Semantic Web Services

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Editors

Semantic Web Services

Advancement through Evaluation

Springer

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Foreword

This book is about evaluating semantic web services. Obviously, this is a task for Heroes and most of us would rather clean up the Augean stables than perform this task. Nevertheless, it has been done, and I have been asked to provide my insight on it. As every child knows, big things should become understandable by breaking them into pieces. Obviously, this book is about the following elements: Evaluation, Semantics, Web, Services, Semantic Web, Web Services, Semantic Web Services, and Evaluating Semantic Web Services. Let's go through them step by step.

Evaluation is a tricky task. In the last millennium I attended a workshop on it (during a very hot summer in Budapest). There they evaluated heuristic search methods. In order to prevent any artificial bias, they used randomized data for it. At first, this sounded very reasonable, especially because the workshop chair had such an impressive and marvelous Oxford English accent – giving you the impression that you were actually speaking to Newton himself. Still, I was a bit surprised about the documented and mostly negative results. I started to wonder whether random data are the right resource to evaluate heuristics. Heuristics make certain assumptions about domain and task specific regularities in order to outperform generic search methods. Obviously the data used in this workshop prevented us from any bias, but is it not precisely a certain bias that makes heuristics work if the bias is chosen well? In other words, could you measure the added value of intelligence in a completely randomized (or alternatively completely frozen) universe? It was evolution that granted our bias the ability to survive in the environment with which we are confronted and which we continue to form according to this bias. In the end, I started to wonder whether not having a bias is actually a very powerful way of actually having one without being able to talk about it. From this experience I learned that you cannot escape your bias; your perception is focused, and something completely random has a rather limited bias and focus. You should rather make your bias explicit and an object of discourse. With this you do not escape it but you can partially observe and rationalize it. Quite an insight for a hot summer that smelted away objectivity as an illusion of people that seem to negate but actually absolute their subjectivity as a matter outside of any discourse!

Semantics is an even stranger beast. In [1] we made an effort to define it by using some others words in a structured, natural language sentence. Unfortunately, we ended up with a set of other words that were just as difficult to understand. Recursively expanding their natural language definitions brought us back in no more than seven steps from our point of departure. In the end, semantics seems to be defined through being semantics. In a certain sense, this should not really be a surprise. If you have a limited number of words to define their meanings, you quickly return to the word you are trying to define. This should not be a problem for most words, but slightly disappointing for words that are about meaning. Now what is the Origin of Meaning? When do I think you understood what I was talking about? When you perform in the way that I had hoped you should act. The meaning of the act of communication is rooted outside the sphere of communication, reflecting the fact that communication is just a partial aspect of structured cooperation process. Or, in the words of Bill Clinton: "It is the cooperation, stupid!" In the end, it is the usage of something that defines its meaning for the subject that is using it (and, by the way, also for the object).

Capturing the essence of the **Web** seems to be rather trivial compared to evaluating semantics. It was invented by Sir Tim just as he invented hypertext, the internet, computers, electricity, and gravitation. More seriously spoken, it was a more focused innovation and somehow a tiny step. He allowed pointers to point beyond the borderlines of existing hypertext systems and he used the internet protocol to implement these links. This was a small step for him but a significant step for mankind. He generated a new mass media on a global scale, with 404 as its bug and major feature. It is currently evolving from a web of documents into in a web of data and hopefully soon into a web of services, processes, sensors, streams, devices and many more. Some of us have become gray haired whilst waiting for this "Future Internet" that is more than just a large pile of static documents and data. When these gray haired people talk about the web they mean it as a synonym for large, decentralized, distributed, and heterogeneous networks no matter which specific protocol instance is used to implement them.

Services started as a verbal cover for a statistical anomaly. Economic activities that could neither be classified as primary nor secondary (agriculture and manufacturing) needed a label, especially because this exception slowly started to become the major economic activity in developed countries. Similar to the case of IBM when it gave up its traditional core business and needed a name and a vision to justify its future, covering with a slogan, a new and not very well understood area does not necessarily lead to good definitions of the field. According to Wikipedia, Services are the "soft parts of the economy"[1] and many of its characterizations read "soft", too, mostly only concrete in what services are not. I tend to understand services as a certain functionality that is provided in abstraction of the infrastructure that is providing it. In conclusion, when you are describing a service as a service you focus on what it is providing (its functionality) and not on how it is implemented.

