Editorial to the special issue “Web services – architecture and infrastructure”

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The recent success of the Web in general and especially the eager uptake of Web service technologies have demonstrated the benefits of loosely coupled software systems. Loose coupling is a central factor for flexible, maintainable, and adaptive systems. Based on loosely coupled architectures, Web technologies enable systems to achieve interoperability and to interact across technical and organisational boundaries. In the last few years, such systems are predominantly being developed following the service-oriented computing paradigm.

Loosely coupled, service-oriented architectures improve a system's ability to change – i.e., to evolve to meet changing requirements and to adapt to changing environments. Services as the building blocks of these systems can be specified, published, and discovered. They can be composed and dynamically deployed. Web service technologies provide the basis for systems development based on heterogeneously implemented individual services using interoperable, non-proprietary mechanisms.

Today, we have reached a stage where an integration technology for cross-organisational software systems exists with the Web services platform that is widely accepted by developers and users. However, service integrators, developers, and providers need to be provided with a wider range of methods, techniques, and infrastructure

technologies to support the cost-effective architectural development and deployment of dependable services and service-oriented applications beyond the core integration solutions.

This *Special Issue of Computer Science – Research and Development* focuses on *Architecture and Infrastructure* aspects of Web service technologies. Today, a service engineering discipline is emerging, linking Web service infrastructure and platform technologies to aspects of service-oriented architecture (SOA). Such a discipline needs to bridge between the architectural design-time concerns and the infrastructure technologies enabling the implementation and deployment of service architectures.

The authors of selected papers presented at the fifth IEEE European Conference on Web Services (ECOWS 2007) were invited to submit substantially extended versions of their conference contributions. ECOWS is the premier conference for both researchers and practitioners to exchange the latest advances in the state of the art and practices of Web services in Europe. At ECOWS 2007, 25 full papers were presented – representing an acceptance rate of 30%. We finally selected four papers from the six ECOWS 2007 papers we invited to submit an extended version that cover a spectrum of architecture and infrastructure aspects:

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- David E. Millard, Yvonne Howard, Noura Abbas, Hugh C. Davis, Lester Gilbert, Gary B. Wills, and Robert J. Walters: *Pragmatic web service design: An agile approach with the service responsibility and interaction design method*
- Meiko Jensen, Nils Gruschka, and Ralph Herkenhöner: *A survey of attacks on web services – classification and countermeasures*

- Yeon-Seok Kim and Kyong-Ho Lee: *A lightweight framework for mobile web services*
- Michele Mazzucco, Isi Mitrani, Jennie Palmer, Mike Fisher, and Paul McKee: *Revenue maximization in web service provision*.

Aspects that are covered by these papers include architecture design, security design and analysis, mobile service infrastructure technologies, and business models for service provision. These papers provide insights into how to advance the quality of service-based software applications. Quality becomes a crucial aspect in an environment that is based on cross-organisational software applications implemented and interconnected through Web services.

Millard, Howard, Abbas, Davis, Gilbert, Wills, and Walters discuss in their paper *Pragmatic web service design: An agile approach with the service responsibility and interaction design method* a design methodology for service architectures. Influenced by agile development principles, the Service Responsibility and Interaction Design Method (SRI-DM) is developed. Based on application scenarios, the method supports the generation of an interaction specification for a service-based architecture by determining a service's responsibilities and collaboration needs. A lightweight, agile approach aims at improving architecture quality, avoiding over-engineered fine-granular and complex architectures at early design stages.

Jensen, Gruschka, and Herkenhöner focus in their paper *A survey of attacks on web services classification and countermeasures* on security. Based on an analysis and classification of denial-of-service attacks in deployed service applications – a critical security risk for Web services – a number of recommendations based on countermeasures are made to avoid or alleviate these risks. Security is a quality requirement that needs to be addressed from the outset and monitored throughout an application's lifecycle.

Kim and Lee present a paper entitled *A lightweight framework for mobile web services* in which they address mobile platforms as a recently emerging application environment for service technologies. Their specific interest lies in a platform framework for these devices that captures message processing and service execution as infrastructure aspects, but also includes architectural aspects such as service migration and service publication and discovery, which need to be addressed at system design time. Performance is a critical quality requirement for these constrained execution platforms.

Mazzucco, Mitrani, Palmer, Fisher and McKee investigate in their paper *Revenue maximization in web service provision* an aspect that is often neglected – the fact that services are business entities. Costing of service provision is an important non-functional aspect in the design of service-based systems. The paper introduces infrastructure technologies to determine costs and penalties for users and providers, including strategies to optimise revenue for the provider. Revenue optimisation is a crucial quality requirement for service providers. The paper also outlines features of a middleware platform to support the presented technologies.

Bringing together these papers to cover a range of topics around Web service architecture and infrastructure was supported by a number of contributors. We would like to thank the many people that have helped in this endeavour: First of all, the authors that submitted extended versions of their original papers. Without them, there would be no special issue. Second, the reviewers who spent a lot of time and effort to provide detailed and constructive reviews – both for the conference and the special issue versions.

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