



## Editorial

## New Horizons of Cloud Computing



Over the last years various approaches and solutions in relation to Cloud Computing have been suggested and discussed. Papers have addressed infrastructural concerns, security and configuration challenges as well as performance issues together with frameworks, application scenarios and business considerations. In addition to technical and managerial issues, domain specific challenges and opportunities of applying Cloud Computing to various sectors have been discussed. Furthermore, recently a move by many cloud providers to business and industry-specific cloud solutions can be observed [1]. Overall, the term “Cloud Computing” has become the summary to describe a new paradigm in computing, with many challenges and opportunities. According to Foster et al. [2], this has largely become popular due to the decrease in hardware cost, increase in computing power, exponentially growing data size, and the wide-spread adoption of service computing. As these trends continue and further advances in technology can be expected, we can assume a further increase in the adoption of Cloud Computing among many industries and applications.

Technological advances within the field of cloud computing have reduced costs associated with service provision. In this regard, Cloud Computing has increased the trend towards service orientation and ‘servitization’ that recognizes the importance of services within complex business and IT environments [3]. The focus shifted from functional system deployment, to service systems for value-co-creation. These service systems are characterized by configurations of people, technology, value propositions connecting internal and external service systems, and shared information. Overall technological advances related to Cloud Computing provide many opportunities but also challenges. This goes along with a shift toward service orientation aiming on delivering value by integrating and bundling products and services together with innovation, people and technology. With this special issue we aim to demonstrate some of the challenges and solutions by presenting five research contributions for this special issue of the Journal of Future Generation Computer Systems (FGCS).

The special issue includes extended and revised versions of a set of selected papers from the 3rd International Conference on Cloud Computing and Services Science (CLOSER 2013). Aim of the conference is to provide a platform for discussing and presenting research results in the area of Cloud Computing and Service Science. Although both areas are related and complement each other, the conference is nevertheless not about the union of these two fields, but about technology advances of Cloud Computing and its relation to Services Science, that can provide theory, methods and techniques to design, analyze, manage, market and study various aspects of Cloud Computing.

With the conference and this special issue we focus on the emerging area of Cloud Computing and Service Science, inspired by advances that concern the infrastructure, operations, and available services through the global network. Further, we consider the relation between Cloud Computing and Services Science, acknowledging the service-orientation in most current IT-driven collaborations.

The special issue herewith presents 5 research papers with novel concepts and applications in the aforementioned areas. The papers were selected by the conference program committee and peer reviewed through the Journal review process. The papers focus on Cloud Computing and Services Science, including contributions of “A Secure Dynamic Collaboration Environment in a Cloud Context” (by Chris Piechotta et al.), “Matchmaking semantic security policies in heterogeneous Clouds” (by Orazio Tomarchio and Giuseppe Di Modica), “Capacity-driven utility model for service level agreement negotiation of cloud services” (by Eugenio Zimeo and Nadia Ranaldo), “Automated Configuration Support for Infrastructure Migration to the Cloud” (by Jesús García-Galán et al.), and “Analysing Hadoop Power Consumption and Impact on Application QoS” (by Javier Conejero et al.).

The paper by Piechotta et al. [4] describes a secure and dynamic collaboration Environment in a Cloud Context, and addresses the increasing security concerns of migrating to the cloud and utilising it for data storage. This paper focuses on the important issue of securing data in an untrusted cloud environment and ensuring detailed data access control in the cloud. The authors propose two conceptual designs by exploring and extending the boundaries of existing secure data-storage schemes. The approaches have then been combined with security principles and research within the field of cryptography. The approach has been validated in form of proof of concept prototypes.

Tomarchio and Di Modica [5] describe with their contribution a matchmaking semantic security policies in heterogeneous Clouds. Recognising the need to address the diversity in security policies, the authors propose an approach that leverages on the semantic technology to enrich standardized security policies with an ad-hoc content. The approach has been developed together with a semantic framework capable of matchmaking security capabilities of providers and security requirements of customers. It uses semantic annotations of policies for both the discovery and the composition of security-enabled services. The authors have developed an automatic procedure that ensures the semantic enrichment of policies.

The paper “Capacity-aware Negotiation of SLAs for Cloud Services” by Ranaldo and Zimeo [6] investigates the challenge of static approaches to guarantee Quality of Service (QoS)

levels and to define pricing. The authors propose to support bilateral negotiation processes by utilising capacity planning, with the aim to avoid contracts that could incur in Service Level Agreements (SLAs) violations as well as ensuring competitive prices. The proposed technique exploits a non-additive utility function defined in the region of acceptable SLA proposals, taking into account desired QoS and expected resources availability, costs and penalties. The authors demonstrate the benefits of their approach by an experimental analysis.

The paper from García-Galán et al. [7] describes an automated configuration support for infrastructure migration to the Cloud. The work addresses the challenge of selecting suitable configuration options for location, purchasing mode, redundancy, extra storage, and other configurations alternatives. In order to select the most suitable cloud configuration, in this work the authors focus on evaluating configuration options in terms of infrastructural requirements and cost. The authors use variability modelling and analysis techniques together with features models, that allow the analyses and search for optimal confirmations. The work is presented with a case study. The results demonstrate how the approach compares with commercial approaches in terms of expressiveness and accuracy.

The contribution from Conejero et al. [8] analyses Hadoop power consumption and its impact on the quality of services of applications. Recognising the key issue of energy efficiency for migrating to Cloud environment, they investigate and measure energy consumption of a number of virtual machines running the Hadoop system. Using the scenario of sentiment analysis of Twitter messages, the authors aim to understand the tradeoff between energy efficiency and performance for such a workload. The results can be used to establish a Service Level Agreement with a Cloud provider considering the variability of energy and performance over multiple runs of the same application. The work provides insight on the relationship between power consumption and Quality of Service related metrics.

We believe the papers presented in this special issue will serve as a reference for readers who research on the areas of Cloud Computing generally and Security, Service Negotiation as well as Power Consumption and Configuration in the Cloud, specifically. We hope that the readers will find new inspiration for their research and may join the CLOSER community in the future.

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