection on Heterogeneous and Volatile Resources <i>Derrick Kondo, Filipe Araujo and Luis Silva, Patricio Domingues</i>	239
FailRank: Failure Monitoring and Ranking System <i>D. Zeinalipour-Yazti, K. Neocleous, C. Georgiou, M.D. Dikaiakos</i>	247
A Fault-Injector Tool to Evaluate Failure Detectors in Grid-Services <i>Nuno Rodrigues, Décio Sousa, Luis Silva</i>	261
Performance monitoring of GRID superscalar with OCM-G/G-PM: improvements <i>Rosa M. Badia and Raul Sirvent, Marian Bubak, Włodzimierz Funika and Piotr Machner</i>	271
A Scalable Multi-Agent Infrastructure for Remote Failure Detection <i>Decio Sousa, Nuno Rodrigues, Luis Silva</i>	283

<i>Contents</i>	vii
A Distributed and Replicated Service for Checkpoint Storage <i>Fatiha Bouabache, Thomas Herault, Gilles Fedak, Franck Cappello</i>	293
Part VI Applications and Use Cases	
High-level Scripting Approach <i>Maciej Malawski, Tomasz Guba-Jla, Marek Kasztelnik, Tomasz Bartynski, Marian Bubak, Francoise Baude and Ludovic Henrio</i>	307
DKS: Distributed k -ary System Middleware <i>Roberto Roverso, Cosmin Arad, Ali Ghodsi, Seif Haridi</i>	321
Transactions and Concurrency Control for Peer-to-Peer Wikis: An Evaluation <i>Stefan Plantikow, Alexander Reinefeld, Florian Schintke</i>	335
Efficient Genome Processing in the Grid <i>Philipp Ludeking, Jan Dunnweber and Sergei Gorlatch</i>	349
Part VII Design Methodologies for Grid Systems	
SZTAKI Desktop Grid: Building a scalable, secure Desktop Grid platform <i>Attila Marosi, Gabor Gombas, Zoltan Balaton, Peter Kacsuk, Tamas Kiss</i>	363
P2P Techniques for Data Distribution in Desktop Grid Computing Platforms <i>Fernando Costa, Luis Silva, Ian Kelley, Ian Taylor</i>	375
Tackling the Collusion Threat in P2P-Enhanced Internet Desktop Grids <i>Gheorghe Silaghi, Luis Silva, Patricio Domingues, Alvaro E. Arenas</i>	391
Index	401

Preface

Three Institutes of the CoreGRID Network of Excellence organized a common workshop to present and discuss the latest results on Grid and P2P Technologies achieved by the Institute partners as well as the latest developments by researchers outside the CoreGRID community. The three institutes involved are:

- The Institute on *Programming Model*,
- The Institute on *Architectural Issues: Scalability, Dependability, Adaptability*, and
- The Institute on *Grid Systems, Tools, and Environments*.

The aforementioned institutes have a history in organizing joint events – the most recent one being the workshop in Krakow, Poland in June 2006.

The 2007 joint workshop took place at the premises of the Institute of Computer Science, Foundation for Research and Technology-Hellas (FORTH-ICS), Heraklion-Crete, Greece on June 12-13, 2007. The event was organized in two plenary sessions hosting a presentation from the CoreGRID scientific coordinator and three invited speakers, followed by 12 technical sessions hosting the accepted contributions. A total of 42 papers were accepted for presentation among those submitted to the workshop.

The workshop invited speakers presented some of the latest developments in Grid Technology, Semantic Grid, and P2P technology respectively. Their talks focused on ongoing work including some open problems and stimulated interesting discussion among the participants.

The invited speakers and their respective talk titles were the following:

- Dennis Gannon, Indiana University, “*Programming Gateways to the Teragrid*”
- David De Roure, University of Southampton, “*Re-evaluating the Grid*”
- Ann Chervenak, University of Southern California “*Peer-to-peer Approaches to Grid Resource Discovery*”.

All the contributions presented to the workshop have been included in a CoreGRID technical report – TR-0080¹. The papers presented at the workshop have been submitted to a further formal refereeing process. This volume hosts the selected contributions resulting from this review process.

We wish to thank our hosts from FORTH-ICS for their kind hospitality, the local organization team for providing such superb support, the CoreGRID administrative structure for allowing us to organize the workshop and, in particular, to support the invited speakers, and the entire CoreGRID community for submitting such a large number of interesting and high quality papers and for their enthusiastic participation in the workshop.

Our thanks also go to the European Commission for sponsoring this volume of selected articles from the workshop via the CoreGRID NoE project, grant number 004265.

