RESTdesc—A Functionality-Centered Approach to Semantic Service Description and Composition

Ruben Verborgh[1], Thomas Steiner[2], Davy Van Deursen[1], Sam Coppens[1], Erik Mannens[1], Rik Van de Walle[1], and Joaquim Gabarró Vallés[2]

[1] Ghent University – IBBT, ELIS – Multimedia Lab
Gaston Crommenlaan 8 bus 201, B-9050 Ledeberg-Ghent, Belgium
{ruben.verborgh,rik.vandewalle}@ugent.be
[2] Universitat Politécnica de Catalunya – Department LSI
08034 Barcelona, Spain
{tsteiner,gabarro}@lsi.upc.edu

Abstract. If we want automated agents to consume the Web, they need to understand what a certain service does and how it relates to other services and data. The shortcoming of existing service description paradigms is their focus on technical aspects instead of the functional aspect—what task does a service perform, and is this a match for my needs? This paper summarizes our recent work on RESTdesc, a semantic service description approach that centers on functionality. It has a solid foundation in logics, which enables advanced service matching and composition, while providing elegant and concise descriptions, responding to the demands of automated clients on the future Web of Agents.

1 Where are the agents?

When asked as researchers to explain what the Semantic Web is about, how do we respond? Many would refer to the initial vision of automated agents browsing the Web and executing tasks for us. But exactly how far are we today? Ten years have passed since the famous *Scientific American* article [2], yet co-author James Hendler questioned at ESWC 2011 why, while all infrastructure is in place nowadays, the agents are still missing.

What makes the Web so difficult for machines? So far, we have only seen successful clients for *specific* purposes, mostly tailored to the API of a *certain* site. This contrasts with human behavior: we surf for several *different* purposes on a *variety* of websites. The discrepancy originates in two related aspects: semantics and hyperlinks. The Resource Description Framework (RDF) and the Linked Data effort help to overcome the problem of *data* semantics by providing machine-interpretable data with linked concepts. On the other hand, *services* tend not to provide semantics or links, although these are vital for the Web.

This paper summarizes our ongoing research on RESTdesc [4], a semantic service description method based on hyperlinks. We believe that the connection of service descriptions and hyperlinks can play a key role in a solution towards making the Web more accessible to automated agents.

2 RESTdesc explains a service's functionality to agents

RESTdesc is both a description and a discovery method targeting RESTful Web services, with an explicit focus on functionality. It consists of well-established technologies such as HTTP [3] and RDF/Notation3 [1] and is built upon the concepts of hyperlinks and Linked Data. Its goal is to complement the Linked Data vision, which focuses on *static* data, with an extension towards Web services that focus on *dynamic* data. All RESTdesc descriptions are:

- *self-describing*: using Notation3 semantics;
- *functional*: explaining exactly what the operation does;
- *simple*: descriptions are expressed directly using domain vocabularies.

Since RESTdesc entails the operational semantics of Notation3, it allows for versatile discovery methods. We can indeed use the power of Notation3 reasoners to determine whether a service satisfies at set of conditions. Even more advanced reasoning is possible to decide on service matching, and to create complex compositions of different services [4]. We see this as an important prerequisite for services in order for them to contribute to the future Web of Agents, since *new* functionality can only be obtained by on-demand compositions tailored to a specific problem.

3 Conclusion and future work

We firmly believe that RESTdesc has a strong potential in the field of service description, automatic discovery, and consumption. Based on RESTful principles, it targets modern, resource-oriented websites and focuses on the resources and their functional relationships instead of technical properties.

Future work includes the application of RESTdesc technologies to different fields and applications, and implementing generic, automated RESTdesc agents. We plan to provide a public implementation of the reasoning framework for use as a black box, so intelligent agents can employ RESTdesc composition techniques transparently. Another interesting area is the collaboration and integration of different services, for example using ontology matching.
Visit the project website `http://restdesc.org/` for updates on our work.

References

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