WSRF2OWLS USER MANUAL

WP4

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Abstract: This documentation presents a framework, which can semi-automatically generate the OWL-S descriptions for both stateful and stateless services based on the Web Service Description Language (WSDL) and corresponding annotations. Such functionality is inevitable in the grid environment hosting a vast number of services, which have to be semantically described in order to enable automated discovery, composition and invocation.

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	Name	Partner	Date	Signature
From	Marian Babik	IISAS	30/12/2005	
Verified by	Piotr Nowakowski	CYFRONET	07/01/2006	
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CONTENTS

1. COPYRIGHT NOTICE

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2. INTRODUCTION

Web Service Resource Framework (WSRF) is a recent effort of the grid community to facilitate modelling of the stateful services. Design and development of the WSRF service based systems is quite common and there are several emerging WS initiatives, which try to automate the process of discovery, composition and invocation of such services. The semantic web services are a typical example, showing the potential of how ontological modelling can improve the shortcomings of the service oriented computing. One of the major obstacles in the process is the development of the ontologies, which describe web and grid services. Although, there are numerous standards for modelling semantic services, there are very few frameworks and tools, which can help automate the process of generating the semantic descriptions of services.

This documentation presents a framework, which can semi-automatically generate the OWL-S descriptions for both stateful and stateless services based on the Web Service Description Language (WSDL) and corresponding annotations. Such functionality is inevitable in the grid environment hosting a vast number of services, which have to be semantically described in order to enable automated discovery, composition and invocation.

2.1. ABBREVIATIONS AND ACRONYMS

WSRF Web Service Resource Framework

WSDL Web Service Description Language

WS   Web Service

OWL   Web Ontology Language

OWL-S Upper Ontology for Web Services

3. PROTOTYPE USAGE

The main goal for the WSRF2OWL-S development was the necessity to address the process of automated generation of semantic descriptions for web and grid services. Such functionality is crucial in order to support pilot applications and effective development cycle, where the descriptions of the services can change regularly. The latest version of the tool has following features:

- OWL-S 1.1 support [1]
- WSRF Services support
- Configuration supports inputs/outputs/precondition/effects
- Integrates SimpleEffects and Preconditions developed by the GOM
- Sample configuration and corresponding OWL-S descriptions for the Flood-Forecasting pilot application
- Automatic parsing of the WSDL and generation of the WSDL part of the configuration
- Extensively tested on Linux
- DataInputObjects, DataOutputObjects support (also format, content and storage constraints)
- support for OWL imports

3.1. RUNNING THE PROTOTYPE

3.1.1. Operating Requirements

WSRF2OWL-S is a standalone tool, which can be used independently from the other software developed by the K-Wf Grid. The tool has no local hardware requirements and is only depends on the availability of the Java Runtime Environment (JRE) version 1.4 or above and third-party libraries including:

- OWL-S API from Mindswap laboratory [2]
- XML APIs (Xerces) [3]
- Jena API [4]

The tool is distributed with all the necessary libraries and can be run on any JRE enabled computer.

3.1.2. Step-by-Step User Setup

WSRF2OWL-S is available in the K-Wf Grid's CVS system in the GOM directory (wsrf2owl-s module). CVS also contains necessary libraries and launcher for the tool. A standard procedure for checking out the tool from cvs and setting up the environment is :

```
Bash# cvs -d :pserver:your_cvs_login@cvs.ui.sav.sk:/home/cvs co
kwfgrid/gom/wsrf2owls
Bash# cd kwfgrid/gom/wsrf2owls/
```

Then you will need to setup the location of your java distribution, e.g. (in BASH):

```
Bash# export JAVA_HOME=/path_to_your_java/j2sdk1.4.2_02
```

Finally you can try to run the tool:

```
Bash# ./wsrf2owl-s.sh –help
```

If everything goes well, you should be able to see this output:

```
WSRF2OWL-S tool by Marian.Babik@saske.sk
Usage: WSRF2OWLS [-i input_uri e.g. file:/home.../x_service.wsdl]
                 [-o output_dir] [-ns owl-s_namespace] [-help this_help]
                               [-p properties_file] [-n service_name -
optional]
                 [-d dump_methods … given services into properties_file]
                 [-c process imports]
```

3.2. BASIC OPERATION

In order to explain the configuration and owl-s conversion we will use a sample WSDL file located at http://www.xmethods.net/sd/2001/BNQuoteService.wsdl. Barnes & Nobles Price Finder is a simple service, which returns the price of a book as advertised in the Barnes and Nobles web site given the ISBN Number. A sample configuration file for the service is (sample.properties):

```
#Thu Sep 29 12:33:22 CEST 2005
BNQuoteService.getPrice.return=http://www.mindswap.org/2004/owl-
s/concepts.owl#Price
BNQuoteService.getPrice.isbn=http://purl.oclc.org/NET/nknouf/ns/bibtex#Book
```

The configuration file is just a simple java Properties file. The format for the mapping is:

```
WSDLServiceName.WSDLOperation.WSDLInput/Output = URL_of_OWL_concept
```

The left hand side provides the description of the actual WSDL input or output. The right hand side is an URL of the corresponding ontological concept (or it can be a more complex structure if it is necessary to map the WSDL Input to more complex ontological concepts). The WSDL part (i.e. WSDLServiceName.WSDLOperation, etc.) can be generated by running:

```
Bash#./wsrf2owl-s.sh -i http://www.xmethods.net/sd/2001/BNQuoteService.wsdl
-ns "http://kwfgrid.net/dummy" -p sample.properties -d
```