Marco Danelutto, Paraskevi Fragopoulou, Vladimir Getov

¹ Available at <http://www.coregrid.net/mambo/content/view/152/292/>

Contributing Authors

Marco Aldinucci Istituto di Scienza e Tecnologie dell'Informazione, ISTI-CNR, Pisa, Italy Marco.Aldinucci@isti.cnr.it

Javier Alonso Technical University of Catalonia Barcelona Supercomputing Center, Barcelona, Spain alonso@ac.upc.edu

Cosmin Arad School for Information and Communication Technology (ICT), Royal Institute of Technology (KTH), Stockholm, Sweden icarad@kth.se

Ani Anciaux-Sedrakian Polytechnic University of Catalonia Campus Nord - Modul D6 c/Jordi Girona 1-3 E08034 Barcelona, Spain ani.anciaux@bsc.es

Filipe Araujo CISUC, Department of Informatics Engineering, University of Coimbra, Portugal filipi@dei.uc.pt

Alvaro E. Arenas STFC, Rutherford Appleton Laboratory Chilton, Didcot, UK a.e.arenas@rl.ac.uk

Rosa M. Badia Polytechnic University of Catalonia Campus Nord, Barcelona, Spain rosa.m.badia@bsc.es

Zoltan Balaton MTA SZTAKI Computer and Automation Research Institute of the Hungarian Academy of Sciences Budapest, Hungary balaton@sztaki.hu

Ranieri Baraglia Institute of Information Science and Technologies, CNR, Via Moruzzi 1, 56100 Pisa, Italy ranieri.baraglia@isti.cnr.it

Tomasz Bartynski Institute of Computer Science and ACC CYFRONET AGH University of Science and Technology Al. Mickiewicza 30, 30-059 Krakow, Poland

Alessandro Basso University of Westminster, Harrow School of Computer Science, Watford Road, Harrow HA1 3TP, U.K. bassoa@wmin.ac.uk

Artie Basukoski University of Westminster, Harrow School of Computer Science, Harrow U.K. A.Basukoski02@wmin.ac.uk

Fatiha Bouabache Laboratoire de Recherche en Informatique Universite Paris Sud-XI, Orsay, France fatiha.bouabache@lri.fr

Francoise Baude INRIA Sophia - I3S - CNRS, Universite de Nice Sophia Antipolis, France fbaude@sophia.inria.fr

Shishir Bharathi USC Information Sciences Institute, Marina del Rey, CA, USA shishir@isi.edu

Alexander Bolotov University of Westminster, Harrow School of Computer Science, Harrow, London, U.K. bolotoa@wmin.ac.uk

Hinde Lilia Bouziane INRIA/IRISA, Campus de Beaulieu, 35042 Rennes, France Hinde.Bouziane@inria.fr

Fabienne Boyer INRIA, France fabienne.boyer@inrialpes.fr

Per Brand SICS, Sweden perbrand@sics.se

Marian Bubak Institute of Computer Science, AGH, Krakow, Poland bubak@uci.agh.edu.pl

Sonia Campa Dept. of Computer Science, University of Pisa, Via Buonarroti, 2 - 56127 Pisa, Italy campa@di.unipi.it

Gabriele Capannini ISTI/CNR and Department of Computer Science, University of Pisa, Pisa, Italy gabriele.capannini@isti.cnr.it

Franck Cappello INRIA Futurs/Laboratoire de Recherche en Informatique
Universite Paris Sud-XI, Orsay, France fci@lri.fr

Denis Caromel INRIA Sophia Antipolis, CNRS - I3S - University of Nice
Sophia-Antipolis, Sophia-Antipolis, France Denis.Caromel@sophia.inria.fr

Ann Chervenak USC Information Sciences Institute, Marina del Rey, CA,
USA annc@isi.edu

Maurice Clint School of Computer Science The Queen's University of Belfast
Belfast BT7 1NN, U.K. m.clint@qub.ac.uk

Fernando Costa CISUC, Dep Eng Informatica, University of Coimbra, Portugal
fcosta@student.dei.uc.pt

Natalia Currie-Linde High Performance Computing Center Stuttgart (HLRS),
University of Stuttgart, Stuttgart, Germany linde@hlrs.de

Marco Danelutto Dept. of Computer Science, University of Pisa, Pisa, Italy
marcod@di.unipi.it

Patrizio Dazzi ISTI/CNR, Pisa and IMT, Lucca, Italy patrizio.dazzi@isti.cnr.it

David De Roure University of Southampton Electronics and Computer Science
Southampton, U.K. dder@ecs.soton.ac.uk

Marios Dikaiakos Department of Computer Science, University of Cyprus,
Nicosia, Cyprus mdd@cs.ucy.ac.cy

Patrício Domingues CISUC, Department of Informatics Engineering, University of Coimbra, Portugal luis@dei.uc.pt

Jan Dunnweber Institut fur Informatik, University of Munster, Munster, Germany duennweb@math.uni-muenster.de

