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## D11.1.5 Extended OASIS Specification For SEE

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0.2	2011-04-21	Relationship SOA4All / SEE TC	Barry Norton (KIT)
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## Executive Summary

This last official deliverable from the standardization work package yields a report on the latest OASIS SEE TC draft for a Reference Ontology for Semantic Service Oriented Architectures and its relationship to the SOA4All project. The Reference Ontology draft is the main document of the technical committee and was most influenced by some of the core design decisions of SOA4All such as the use of RDFS for compatibility with Linked Data, the use of a lightweight minimal service model for the process model, or the application of a more RESTful, resource-oriented implementation of the process model through the so-called ROSM approach.

# 1. Introduction

The deliverable “Extended OASIS Specification for SEE” from summarizes the core design decisions of SOA4All that had an impact on the work of the OASIS SEE TC so far. We first provide a quick overview of the SEE TC again, for reasons of completeness, and then discuss the relationship of SOA4All to the latest release of the Reference Ontology (SSOA-RO) in Section 2 of this document. Additionally, this deliverable includes a copy of the Public Review Draft 02 of the Reference Ontology document which was published on April 21, 2011; the document is as well available on the Web at [http://www.oasis-open.org/apps/group\\_public/document.php?document\\_id=27913](http://www.oasis-open.org/apps/group_public/document.php?document_id=27913).

The aim of the OASIS SEE TC (Technical Committee on Semantic Execution Environments) is to provide guidelines, justifications and implementation directions for an execution environment for Semantic Web services. The resulting infrastructure will incorporate the application of semantics to service-oriented systems and will provide intelligent mechanisms for consuming Semantic Web services. As such, the TC is an important sink for consuming SOA4All results and lessons learned for turning those in the long run into standard ontologies, formalisms and technologies – supported by tools such as the ones developed in scope of the SOA4All project: SWEET, SOWER, iServe but also the various service location and service construction suites, which are essential when building a SEE platform, or as it is now termed in the context of SOA4All, a (global) service delivery platform. The tool support from SOA4All is particularly important for the standardization and the adoption process for the standards, as the SEE TC has moved, just as SOA4All did, to a more lightweight approach when it comes to semantics. In this respect, the current draft was mostly impacted; e.g., the Reference Ontology draft has taken on the decisions of SOA4All i) to use RDFS as core formalism due to its compatibility with Linked Data, ii) to use a lightweight minimal service model as process model, and iii) to apply a more RESTful, resource-oriented implementation of the process model through the so-called ROSM approach.

The Reference Ontology for Semantic Service Oriented Architectures (SSOA) is an abstract framework for understanding significant entities and relationships between them within a semantically-enabled service computing environment. It may be leveraged for the development of related standards or specifications supporting that environment, as well as guiding efforts to realize concrete solutions. The SSOA-Reference Ontology builds on the OASIS Reference Model for Service Oriented Architecture (SOA-RM) and combines it with the key concepts of semantics that are relevant for semantically-enabling service oriented architectures. As a reference model, it is not directly tied to any standards, technologies or other concrete implementation details. It does seek to provide a common understanding that can be used unambiguously across and between different implementations such as the WSMO, OWL-S and others, and now certainly also the work that emerged from SOA4All and other NESSI strategic projects. Just as the SOA-RM, this reference ontology focuses on the field of software architecture. The concepts and relationships described may apply to other "service" environments; and hence there is also, at least in the wider sense of having a focus on semantics, a relationship to NEXOF-RA.

The official Web site of the TC is [http://www.oasis-open.org/committees/tc\\_home.php?wg\\_abbrev=semantic-ex](http://www.oasis-open.org/committees/tc_home.php?wg_abbrev=semantic-ex), while its charter can be found at <http://www.oasis-open.org/committees/semantic-ex/charter.php>.

## 1.1 Purpose and Structure of the Document

The objective of this deliverable is to give a consolidated impression of the main influences SOA4All has been able to take in regards to the standardization of Semantic Execution Environments through the OASIS SEE TC. The principle work of the committee still

concentrates on the specification and formalization of a Reference Ontology for Semantic Service Oriented Architectures, and this is also where the work of SOA4All is visible. This deliverable thus offers a summary of the main points that were taken on in the Reference Ontology draft from SOA4All; Section 2: SOA4All and the Reference Ontology for Semantic SOA. Additionally, the latest Public Review draft of the Reference Ontology makes also part of this deliverable, and is contained as Appendix A. This document hence mainly serves as a support in reading the latest release of the Reference Ontology for Semantic Service Oriented Architectures with a focus on SOA4All.

