

Special Issue: Grid Applications and Programming Tools

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Grid computing has gained widespread attention, both in academic and commercial settings. As a result, the development of grid middleware infrastructure has made tremendous progress. But still, application developers and end users have to cope with many problems and intricacies when trying to actually exploit grids for their application needs.

The Global Grid Forum (GGF) is a community-initiated forum working on grid technologies. GGF's primary objective is to promote and support the development, deployment, and implementation of grid technologies and applications via the creation and documentation of "best practices" – technical specifications, user experiences, and implementation guidelines.

The special issue presented here is the result of the joined efforts of two of GGF's research groups. The Applications and Testbeds Research Group (APPS-RG) seeks to facilitate the use of grid technology by application developers, and to attract new application domains to the grid. The User Program Development Tools Research Group (UPDT-RG) seeks to simplify the process of programming on the grid by facilitating the development and deployment of grid-enabled tools such as debuggers and performance tuning tools.

Recent experience has shown that grid users are running their applications using various kinds of additional (and frequently tailor-made) tools, ranging from simple wrappers around Globus commands up to web-based application portals. APPS-RG and UPDT-RG had decided to organize a workshop on grid applications and programming tools which was held in conjunction with the GGF8 meeting, June 25, 2003, in Seattle, USA. The goals of the workshop were:

- to provide a forum for (prospective) applications utilizing Grids and to disseminate "lessons learned" from grid-enabling application codes,
- to spread information about tools, toolkits and other instruments for users and application programmers,
- and to encourage users and application programmers to make use of existing grid infrastructure.

From the submissions, the programme committee selected eleven papers to be presented at the workshop. Together with two open discussion sessions,

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the presentations formed a highly interesting and inspiring assessment of the current state of grid application programming and deployment. The workshop organizers are very grateful to the editors of the Journal of Grid Computing for their offer to publish a special issue with extended and carefully revised versions of the best workshop presentations.

For this special issue, the programme committee selected the following six articles, describing existing grid programming tools and environments as well as “hands on” grid application experiences.

Barkstrom et al. open this special issue with their application case study *Distributed Generation of NASA Earth Science Data Products*.

In *Constructing Grid Applications using Standard Grid Middleware*, Takemiya et al. present their lessons learned from grid-enabling a large meteorology application using Ninf-G, a standard grid middleware.

In *Towards efficient execution of MPI applications on the Grid: Porting and Optimization Issues*, Keller et al. present their experience in developing grid-enabled versions of tools and libraries for MPI, the most widely used standard for message passing programs, originating from traditional (non-grid) supercomputers.

Badia et al. go one step further. *Programming Grid Applications with GRID superscalar* presents a programming model and runtime system that has been explicitly designed for grid environments.

Kacsuk et al. present *P-GRADE: a Grid Programming Environment*, providing a high-level, graphical environment, also integrating application monitoring and visualization.

Taylor et al. conclude this special issue. They demonstrate the use of a high-level Grid Application Toolkit (GAT) to integrate multiple execution environments in *Triana Applications within Grid Computing and Peer to Peer Environments*.

The workshop has been organized by the co-chairs of GGF’s APPS-RG and UPDT-RG: Tom Hinke (NASA Ames), Thilo Kielmann (Vrije Universiteit), Ed Seidel (LSU), Susanne Balle (HP), and Robert T. Hood (NASA Ames). Together, we would like to thank the members of the programme committee for their vital help in making both the workshop and this special issue happen: Gabrielle Allen (LSU), Simon J. Cox (University of Southampton), Shantenu Jha (University College London), André Merzky (Zuse Institute Berlin), Matthias Müller (HLRS Stuttgart), and Yoshio Tanaka (AIST).