Editorial

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Biographical notes: Francesco Palmieri is an Assistant Professor at the Second University of Napoli. He received his MS degree and PhD in Computer Science from the Salerno University. His research interests concern advanced networking protocols and architectures and network security. He has been the Director of the Networking Division of the Federico II University of Napoli. He contributed to the development of the internet in Italy as a senior member of the Technical-Scientific Advisory Committee and of the CSIRT of the Italian NREN GARR. He serves as the Editor-in-Chief of an international journal and participates in the editorial boards of other ones.

Aniello Castiglione joined the Department of Computer Science of the University of University of Salerno in 2006. He received his degree in Computer Science and PhD in Computer Science from the same university. He serves as a reviewer for several international journals (Elsevier, Hindawi, IEEE, Springer, Inderscience) and he has been a member of international conference committees. He is a member of various associations including: IEEE, ACM, of IEEE Computer Society, IEEE Communications Society, and Signal Processing Society. For many years, he has been involved in forensic investigations, collaborating with several law enforcement agencies as a consultant. His research interests include data security, communication networks, information forensics, security and privacy, and cryptography.

1 Introduction

The internet has drastically changed our lives as well as the way we acquire, process and manage information and knowledge, but its overwhelming success and growth in terms of scale and pervasiveness has revealed most of the limits of traditional computing and storage architectures by introducing several new challenges mainly related to capacity, performance and robustness/security issues. In particular, modern network-based ICT applications need enormous processing power and effective access to massive amounts of data, resulting in the need of a new e-business model based on the concept of always available runtime and data archival services that are provided according to a commodity paradigm like traditional utilities such as telephone, water, electricity and gas. Faced with the above challenges, new large-scale fully decentralised distributed architectures are emerging, with the goal of providing dependable, consistent, and inexpensive access to virtually unlimited amounts of computational and storage resources, which are provided by multiple different organisations and physically located in various geographical sites. These resources should be available to users according to an on-demand paradigm, without considering where they are hosted, who owns them or how they are delivered.

Several paradigms and architectures have been developed to deliver this kind of utility computing vision, ranging from cluster computing, grid computing, and more recently cloud computing. The internet is clearly the strongest enabling factor for these paradigms due to its pervasiveness and coverage, supported by a wide range of transmission technologies that span from high performance ultra-broadband fixed optical fibre connections to totally dynamic wireless ad hoc meshes, empowering a large variety of network-based cooperation protocols and architectures that are the basis for modern distributed computing infrastructures.

In detail, by leveraging high performance IP-based networks, cluster computing tightly associates into homogeneous pools, operating like single larger parallel machines, several individual systems which are usually bounded in their memory space and processing power.

Similarly, but from a slightly different perspective, grid computing is concerned with the optimal utilisation and workload management of multiple heterogeneous computing and data storage systems geographically scattered throughout the world, in order to serve very large and complex distributed applications. However, while enabling effective access and transparent resource usage, the grid paradigm does not provide any kind of QoS support and operating environment isolation: running multiple different customised environments is quite difficult and, in addition, a running task can influence with its demands the performance of other completely unrelated ones.

Cloud computing is the natural evolution of the grid-utility model, introducing flexible environment customisation through enhanced virtualisation and control capabilities, often provided by using the new software-as-a-service (SaaS), infrastructure-as-a-service (IaaS) and platform-as-a-service (PaaS) paradigms. While from a general point of view all the above computing paradigms have a common goal in trying to offer transparent access to a large amount of resources, usually overcoming the limitations of a single machine, clusters and grids are mainly used within the academic and research sector, whereas clouds receive a major interest from industry and enterprises.

It must be highlighted that the potential of the grid and cloud computing paradigms on the new internet-based information society may largely go beyond traditional distributed computing, but at the same time they introduce a significant degree of complexity in the whole computing framework. Both the paradigms need advanced hardware and software technologies, such as new platforms, security services, resource discovery and management facilities, job scheduling algorithms and policies, replication strategies, and so on, in order to provide transparent, secure, reliable, and efficient resource access within the involved infrastructures. However, many challenges remain still open in ensuring reliable high performance services through effective data and runtime resource placement, fault tolerance, strong access security, and workload management, as well as providing novel architectures and reference models that are able to cope with the tremendous increase of users and applications.

Accordingly, this special issue aims at fostering state-of-the-art research in the area of grid and cloud computing and is expected to focus on many open aspects of these technologies and to present novel results and solutions to solve the various problems and challenges in these platforms. We strongly believe that the papers presented in this special issue may significantly contribute to the work and studies conducted by academic researchers, industry professionals, students, and everyone interested in this subject wanting to extend the knowledge about advanced security, networking and architectural issues in the context of distributed computing.

2 Special issue contents

This special issue is composed of five contributions, carefully selected according to their subject and accepted based on merit contents. These works cover a variety of topics, including interworking and interoperability, security, management/monitoring and personalisation in the grid and cloud scenarios.

Starting from the great limitations in interoperability of cloud services, the contribution from Sotiriadis et al. (this issue) proposes an algorithmic model for service distribution in order to manage interoperability in cloud environments, namely inter-cloud. In doing this it integrates theoretical issues in coordinating and orchestrating job execution in a distributed setting with flexible meta-computing features, in order to allow advanced scheduling decisions based on a single aggregated view of multiple distributed resource managers.

The article from Ficco (this issue) has the main objective of countering cyber attacks in clouds that can potentially compromise the QoS delivered to the customers, together with the overall costs of the provided services. For this purpose, it proposes an hybrid hierarchical event correlation approach for intrusion detection that allows the discrimination of intrusion symptoms through the simultaneous collection of multiple information at several levels of the cloud architecture, by using distributed security probes, as well as performing complex event analysis based on a properly crafted event processing engine. The escalation from the detected symptoms to the identified intrusion cause and target is driven by a knowledge-base represented by using ontologies.

Another security-related contribution, proposed by Catuogno et al. (this issue), copes with the security of economic transactions related to the fulfilment of services with the mediation of the grid infrastructure. By starting from the available economic models for charging grid services, the work presents a new security scheme, based on the existence of a trusted party within the grid that can be used to build a reliable accounting system using the pay-for-use approach. It guarantees the execution of reliable economic transactions on the grid also when either the clients or the resource owners are compromised.

The work from Pardi et al. (this issue) illustrates a new distributed monitoring model properly conceived for multi-regional grid infrastructures. It is based on a flexible cloud-based architecture, working on a geographical scale that allows managing, reconfiguring and modifying monitoring components for each grid site. As a significant added value, such architecture is structured according to the IaaS paradigm and is empowered by a network management system that relies on advanced network services that are able to create on-demand layer-2 interconnection among sites. It is presented within the context of a case study, concerning a possible evolution scenario for the scientific computing infrastructure deployed in the South of Italy.

Finally, the article from Do and Hussain (this issue) faces with the problem of personalisation in cloud-based e-governance services, in order to help the users of provided services, to more easily achieve results that are of the greatest relevance to their own profiles. The contribution essentially focuses on a personalisation algorithm combining the TOPSIS and Pearson correlation coefficient methods, whose effectiveness is presented within the context of a case study in which cloud users are suggested the interface language they want to use without making an explicit request.

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