Special Issue Editorial

Recently Web services have become a hot research area due to its immense practical applications. Web services are a new breed of Web applications which are self-contained, self-describing, modular applications that can be published, located, and invoked across the Web. Web services perform functions, from simple requests to complicated business processes. Once a Web service is deployed, other applications (and other Web services) can discover and invoke the deployed service.

In a nutshell, web services can be defined as network-based application components with services-oriented architecture (SOA) using standard interface description languages and uniform communication protocols. Key SOA principles include modularity, encapsulation, composability, loose coupling, separation of concerns, and single implementation. SOA allows organizations to sense and respond and adapt their business processes rapidly without major changes to the IT infrastructure.

Despite the advances made, progress across the board has been moderate. The Inaugural International Conference on Next Generation Web Services Practices (NWeSP'05) gathered individual researchers who are also the world's most respected authorities on semantic Web; Web based services, Web applications and services. This special issue comprising of sixteen papers is focused on the various aspects of Web services and its applications. Papers were selected on the basis of fundamental ideas/concepts rather than the thoroughness of techniques deployed. The papers are organized as follows.

Model Driven Architecture (MDA) proposes the definition and use of models, with different levels of abstraction, all along the software development process. This is extended to the Service Oriented Architecture processes where granularity, composability, and consumability of services become part of the architecture decisions. MDA serves as the ideal framework to include the modeling process in Web Services development. The application of MDA techniques needs new tools supporting the modeling of Web Services. *Vara et al.* in the First paper present the MIDAS-CASE subsystem for Web information systems development. Using an extension of the Unified Modeling Language (UML) for the Web Services Description Language (WSDL), the MIDAS-CASE subsystem proposed supports the modeling of Web Services in extended UML and the automatic generation of the respective WSDL description for the Web Service modeled.

Quality of Service (QoS) becomes necessary for service-oriented computing. Web Services Agreement (WSA) aims at defining a language and a protocol for advertising the capabilities of providers, creating agreements based on creational offers, and monitoring of QoS. On the other hand, semantic web provides many burgeoning techniques that enable services intelligent and automatic on the web. *Jin and Wu* in the Second paper integrate semantic web techniques with WSA management to utilize its advantages. Authors illustrate how to specify WSA with ontology language instead of XML schema. The negotiation rules and policies are specially described with Semantic Web Rule Language (SWRL) for web service, and agents negotiate with each other under steering of such rules and policies.

Semantic search, interoperability, and easy integration between applications are the main advantages of the semantic web. It is considered that the next generation web model can provide solutions to many problems of the current web technology. In the Third paper, *Choi et al.* propose Semantic Web based Information Query System (SW-IQS) using an Ontology Server. SW-IQS is supposed to enhance the efficiency and accuracy of information retrieval for unstructured and semi-structured documents. For the interoperability and easy integration, RDF based repository system is suggested. A new ranking algorithm is also proposed to measure the similarity between documents with semantic information for fast and accurate information retrieval.

Processes can be used to integrate, coordinate and interact with many actors and software in many application domains; their range of needs and objectives is virtually unlimited. A system fitting all needs would be huge and complex, too hard to use and evolve, but on the other extreme, developing many specialized process environments for each need would lead to a situation where many independent and incompatible process islands prohibit a consistent and global process management of a company. *Estublier and Sanlaville* in the Fourth paper propose an approach where a process environment can be tailored to specific needs, most notably for Web service orchestration.

In the Fifth paper, *Vukovic and Robinson* present GoalMorph, a framework for context aware goal transformation that (a) constructs context aware goals and (b) reformulates failed goals into problems that can be solved by an AI planner. The core of the approach is ContextMesh, a context ontology, which facilitates context layering – the process of expanding or reducing the number of context types and generating corresponding context goal transformations.

Due to the complexity of the development process of high-quality learning materials, the

reuse and sharing of instructional content is increasingly needed in Web-based education. This calls for the application of the learning object paradigm as well as for partnerships among institutions to promote sharing and reuse of instructional content. In order to allow local autonomy and less local effort when participating in this global environment, *de Moura et al.* in the Sixth paper have developed LORIS, an integration system of learning objects' repositories. This system is based on an architecture that emphasizes the use of mediators and wrappers, implemented through web-services and ontologies. The use of web-services gives more flexibility to the implementation of the architecture components while the use of ontologies gives better treatment to semantic heterogeneity.

In the Seventh paper, *Ruth et al.* have designed and implemented a framework assisting client-side applications to utilize asynchronous Web services that deliver results by calling back the applications in the context of enterprise network security. This framework can support a number of rich features such as resumable client applications, the Single-Request/Multiple-Response (SRMR) message exchange pattern, intra-enterprise user and terminal mobility, and flexible interaction styles for client applications to communicate with asynchronous Web services.