## 2. SOA4All and the Reference Ontology for Semantic SOA

The Reference Ontology for Semantic Service Oriented Architectures (RO-SSOA) has evolved over a number of existing European Commission-funded research projects, with input from interested third parties and from industry. At the beginning of the SOA4All project, the first public release of the Reference Ontology was made; Committee Draft / Public Review 1 draft published on November 5, 2008. A large number of comments have been received since, with many concerning the relationship with the SOA Reference Model, a fore-going OASIS standard on which the Reference Ontology for SSOA builds. As a primary target, these comments have been addressed in the new release candidate, which is contained in the attached document to this deliverable (Appendix A).

In the Public Review 1 draft of the Reference Ontology for SSOA one of the further comments concerned the use of WSML for formalisation. The committee was asked whether the use of OWL, as an official W3C recommendation, would not be preferable. In this context, the design decision of the SOA4All project to start with the aim to be highly lightweight in the use of semantic technology was very influential. SOA4All has chosen to rely on RDF Schema (RDFS) as the basis for service modelling and has proven that this was a very astute choice due to the compatibility with the aims and best practice associated with the Linked Data movement. SOA4All has therefore provided guidance in the re-expression of the Reference Ontology using RDFS. Consequently, the SSOA-RO is formally described using RDFS in Appendix B of the latest OASIS SEE TC draft; the one attached to this deliverable.

The use of RDFS is not wholly without drawbacks – the following documents the issues that were met in revising the SSOA-Reference Ontology:

- RDFS provides no cardinality constraints – on the other hand, Linked Data vocabularies often view cardinalities as guidance and view the checking of these, for a given dataset, as quality criteria rather than a consistency issue. In the latter case, seen as an overly restrictive approach from the DL community, any inference is viewed as invalid if inconsistencies are encountered. The approach taken, therefore, is to preserve cardinalities in informal documentation, and UML diagrams,<sup>1</sup> but to separate these from the formal specification of the vocabulary.
- RDFS provides no means to restrict the range of properties when subclassing. One point where this is visible in the SSOA-Reference Ontology is in the derivation of specific mediator types from the generic type. The revised Reference Ontology follows the SOA4All approach to annotation where the explicitly stated characteristics of the target of relations (cf. WSMO-Lite classes in the target for the SAWSDL modelReferences relation) determine the interpretation of mediators (OO-Mediator, SS-Mediator, GG-Mediator or SG-Mediator as of the original WSMO specification), rather than the use of explicit classes and constraints, where inconsistency means again that no reasoning should be carried out.
- Meta-classing, while supported in RDF Schema, causes problems in applying OWL-DL inference. For this reason, the use of meta-classes was kept to a minimum, but was required for the Communicable class. The alternative – used in Parameters in the OWL-S model – to use literals containing URIs that are however not treated as resources, itself means that required reasoning cannot be carried out and was therefore discounted.

A major advantage of the RDFS style of formalisation for the SSOA-Reference Ontology is

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<sup>1</sup> Within the OASIS draft document, the Reference Ontology is given by Concept Maps and UML Diagrams.

its immediate compatibility with Linked Data. SOA4All technologies and tools will prove very useful in providing guidance notes on applying the SSOA-Reference Ontology in practice, which will be part of the advancement of the new release candidate towards an OASIS standard on Semantic Execution Environment, and in particular of the Reference Ontology for Semantic Service Oriented Architectures.

Further input from SOA4All to the new Reference Ontology relates to the clarification of the role of Process Model in the formalisation. By establishing both a ‘minimal’ model of RPC-style services, the Minimal Service Model or MSM, as well as investigating resource-oriented modelling of truly RESTful services, SOA4All provides two novel, but lightweight, candidates for inclusion as process models. Again, both of these models offer advantages for the exposure of service descriptions as Linked Data, as can already be seen, in the former case, by the inclusion of iServe in the Linking Open Data Cloud.



### 3. Conclusions

This short report on the work in the OASIS SEE TC was intended to support the reader in studying the latest draft of the Reference Ontology for Semantic Service Oriented Architectures with a SOA4All perspective.

The Reference Ontology has been altered under the influence of the SOA4All Project. In particular the process model has been changed and the ontology has been transformed into a lightweight RDFS version; mainly due to compatibility with Linked Data, as promoted by the SOA4All project. The main issues with respect to the Reference Ontology, in scope of the transformation process, were hence due to the differences between the original representation language, WSML, and RDFS. Specifically, RDFS has no co-variance (properties versus - e.g., range of source, target) and is therefore less constrained.

The next steps for the working group will now be to finalize the Reference Architecture and specify a Linked Data solution. In more detail, the capabilities of SEE components can be represented as (SOA4All) Service Templates and services meetings these could then be advertised. One mechanism which could be used to support this would be to have SEE components being described and registered in SOA4All's iServe registry from where they could be leveraged through SOA4All's service delivery platform.

## Appendix A

The Reference Ontology for Semantic Service Oriented Architectures by the OASIS SEE TC is contained in the attached document SSOA-RO\_PublicReviewDraft02\_20110421.pdf.