This will create the sample.properties file containing following WSDL information:

```
#Thu Sep 29 12:56:20 CEST 2005
BNQuoteService.getPrice.return=
BNQuoteService.getPrice.isbn=
```

You can then manually type in the concepts, which these inputs/outputs will point to as was already shown. You can then generate the OWL-S by running:

```
./wsrf2owl-s.sh -i http://www.xmethods.net/sd/2001/BNQuoteService.wsdl
-ns "http://kwfgrid.net/sample.owl" –p sample.properties -o /output_dir/
```

Since sometimes you will need more then just simple input/output concepts mapping, you can further specify effects and preconditions as follows:

```
BNQuoteService.getPrice.return=effect|
http://url.to.domain.ontology/sample.owl#hasPrice
BNQuoteService.getPrice.isbn=http://purl.oclc.org/NET/nknouf/ns/bibtex#Book,
condition|http://url.to.domain.ontology/sample.owl#hasISBN
```

Further examples can be found in the file ffsc.properties, which is part of the distribution.

3.3. ADVANCED FEATURES

Additional feature cover the areas of specific ontological concepts such as DataObjectInputs, DataObjectOutputs, etc. Support for the DataInputObjects and DataOutputObjects (see GOM documentation for more details) has been added to the current version of the tool. A sample configuration for the Coordinated Traffic Management service called VISSIMProxy (http://zeus72.cyf-kr.edu.pl/CTM01/services/VISSIMProxy?wsdl):

```
#Mon Oct 03 13:21:13 CEST 2005
VISSIMProxyService.runSimulation.params=http://gom.kwfgrid.net/gom/ontology/
DomainApplicationOntology/CTM#VISSIMSimulationParameters
VISSIMProxyService.runSimulation.traffic_flow_data_url=dataobject|
{http://gom.kwfgrid.net/ontology/ServiceOntology#URL,
format|http://gom.kwfgrid.net/gom/ontology/DomainDataOntology/CTM#Excel,
storage|http://gom.kwfgrid.net/ontology/DataOntology#RemoteFile,
content|http://gom.kwfgrid.net/gom/ontology/DomainDataOntology/CTM#
TrafficFlowData}
VISSIMProxyService.runSimulation.runSimulationReturn=
dataobject|{>>http://gom.kwfgrid.net/ontology/ServiceOntology#URL}
```

Format, storage and content constraints are optional, however since DataObjects have nested constraints, the configuration is bit different then in previous cases. You can find sample2.properties for VISSIMProxy in the distributed package.

The current version also supports OWL imports, e.g. for a given concept *http://gom.kwfgrid.net/ gom/ontology/DomainDataOntology/CTM#Excel* it will load the ontology *http://gom.kwfgrid.net/ gom/ontology/DomainDataOntology/CTM* and will put it into the OWL imports in the OWL-S file, thus producing valid OWL-S. This however means that this ontology and its concepts has to be valid and available online, otherwise an error or timeout will occur. If for the given ontology the referenced concept is missing, a fake one will be created in the OWL-S. This will result in the inconsistent GOM, so please, make sure you remove all the fake concepts before loading the ontology into the GOM. A sample session with imports enabled is shown below:

```
[bb@localhost wsrf2owls]$ sh wsrf2owl-s.sh -i http://zeus72.cyf-kr.edu.pl/
CTM01/services/VISSIMProxy?wsdl -ns "http://dummy.org/test.owl" -p
sample2.properties -o . -c

- Unable to find required classes (javax.activation.DataHandler and
javax.mail.internet. MimeMultipart).
Attachment support is disabled.
Importing:http://gom.kwfgrid.net/gom/ontology/DomainApplicationOntology/CTM
Importing: >>http://gom.kwfgrid.net/ontology/ServiceOntology
Importing: >>http://gom.kwfgrid.net/gom/ontology/DomainDataOntology/CTM
Importing: >>http://gom.kwfgrid.net/ontology/DataOntology
```

3.4. KNOWN PROBLEMS

There are two known problems in the current implementation:

- WSRF2OWL-S was not tested under Windows, but should run with appropriate launcher
- OWL imports are turned off by default, since loading each referenced ontology might not be always desirable

4. INTERFACE REFERENCE GUIDE

The command line tool WSRF2OWL-S uses the following syntax:

```
WSRF2OWL-S tool
Usage: WSRF2OWLS [-i input_uri]
                 [-o output_dir] [-ns owl-s_namespace] [-help this_help]
                                 [-p properties_file] [-n service_name]
                 [-d dump_methods]
                 [-c process imports]
Where:
-i      URL of the WSDL location (e.g. http://www.xmethods.net/ BNQuoteService.wsdl)
-o      directory, where the final OWL-S file should be saved
-ns     URI of the OWL-S namespace
-p      location of the configuration file (properties file)
-n      service name, if different from the WSDL service name
-d      dump the WSDL methods/operations to the properties file and exit
```

5. CONTACT INFORMATION AND CREDITS

Marian.Babik@saske.sk

Bkryza@icsr.agh.edu.pl

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7. REFERENCES

[1] Ankolenkar, A. , et.al., OWL-S: Semantic Markup for Web Services, http://www.daml.org/services/owl-s/1.1

[2] Mindswap, http://www.mindswap.org/2004/owl-s/api/

[3] XML APIs, Xerces, http://xerces.apache.org/

[4] Jena Semantic Web Framework, http://jena.sourceforge.net