Gilles Fedak INRIA Futurs/Laboratoire de Recherche en Informatique Universite Paris Sud-XI, Orsay, France fedak@lri.fr

Joaquim Gabarro Universitat Politecnica de Catalunya ALBCOM Research Group Edifici Ω, Campus Nord Jordi Girona, 1-3, Barcelona, Spain gabarro@lsi.upc.edu

Dennis Gannon Department of Computer Science, Indiana University, Bloomington, USA gannon@cs.indiana.edu

Konstantinos Georgiou University of Patras, CEID, Patras, Greece georgiu@ceid.upatras.gr

Chryssis Georgiou Department of Computer Science, University of Cyprus, Nicosia, Cyprus chryssis@cs.ucy.ac.cy

Vladimir Getov Harrow School of Computer Science, University of Westminster, Harrow, London, U.K. V.S.Getov@westminster.ac.uk

Ali Ghodsi School for Information and Communication Technology (ICT), Royal Institute of Technology (KTH), Stockholm, Sweden

Gabor Gombas MTA SZTAKI Computer and Automation Research Institute of the Hungarian Academy of Sciences, Budapest, Hungary gombasg@sztaki.hu

Sergei Gorlatch Institute for Informatics, University of Munster, Germany gorlatch@math.uni-muenster.de

Carole Goble Department of Computer Science, The University of Manchester, Manchester, U.K. carole.goble@manchester.ac.uk

Tomasz Gubala Institute of Computer Science and ACC CYFRONET AGH University of Science and Technology Al. Krakow, Poland

Thomas Herault INRIA Futurs/Laboratoire de Recherche en Informatique Universite Paris Sud-XI, Orsay, France thomas.herault@lri.fr

Seif Haridi School for Information and Communication Technology (ICT), Royal Institute of Technology (KTH), Stockholm, Sweden seif@kth.se

Joel Hoglund SICS, Sweden joel@sics.se

Stavros Isaiadis Harrow School of Computer Science, University of Westminster, Harrow, London, U.K. S.Isaiadis@westminster.ac.uk

Peter Kacsuk MTA SZTAKI Lab. of Parallel and Distributed Systems, Budapest, Hungary kacsuk@sztaki.hu

Marek Kasztechnik Institute of Computer Science and ACC CYFRONET AGH University of Science and Technology Al. Mickiewicza, Krakow, Poland

Ian Kelley School of Computer Science, Cardiff University, U.K. and Center for Computation Technology Louisiana State University, USA
I.R.Kelley@cs.cardiff.ac.uk

Thilo Kielmann Department of Computer Science, Vrije Universiteit, Amsterdam, The Netherlands kielmann@cs.vu.nl

Peter Kilpatrick Computer Science Department, Queen's University of Belfast, Belfast, UK p.kilpatrick@qub.ac.uk

Tamas Kiss School of Informatics, University of Westminster, London, U.K.
kisst@wmin.ac.uk

Giorgos Kollias University of Patras, CEID, Patras, Greece
gdk@ceid.upatras.gr

Derrick Kondo Laboratoire d'Informatique de Grenoble INRIA Rhone-Alpes, France dkondo@imag.fr

Domenico Laforenza Istituto di Scienza e Tecnologie dell'Informazione, ISTI-CNR, Pisa, Italy Domenico.Laforenza@isti.cnr.it

Philipp Ludeking University of Munster, Department of Mathematics and Computer Science, Munster, Germany luedeking@uni-muenster.de

Maciej Malawski Institute of Computer Science and ACC CYFRONET AGH
University of Science and Technology Al. Mickiewicza, Krakow, Poland
malawski@agh.edu.pl

Andre Merzky Department of Computer Science, Vrije Universiteit, Amsterdam, The Netherlands merzky@cs.vu.nl

Piotr Machner Inst. Computer Science, AGH, al. Mickiewicza, Krakow, Poland machner@student.agh.edu.pl

Attila Csaba Marosi MTA SZTAKI Computer and Automation Research Institute of the Hungarian Academy of Sciences Budapest, Hungary

Kyriacos Neocleous Department of Computer Science, University of Cyprus, Nicosia, Cyprus kyriacos@cs.ucy.ac.cy

Harris Papadakis ICS, Foundation for Research and Technology-Hellas, Greece adanar@ics.forth.gr

Ludovic Henrio INRIA Sophia - I3S - CNRS - Universite de Nice Sophia Antipolis, France Ludovic.Henrio@sophia.inria.fr

Paraskevi Fragopoulou ICS, Foundation for Research and Technology-Hellas, Greece fragopou@ics.forth.gr