[1] http://en.wikipedia.org/wiki/Tertiary_sector_of_the_economy

Therefore, services are not about tangible products but about an organized way to use these things as a means of achieving certain goals.

In contrast to their name **Web Services** do not have much to do with the web other than using XML as exchange syntax. However, they come with their own protocol (SOAP), and use a message-centric paradigm. Finally, most of them are not used on the web but in intranets neither being open available nor using a web protocol. Meanwhile, this is slightly chanced by a number of services being directly accessible on the web using HTTP as their protocol. However, this introduces a new difficulty. In the old days, one could argue that a web service is a URI described by a WSDL file. The new type of services usually does not have such a machine readable description. It is hard to distinguish an ordinary web site and a web service. Somehow this is not surprising since we inherit this difficulty from the vague definition of what a service is. Still, we can identify two major characteristics of services:

- They are means to encapsulate data. Take the multiplication of two digits as an example. Instead of materializing all possible results in a large and potentially infinite matrix one can publish a function that does these calculations when needed.
- They are means to perform transactions like buying a book or booking a journey.

The **Semantic Web** applies semantics to the web. Therefore, its first generation was document-centric. It provides annotations for describing web content. With the web of data, it evolved towards a means of directly providing data on the web without being structured as documents. Indeed, a SPARQL endpoint in the web of data could be viewed as a service, however, as a pure data delivery service. **Semantic Web Services** provide semantic annotations for web services. Since the field of web services is still in its infancy, semantic web services are nevertheless mostly an academic exercise compared to the huge take-up of the semantic web and the web of data. Also, they are tackling a much more difficult problem. They do not simply annotate a piece of data but a piece of software with potentially real world activities following their usage. Clearly, pragmatic assumptions must be made to save us from the impossibility of automatic programming.

Therefore, **Evaluating Semantic Web Services** is obviously a difficult task. A first step in this direction was made by Petrie et al. [2] and I congratulate the editors and authors of this issue for making a second one. It provides a complete and up-to-date survey of the field by integrating results from all major evaluation initiatives such as the Semantic Service Selection contest, the Semantic Web Service Challenge, and the Web Service Challenge. In conclusion, I can strongly recommend this book and it is a pleasure to provide a Foreword for it.

Innsbruck Dieter Fensel

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Preface

This book compiles the perspectives, approaches and results of the research associated with three current Semantic Web Service (SWS) evaluation initiatives, namely the Semantic Service Selection (S3) contest,[1] the Semantic Web Service Challenge (SWS Challenge)[2] and the Web Service Challenge (WS Challenge).[3] The book will contain an overall overview and comparison of these initiatives as well as chapters contributed by authors that have taken part in one or more of these initiatives.

In addition, the participants are given the opportunity to focus on a comparative analysis of the features and performance of their tools with respect to other contest entries.

The goals of this book are to:

- Report results, experiences and lessons learned from diverse evaluation initiatives in the field of Semantic Web Services.
- Enable researchers to learn from and build upon existing work (SWS technology) and comparative results (SWS technology evaluation).
- Provide an overview of the state of the art with respect to implemented SWS technologies.
- Promote awareness among users and industrial tool providers about the variety of current Semantic service approaches.
- Provide information to enhance future evaluation methodologies and techniques in the field.

This book is aimed at two different types of readers. On the one hand, it is meant for researchers on SWS technology. These researchers will obtain an overview of existing approaches in SWS with a particular focus on how to evaluate SWS technology. In this community, the book will also encourage more thorough and

[1] http://dfki.uni-sb.de/~klusch/s3/index.html

[2] http://sws-challenge.org

[3] http://wschallenge.org/

methodological evaluation of new approaches. On the other hand, this book is meant for potential users of Semantic Web service technology and will provide them with an overview of existing approaches including their respective strengths and weaknesses and give them guidance on factors that should play a role in evaluation.

We hope the broader community will benefit from the insights gained from the experimental evaluation of the presented technologies. This book will extend the state of the art, which is concerned with developing novel technologies but often omits the experimental validation and explanation of their merits.

We would like to thank all the participants of the evaluation initiatives, who through their contributions promoted advances in the Semantic Web Service area.

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