

Journal of Grid Computing, Special Issue of Cloud Computing and Services Science

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The stated mission of *The Journal of Grid Computing* is exploring “an emerging technology that enables large-scale resource sharing problem solving within distributed, loosely coordinated groups.” The technologies in the journal’s scope are extremely broad and deep, and fundamental to modern computing infrastructure and solutions. Cloud Computing focuses on delivering physical hardware, Infrastructure-as-a-Service (IaaS), software infrastructure for solutions (Platform-as-a-Service) and complete applications or application APIs as a service (SaaS). Advances in cloud computing support and are critical to advances in grid computing. Equally important is the concept of *services*. At a technical level, Service Oriented Architecture (SOA) is core to how clouds implement use of and management of the resources they provide. More generally, the cloud is a network of business services providing technical, administrative, regulatory and financial capabilities necessary for resource sharing and problem solving. The importance and interrelatedness of grid computing, cloud computing and services sciences motivates a special issue on these topics.

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This special issue contains 5 papers that significantly contribute to the advancement of grid computing, cloud computing and services science. The papers went through a rigorous, multi-step review and editorial process. First, the papers went through peer review for acceptance to *the 5th International Conference on Cloud Computing and Services Science*. Second, the conference program committee and journal’s editors choose 15 of the best papers for consideration for this special issue. Authors expanded their papers and added technical material. The submitted papers went through several steps of peer review and feedback. Ultimately, the editors chose five papers for publication. The five papers address three technical areas: 1) Optimizing shared, federate infrastructure. 2) A specific solution that demonstrates the value, challenges and innovation in grid, cloud and services. 3) Security.

The first paper is “Implementation and Provisioning of Federated Networks in Hybrid Clouds.” Clouds, grid computing and services are not possible without overcoming complex problems of shared, federated networks. The problems become increasingly complex because solutions span public-private networks and network services provided by multiple, independent clouds. The first paper introduces and evaluates a framework for automated provisioning of virtual networks spanning multiple cloud providers. The framework and solution is secure, elastic and hybrid. The paper also describes a proof of concept to demonstrate the practical implementation of the framework. The second paper is “Many-Objective

Virtual Machine Placement.” A defining characteristic of shared infrastructure is the need to evolve from simple, focused optimization objectives, e.g. load balancing, to more complex, interacting multi-objective optimization (power consumption, revenue, availability, ...). Like networking, compute is core to cloud and grid, and VMs and their placement is the most common technology in use. The second paper explains the problem and concepts of multi-objective optimization and defines an algorithm for achieving multi-objective optimization for VM placement in a cloud. The paper uses experimentation to demonstrate the correctness and effectiveness of the algorithm for large numbers of diverse VMs and diverse performance objectives.

Case studies and concrete solutions are essential to advancing cloud, grid and services technology. Case studies demonstrate the interplay between technologies that other papers address in isolation. Case studies also demonstrate the complexity that arises when trying to align technical frameworks and algorithms with the higher layer business goals. The special issue’s third paper is “Financial Modeling and Prediction as a Service.” The paper describes a quality-of-service (QoS) for financial modeling and prediction as a service, and technology necessary to implement the QoS. The paper uses experimentation and specific examples to demonstrate the value of the quality-of-service definition and the implementing technology. An especially interesting aspect of the paper is the interaction between application objectives (prediction accuracy) and infrastructure objectives (compute resource consumption).

Potential exploiters of cloud computing and cloud services cite security concerns as the number one inhibitor to adoption. The final two papers in this special issue cover security. The first paper is “Design

and Comparative Analysis of MCDM-Based Multi-Dimensional Trust Evaluation Schemes for Determining Trustworthiness of Cloud Service Providers.” Security and trust evaluation is inherently a multi-criteria decision making (MCDM) problem. Currently, there are no MCDMs for enabling consumers to evaluate the security and trustworthiness of cloud service providers. This paper proposes and evaluates three MCDM systems and evaluates them from several perspectives (cloud auditor, cloud broker, peer cloud). Experimental results demonstrate the effectiveness and value of the systems. The final paper, “PaaSword: A Holistic Data Privacy and Security Design Framework for Cloud Services,” defines a framework for data security. Data security in the cloud is extraordinarily important and has been extensively studied. This paper makes two important contributions to the state of the art: 1) A context aware security model, 2) An integration of physical distribution, encryption and middleware to provide a solution. Many security architectures incorrectly ignore the context of data access (From where? When? Under what conditions? etc.) and focus solely on who is accessing which data. Most architectures and papers focus on individual aspects of security, e.g. firewalls, authentication schemes. Practitioners realize that data security is a system and solution problem. The final paper makes significant advancements by addressing context and the security solution as a whole.

This special issue could have contained many papers in many areas of a broad and deep technical domain. We chose these five papers because of the special significance of the topics they cover and their demonstrated excellence. We want to thank everyone who submitted papers, reviewed papers and helped contribute to what we hope is an excellent special issue.