PREFACE

The Computational Grid (CG) as a type of parallel and distributed system enables large scale computing by virtually joining geographically distributed and autonomous resources under the restrictions of their availability, computing capability, cost, etc. The emerging deadline-driven grid-enabled applications require access to several resources and predictable Quality of Service (QoS). Therefore, efficient resource management is a crucial research issue.

Substantial work has been done on protocols, middleware and services for security and management of computing, storage data and other resources within dynamic, distributed computing systems. Some attention has also been paid to economically efficient allocation of such resources and business-like models based on grid utilization. All those topics seem to be one of the key research issues in the domain of grid technology employment to commercial applications and enterprise grid computing.

In this special section we present seven research papers reporting recent findings, developments of models and solution techniques used for scheduling and resource management in grid computing as well as grid-enabled applications.

Effective resource allocation in grid computing requires application of intelligent and scalable data management systems. The complexity of this problem comes directly from the hierarchical large-scale nature of the computational grid, which accounts for many administrative domains with their own access policies, user privileges, etc.

Terzo *et al.* present a grid based data processing system for a radio occultation receiver. The system uses the Globus Grid Toolkit to link geographically distributed nodes and schedule jobs. Carpen-Amarie *et al.* propose the integration of an introspection mechanism with a BlobSeer service for sharing massive data in a grid environment. The introspection mechanism introduces self-adaptation into data management in a large-scale grid, which copes with grid dynamics.

The effectiveness of the grid data management system can depend on some additional requirements defined by grid users, such as security in scheduling and resource reliability. A new game-theoretical approach, in which those requirements arise in task scheduling and resource allocation problems in computational grids, is presented by Kołodziej and Xhafa. Two game scenarios, a symmetric non-cooperative game of grid users and an asymmetric Stackelberg game, are considered in this approach. The games are solved using GA-based hybrid schedulers, which are experimentally evaluated through the grid simulator under heterogeneity as well as large-scale and dynamics conditions.

A game-theoretical grid data management system can be interpreted as a decision making system of grid users. However, in practical application it may not be so easy to set the game conditions. The complexity of the decision process in a real-life Information and Communications Technology (ICT) system is well illustrated by Hall-May *et al.* The authors present the SERSCIS framework to support and manage the critical infrastructure of ICT services. The proposed framework allows risks in operating the critical infrastructure to be managed by augmenting the current 'slow' human-initiated management with automated and assisted management of ICT components and services. The problem of system interconnectedness is demonstrated by the airport collaborative decision making approach.

The SERSCIS system presented Hall-May *et al.* is an example of a Service-Oriented Architecture (SOA), which is, together with grid and cloud computing, the key technology in large-scale distributed systems. Recently some overlap between the goals of grid computing and the benefits of SOAs can be observed. The advances in Web services technologies moved the architecture of classical grids to the service-oriented enterprise-grid environment. In such a system, services are used both to virtualize resources and to provide specific grid functions and applications. The core of modern SOA systems can be based on cloud and Peer-to-Peer (P2P) architectures.

In the paper by González-Vélez and Kontagora, a cloud environment model is presented, which typically comprises inter-connected, virtualized computers coupled with security and a programming model. The authors use a MapReduce model for efficient virtualization of the departmental cloud. They perform the experimental analysis using standard Hadoop benchmarks in order to determine whether or not significant reductions in the execution time of computations are experienced on the virtualization cloud platform.

Di Modica *et al.* present a P2P-based system with semantic groups of peers that can be used for storing discovery information for various services in a distributed environment. Each peer in the network is specialized in answering queries pertaining to several domains. The novelty of the approach consists in combining P2P overlays (that facilitate quick searches) with the use of functions provided by the running services (based on semantics).

A practical P2P resource management approach is presented in the paper by López-Fuentes. The main contribution is a flow control mechanism that allows dynamical optimization of the overall throughput and automatic adjustment of the video quality for each peer. Thus, peers with different upload capacity receive different video quality. The contribution also combines Scalable Video Coding (SVC) with Multiple Description video Coding (MDC) methods to alleviate the packet loss problem. The proposed methodology is tested in the PlanetLab infrastructure.

Most authors contributing to this special section participated in the 4th International Conference on *Complex, Intelligent, and Software Intensive Systems (CISIS-2010)*, held in Cracow (Poland) in 2010. The aim of this annual conference is to deliver a platform for scientific interaction between the three interwoven challenging areas of research and development of future ICT-enabled applications: software intensive systems, complex systems and intelligent systems.

As guest editors, we would like to take this opportunity to thank the authors for their effort and contribution. We also would like to express our sincere thanks to the reviewers, who helped us to ensure the quality of this special section. We gratefully acknowledge their time end effort.

We believe that this collection of papers provides a simultaneous design blueprint, user guide, and research agenda for current and future developments and will appeal to a broad audience, from developers and users of grid-enabled technologies, to advanced students interested in this field.

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