Much of the content of popular Internet information sources is highly dynamic: urgent in nature and sometimes relevant only for a short time. The typical approach to querying such dynamic sources is polling for updates often.[1] This strains the traditional pull-based Internet and wastes network resources on transmitting redundant information. *Brenna and Johansen* in the Eighth paper focus on how to structure the Internet to avoid much of the unnecessary client-server interactions. The author's extend the API of popular existing Internet services through push-based Web service wrappers. These wrappers use the API of, for instance, Google, but provide functionality that is richer.

Annotation tools allow users to complement existing documents with comments, suggestions or other information. Currently, desktop annotation tools are much more sophisticated than those available for annotating web documents. In the Ninth paper, *Fernandes et al.* present EspiritUs, a Web Services based annotation system designed to allow users to create, share, and search annotations on the web. Authors present the adopted XML technologies based architecture for EspiritUs with two possible annotation scenarios.

Mobile users often require access to their documents while away from the office. While pre-loading documents in a repository can make those documents available remotely, people need to know in advance which documents they might need. Furthermore, it may be difficult to view, print, or share the document through a portable device such as cell phone. *Golovchinsky and Filby* in the Tenth paper describe DoKumobility, a network of web services for mobile users for managing, printing, and sharing documents. Authors describe the infrastructure and illustrate its use with several applications.

The hardware technology continues to improve at a considerable rate. Besides the Moore law increments of the CPU speed, in the last years the capacity of the main memory is increasing at an even more impressive rate. One of the consequences of a continuous increment of the main memory resources is the possibility of designing and implementing memory-embedded Web sites in the near future, where both the static resources and the database information is kept in the main memory of the server machines. In the Eleventh paper, *Andreolini et al.* evaluate the impact of memory and network technology trends on the performance of e-commerce sites that continue to be an important reference for Web-based services in terms of complexity of the hardware/software technology and in terms of performance, availability and scalability requirements. Authors demonstrate through experiments on a real system how the system bottlenecks change depending on the amount of memory that is (or will be) available for storing the information of a Web site, taking or not into account the effects of a WAN.

Many methods have recently been proposed for automatically composing Web services from existing ones. The methods range from AI planning to automated theorem proving and graph search algorithms. However, the usability of these methods is greatly affected by two assumptions. Firstly, it is assumed that developers provide consistent declarative descriptions of Web services. Secondly, it is assumed that there exists a sufficient set of atomic Web services, which would facilitate the composition of all other Web services. *Küngas and Matskin* in the Twelth paper propose a method to ensure these two assumptions by using analysis of Web services' descriptions. Authors method also determines possibly missing atomic Web services, which should be implemented in order to compose a requested composite Web service.

In the Thirteenth paper, *Jardim et al.* present a case study of how the context kernel has been used to integrate a suite of e-learning applications, a domain rich in research exploiting the ubiquitous computing themes. Authors illustrate how the Web Services approach allowed applications to seamlessly exchange context on the Web through a uniform context representation schema.

Reliability of web services is becoming more and more important, however, the current fault-

tolerance method requires the user application to change to a certain format and does not extend and consider the quality factors. Considering the fact that current methods make web service conversion only when a fault has occurred, *Lee et al.* in paper Fourteen focus on enabling support for service quality factors including faults so that service conversion can be supported when the user is not satisfied with the service quality. Authors also suggest new methods for efficiently converting to another web service and searching for alternative web services.

In the Fifteenth paper, *Bharti et al.* present a unique perspective of bringing service orientated architecture (SOA) to network management systems (NMS) with an aim to improve extensibility and flexibility, which are key requirements in current day dynamic environments. Authors illustrate this model for fault management, by delving in detail about implementation of such architecture with finer issues like thread management being explored in depth for an FMS as part of an overall NMS.

Baravaglio et al. in the last paper describe how a Telecom Operator can leverage on Web Services to provide integrated services which span over several technologies. The focus is on how SIP protocol (Session Initiation Protocol) can be used along with Web Service technologies to enable a new set of integrated IT and Telco services. The paper highlights the benefits and drawbacks of application of Web Service paradigm in a Telco environment and the results of research and prototyping activities carried out within Telecom Italia Lab (the R&D of Telecom Italia group).

The guest editors wish to thank all the authors of this special issue for contributing the high quality papers. We would also like to thank the referees who have critically evaluated the papers within the short stipulated time. Finally we hope the reader will share our joy and find this special issue very useful.

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