Noel de Palma INRIA, France noel.depalma@inrialpes.fr

Nikos Parlantzas INRIA, France nikolaos.parlantzas@inrialpes.fr

Marco Pasquali ISTI/CNR Pisa Italy IMT, Lucca Institute for Advanced Studies, Lucca, Italy m.pasquali@isti.cnr.it

Jean-Louis Pazat IRISA/INSA, Campus universitaire de Beaulieu, Rennes, France Jean-Louis.Pazat@irisa.fr

Christian Perez INRIA/IRISA, Campus de Beaulieu, Rennes, France Christian.Perez@inria.fr

Josep M. Perez Polytechnic University of Catalonia Campus Nord, Barcelona, Spain josep.m.perez@bsc.es

Stefan Plantikow Zuse Institute Berlin, Takustr. Berlin-Dahlem; and Humboldt-Universität zu Berlin, Rudower Chaussee, Berlin-Adlershof, Germany
plantikow@zib.de

Konstantin Popov SICS, Sweden kost@sics.se

Diego Puppin Istituto di Scienze e Tecnologie dell'Informazione, ISTI-CNR, Pisa, Italy and Dept. of Computer Science, University of Pisa, Pisa, Italy
Diego.Puppin@isti.cnr.it

Alexander Reinefeld Zuse Institute Berlin, Takustr. Berlin-Dahlem; and Humboldt-Universität zu Berlin, Rudower Chaussee Berlin-Adlershof, Germany ar@zib.de

Nuno Rodrigues Dep. Engenharia Informática, University of Coimbra, Polo II, Coimbra, Portugal Portugal nuno@dei.uc.pt

Roberto Roverso School for Information and Communication Technology (ICT), Royal Institute of Technology (KTH), Stockholm, Sweden
roverso@kth.se

Michael Resch High Performance Computing Center Stuttgart (HLRS) University of Stuttgart, Stuttgart, Germany resch@hlrs.de

Laura Ricci Department of Computer Science, University of Pisa, Pisa, Italy ricci@di.unipi.it

Florian Schintke Zuse Institute Berlin, Berlin-Dahlem, Germany
schintke@zib.de

Gheorghe Cosmin Silaghi University of Coimbra, Department of Informatics Engineering Polo II, Coimbra, Portugal gsilaghi@dei.uc.pt

Luis Moura Silva CISUC, Dep Eng Informatica, University of Coimbra, Portugal luis@dei.uc.pt

Ahmad Al-Shishtawy KTH, Sweden ahmadas@kth.se

Gergely Sipos MTA SZTAKI Lab. of Parallel and Distributed Systems, Budapest, Hungary sipos@sztaki.hu

Raul Sirvent Polytechnic University of Catalonia Campus Nord, Barcelona, Spain raul.sirvent@bsc.es

Decio Sousa Dep. Engenharia Informática, University of Coimbra, Polo II, Coimbra, Portugal decio@dei.uc.pt

Alan Stewart School of Computer Science The Queen's University of Belfast, Belfast, U.K.

Domenico Talia DEIS, University of Calabria, Via P. Bucci, Rende, Italy talia@deis.unical.it

Ian Taylor School of Computer Science, Cardiff University, U.K. and Center for Computation Technology Louisiana State University, USA
Ian.J.Taylor@cs.cardiff.ac.uk

A.D. Techiouba ISTI/CNR, Pisa, Italy

Enric Tejedor Universitat Politecnica de Catalunya Barcelona, Spain etejedor@ac.upc.edu

Gabor Terstyanszky School of Informatics, University of Westminster New Cavendish Street, London, U.K. terstyg@wmin.ac.uk

Jeyarajan Thiyagalingam Harrow School of Computer Science, University of Westminster, London, U.K. T.Jeyan@westminster.ac.uk

Nicola Tonellotto Institute of Information Science and Technologies, CNR, Pisa, Italy nicola.tonellotto@isti.cnr.it

Jordi Torres Technical University of Catalonia Barcelona Supercomputing Center, Barcelona, Spain torres@ac.upc.edu

Paolo Trunfio DEIS, University of Calabria, Rende, Italy trunfio@deis.unical.it

Alexandru Tudose School of Informatics, University of Westminster, London, U.K. A.Tudose@student.westminster.ac.uk

Demetris Zeinalipour-Yazti School of Pure and Applied Sciences, Open University of Cyprus, Nicosia, Cyprus zeinalipour@ouc.ac.cy

Włodzimierz Funika Inst. Computer Science, AGH, Krakow, Poland funika@agh.edu.pl

Wolfgang Ziegler Fraunhofer Institute SCAI, Department for Web-based Applications, Sankt Augustin, Germany wolfgang.ziegler@scai.fraunhofer.de

Corrado Zoccolo Dept. of Computer Science, University of Pisa, Pisa, Italy zoccolo@di.unipi.it