Preface

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Biographical notes: Horacio González-Vélez is head of NCI Cloud Competency Centre in Dublin and executive editor of the *International Journal of Grid and Utility Computing*. He spent over ten years working for innovation-driven companies such as Silicon Graphics and Sun Microsystems. With a proven track record of attracting research and commercial funding, he has embraced joint interdisciplinary research that motivates knowledge transfer, creative thinking, and innovative products. His research touches upon cloud/parallel computing, multi-core technologies, and the application of algorithmic skeletons to the solution of domain-specific problems in science and industry. He has a PhD in Informatics from the University of Edinburgh.

Widely adumbrated as networks of heterogeneous, computational resources linked by software in such a way that they could be used as easily as a personal computer, computational grids have long posed a challenge to known distributed systems programming and management techniques, as a result of the inherent heterogeneity and dynamic nature of their resources. From the late 1990s onwards, their study has constituted a continuously evolving field in computer science.

This special issue incorporates a collection of works describing decentralised approaches to processing and organising resources in grids. These works have been carefully selected from leading conference presentations and extended by their authors. They cover not only innovative systems deployed in infrastructures with federated networks with reliable connections or loosely-coupled peer-to-peer node assemblies, but also advanced developments in distributed heterogeneous processing, resource accounting, and data organisation.

Bernardo and Hoang (2012) make the case for the use of a UDP-based data transport protocol as a secure, reliable mechanism to transmit data on diverse grid infrastructures, including next generation high-speed networks and wide-area optical networks.

Barbera et al. (2012) describe Gustav, an accounting system for small-scale infrastructures and a viable option to larger systems. By employing an ad hoc lightweight mechanism, Gustav provides nimble resource tracking to geographically-distributed sites with diverse network bandwidth characteristics.

Liang et al. (2012) introduce a framework to enable seamless GPU computing on computational grids. Using remote procedure calls on distinct hosts, programmers can transparently access GPU resources across a given distributed infrastructure.

Alghamdi et al. (2012) purport to improve the processing of large XML databases using a dual-layer mechanism to partition and, subsequently, index and link XML data, in order to ultimately improve query performance.

Takeda et al. (2012) propose a structured peer-to-peer network organisation to achieve dynamic load balancing among nodes. By coupling a simple load-balancing algorithm with a hop-based routing table, it has showed to reduce network communication overheads.

Kohana et al. (2012) introduce a dynamic data management mechanism to handle requests for a large number of users in the context of multi-player online role-playing games. Its proposed rule triad proves to be particularly useful when users' 'avatars' concentrate in specific locations.

Haribabu et al. (2012) present a methodology to detect Sybil attacks in peer-to-peer networks with a large number of users. By analysing individual responses to questionnaires using clustering algorithms, it has arguably demonstrated to detect Sybil groups in a reliable manner.

Shorfuzzaman et al. (2012) employ dynamic programming to determine the number and location of data replicas in a large grid infrastructure. For a given traffic pattern, data access history and minimal replication costs are exploited to satisfy a certain quality of service.

Barhamgi et al. (2012) pose a declarative approach for mashing-up data, whereby programmers do not need to explicitly invoke directives to combine and aggregation data. Data is handled via web services and their view formally organised in ontologies.

Fujimoto et al. (2012) discuss a caching scheme to enhance utilisation in peer-to-peer video applications. By using content popularity they show interesting performance improvements.

Pandey et al. (2012) propose a large educational content system for hierarchical peer-to-peer networks to enable interest-based communities. Designed for India's National Knowledge Network – a high-speed infrastructure to connect centres of science, technology, and higher education – their system have shown promising results for two geographical distributed locations.

It is expected that this collection will contribute to advance knowledge in the evolving field of grid computing, informing decisions and future developments of scholars and practitioners.

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