# Editorial

Krzysztof Walkowiak* and Michał Woźniak

Department of Systems and Computer Networks,
Wroclaw University of Technology,
Wybrzeze Wyspianskiego 27, 50-370 Wroclaw, Poland
E-mail: Krzysztof.Walkowiak@pwr.wroc.pl
E-mail: Michal.Wozniak@pwr.wroc.pl
*Corresponding author

**Biographical notes:** Krzysztof Walkowiak received his MSc, PhD and DSc (Habilitation) in Computer Science from Wroclaw University of Technology in 1997, 2000 and 2008, respectively. Since 2009, he has been a Professor in the Department of Systems and Computer Networks, Faculty of Electronics, Wroclaw University of Technology. His research interest is mainly focused on optimisation of grids and P2P systems, optimisation of connection-oriented networks, survivability issues of MPLS, application of soft-optimisation techniques for design of computer networks. He has published over 80 papers and one book. He is a member of many international conferences' program committees. For more details see http://www.kssk.pwr.wroc.pl/walkowiak/.

Michał Woźniak is a Professor of Computer Science in the Department of Systems and Computer Networks, Faculty of Electronics, Wroclaw University of Technology, Poland. He received his MS in Biomedical Engineering in 1992 and PhD in Computer Science in 1996 from the Wroclaw University of Technology. His research focuses on multiple classifier systems, machine learning, data and web mining, Bayes compound theory, distributed algorithms, computer and networks security and teleinformatics. He has published over 100 papers, two books and he has edited three books including *Computer Recognition Systems* (Springer). He is the Editor-in-Chief of *International Journal of Computer Networks and Communications* and the Associate Editor of several international journals including *Pattern Analysis and Applications*, *Expert Systems*, *Computational Intelligence* and *International Journal of Communication Networks and Distributed Systems*. He serves on program committees of numerous international conferences. His works have been transitioned into commercial applications. See detailed profile at http://www.kssk.pwr.wroc.pl/pracownicy/michal.wozniak-en.

Since 1998 – when Ian Foster and Carl Kesselman proposed the term 'grid computing' in *Grid Computing: Blueprint for a New Computing Infrastructure* – grid computing has received a significant and sustained research interest in terms of designing and deploying large scale and high performance computational in e-science and businesses. Service-oriented computing is a popular design methodology for large scale business computing systems. Grid computing enables the sharing of distributed computing and data resources such as processing, networking and storage capacity to create a cohesive resource environment for executing distributed applications in service-oriented computing. Grid computing also represents a more business-oriented orchestration of pretty homogeneous and powerful distributed computing resources to optimise the execution of time consuming process.

Grid computing is continuously evolving according to changing needs of potential users and new technological inventions. The most important and current trends in grid computing are as follows. First, the growing role of network-oriented communication with a special focus on the internet. Many grid developers and practitioners are underling the importance of efficient network support. Computational resources placed in remote geographical locations are to be connected to establish effective computing systems. Therefore, the underlying network infrastructure must provide robust and effective means of communications with quality of service (QoS) guarantees specific for grid computing. Significant problems can be encountered since the internet and currently used network technologies and protocols are mostly not designed to satisfy these grid-oriented QoS requirements. Second, grid computing systems are migrating from traditional high performance and distributed computing to pervasive and utility computing based on the advanced capabilities of the networks (including the wireless) and the lightweight thin devices. A representative example is a sensor network consisting of small devices that can measure a physical quantity and convert it into a signal which is transmitted using the wireless network. The advent of these new kinds of computing systems possibly can enable development of new grid technologies and commercial applications aimed for a vast number of end users. Third, parallel to dynamic evolution of grid computing systems, many issues of security must be addressed. This follows mainly from the fact that grid computing systems are gradually applied in many areas of human activity, and a potentially successful attack reducing the grid functionality and availability can lead to many severe consequences. Since the fundamental element of the grid computing system is the network, grids are vulnerable to the same threats and attacks that are encountered in the internet and other networks. Moreover, also new dangers – specific for grid computing systems – regularly appear. Analogously to security requirements, also issues of survivability must be addressed. Grid computing systems must be provisioned with a spectrum of efficient and cost-effective mechanisms improving resilience of the system against failures related to the hardware, network, energy, etc. The forth important aspect of grid-related research concentrates on problems of scheduling and management. Grid computing systems – like many computer systems – should be designed and optimised in order to provide the required functionality in a cost-effective manner. Thus, the scheduling and management implemented in grid computing systems must enable effective utilisation of all resources composing the system, i.e., hardware, storage, network, application, etc. Due to the heterogeneity of both computing systems and computational tasks, scheduling and management trigger significant research challenges including offline and online optimisation, real-time requirements, economical issues and others.

In addition to the trends in grid computing research presented above, we can enumerate also such issues as: scalability of grids, cloud computing, web services, public-resource and peer-to-peer computing systems, financing of grids, law regulations, energy saving and 'green' IT.

This special issue aims to foster state-of-the-art research in the area of grid computing and focuses on all aspects of grid technologies and to present novel results and solutions to solve various problems and challenges in grid platforms. The special issue additionally includes high quality papers from the first international workshop on grid computing (GridCom-2009) held in Morocco, May 2009.

As a result of the call for papers, 14 articles were submitted and these were put through a rigorous peer-review process. In the end, eight contributions were selected,

resulting in an acceptance rate of 57%. We hope that the selected papers of this issue provide the reader with an excellent discussion of the current issues of grid computing. The topics selected cover the vital parts of modern grids including: security, resource management, scheduling, network design and data mining. Let us present shortly the contents of collected articles.

Moez Ben Haj Hmida and Yahya Slimani, in their paper 'Meta-learning in grid-based data mining systems', present data mining tools based on well-known WEKA software. The great advantage of the proposed software is its ability of working in grid environment.

James Edmondson and Douglas Schmidt, in the paper 'Multi-agent distributed adaptive resource allocation (MADARA)', deal with the NP hard optimisation problem of resources allocation. They propose original heuristic and software environment for aforementioned problem dedicated for grids.

Filippo Cugini et al., in their article 'Optical grid networking exploiting path computation element (PCE) architecture', discus how to improve the performance of grid-based applications by optimising computational and network resources.

G. Sudha Sadhasivam and C. Geetha Jini, in their work 'Secure communication between grid domains based on trust relationship and group keys', focus on the security communication in grid computing systems. The authors propose how to generate and to distribute group key and how to establish domain to domain communication using trust relationship among the entities.

P. Jayashree and K.S. Easwarakumar, in their article 'User behaviour trust model to defend denial of service attacks in distributed computational environments', deal also with security problem. They focus on making the underlying network reliable for transactions by identifying attack clients based on their behaviour in request participation using a trust model to substantially prevent them from participating in normal data transactions and to ensure sustainable network.

N. Jaisankar and R. Saravanan in their paper 'An efficient layered security framework for protecting network layer operations in mobile ad hoc networks', discuss another security problem. They propose an agent-based framework to monitor, detect and isolate misbehaving nodes in the mobile ad hoc networks.

Giuseppe Minutoli et al., in the work 'VisualGrid: enabling runtime applications monitoring in grid environments', describe how scientific visualisation techniques could be used in a grid environment in order to allow users to monitor the evolution of their applications.

Amit Agarwal and Padam Kumar, in their article 'An effective compaction strategy for bi-criteria DAG scheduling in grids', present scheduling heuristic which comprises of two stages. The first one optimises execution time and the second one minimises the number of processors and optimises economic cost without increasing the makespan obtained in primary scheduling.

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