

Agile Future Internet Applications: An Introduction to Emerging Data, Service, and Process Technologies

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1 Tutorial Outline

The current Internet has emerged as the dominant application platform. Software is no longer installed on computers and distributed on physical media, but accessed as an online service, remotely, on any computer, via standard protocols such as HTTP. With the advent of this network-mediated service delivery, higher level standards have emerged and are proposed. Data is increasingly described in a standardized manner using technologies based on XML, RDF, and OWL. Leading application providers open their systems and expose APIs via Web service standards such as SOAP or REST. Similarly, business process languages such as BPEL and BPMN allow to orchestrate and network workflows across single applications. Taken together these technologies form the basis for a more agile, flexible and adaptive Future Internet services.

This tutorial covers the fundamentals of the aforementioned technologies and provides a new perspective for realizing Future Internet services leveraging these technologies.

We aim for a half-day tutorial of four hours. We assume a technical audience that is familiar with the basis of current Internet technologies such as protocols and standards-in-use like XML as well as a sound basic computer science education.

We cover new technologies that are not yet broadly in use, but emerging technologies with large potential for future Internet services. We categorize these technologies into three clusters, which form the structure of the tutorial:

1. Data (1 hour)
2. Service (1 hour)
3. Process (1 hour)

2 Data

We briefly cover established technologies for data description such as XML and databases to provide a reference point for the emerging technologies covered in depth. We describe the Semantic Web stack which aims at a increased reuse and expressiveness of data descriptions on the Web. This includes the Resource Description Framework (RDF), the Ontology Web Language (OWL) and emerging standards for the description of declarative rules (RIF).

We provide application examples and discuss the benefits that arise from using these technologies (rather than more established technologies) in applications. We conclude with providing an overview of readily available tools and prominent application examples.

3 Service

We remind the audience about the fundamental differences between data and functionality in computer science and introduce services from a technological perspective as components that package a set of functionality for reuse. We introduce standards and protocols to make services available via the internet such as REST, SOAP, WSDL and UDDI and extensions thereof discussed in the academic realm. We additionally discuss the difference between technical services and business services, which further aggregate related technical services and provide a coarser view understandable for non-technical audiences. We discuss the benefits that arise from using a service-oriented architecture (SOA) for building future Internet applications. This includes aspects of service delivery and execution and technologies supporting large-scale distributed Future Internet services. We conclude with providing an overview of readily available tools and prominent application examples.

4 Process

Processes relate services and data and tie them together into composite services which cover more tailored business functionalities. We first discuss the relation between high-level business processes and executable technological processes. We identify connections and dependencies in terms of data and services.

We show how business requirements can be captured with technologies such as BPMN, and BPEL as collaborative processes that are realized over a set of Future Internet services. This projects high-level processes to executable processes and finally to the services. We point out the recent advances of academia in formal process languages and technologies, which allow dynamic maintainance and adaptation by using advanced algebras and reasoning techniques. We show the benefits of these approaches in comparison with the available process standards in terms of the features provided and maturity level achieved. It is concluded by providing an overview of existing process management tools and example applications.

5 Presenters

Dr. Raphael Volz Dr. Raphael Volz is managing director of Raphael Volz Innovation Consulting GmbH, a boutique consultancy supporting clients in the use of new technologies and identifying the potential of new technologies for innovating their businesses. He is a visiting lecturer for applied computer science at the Karlsruhe Institute of Technology (KIT), one of the leading universities in Germany. Raphael has made numerous technical contributions in the field of Semantic Web technologies and has held tutorials about the covered topics at leading conferences such as IJCAI, ISWC and SAC. He has been awarded a PhD with distinction by the University of Karlsruhe for his dissertation "Web Ontology Reasoning with Logic Databases" in 2004. You can contact him at volz@fzi.de.

Dr. Steffen Lamparter Dr. Steffen Lamparter is a researcher and project leader at the Karlsruhe Service Research Institute (KSRI) at the Karlsruhe Institute of Technology (KIT), one of the leading universities in Germany. Steffen has made numerous technical contributions in the field of Service management and coordination and has been awarded a PhD for his thesis on "Policy-based Contracting in Semantic Web Service Markets" in 2007.

Veli Bicer, M.Sc. Veli Bicer is a researcher at Forschungszentrum Informatik (FZI) at the University of Karlsruhe (TH) and participates in THESEUS, the largest German Internet research project. He has co-authored various publications in the field of Services Science and Semantic Web. He received a M.Sc. degree from Middle East Technical University, Ankara, Turkey, with his thesis on "Architectural Specification of Service-Oriented System using Semantic Web Technologies" in 2007.

Tutorial Format The tutorial will be presented in a lecture format. A question and answer session will also follow the lecture in order to discuss further details on the topic.

Recording The presenter agree to the tutorial being recorded.

Intended Audience The tutorial covers important topics which create awareness for a wide range of technical audiences as discussed above.

Prerequisites Attendees should have a basic education in computer science at university level and should be familiar with established Internet technologies such as HTTP and XML.

Presenter Requirements An overhead projector is required for the tutorial as well as a running Internet connection.

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