SCIDIP-ES
SCIENCE DATA INFRASTRUCTURE FOR PRESERVATION - EARTH SCIENCE

D21.3 Gap Identification Service Installation, Deployment and User Manual

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Task	T21.7 Gap Identification Service Development	
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Abstract:

This document represents the Deployment and User Manual for the Gap Identification Service developed in the frame of SCIDIP-ES project. This document contains all useful information on how to install/deploy, configure and use Gap Identification Service.

Document Log

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20/02/2014	Yannis Marketakis	Additions under Software Design section	1.1	

TABLE OF CONTENTS

1 Introduction

1.1 Purpose and Scope

This document provides detailed information on how to install, configure and use the Gap Identification Service (GapIS).

1.2 Who should read this document

This document addresses:

(a) system administrators who wish to install and deploy GapIS, and
(b) end users who wish to use GapIS.

1.3 System Context

GapIS is a generic service of the SCIDIP-ES e-infrastructure. Its key functions are to help preservation archives evaluate if their digital objects remain understandable by the targeted user communities and to identify hazards and the consequences of probable losses or obsolescence risks.

1.4 Software Design

In SCIDIP-ES, GapIS assesses intelligibility of digital objects by identifying “gaps” in the corresponding RepInfo Network stored in the SCIDIP-ES RepInfo Registry (RepInfo is defined in OAIS[1] as the additional information that maps a data object into more meaningful concepts). GapIS’ design is inspired by a model that consists of the notions of a **module**, **dependency** and **profile** as discussed in [Tzitzikas1, 2]. If applied to digital objects, a module can be a software/hardware component or even a part of the knowledge base expressed either formally or informally, explicitly or tacitly, that we want to preserve. The dependency is captured in the logical links in meaning between modules. In addition, a module may require the availability of other modules in order to function, be understood or managed (e.g. a network of RepInfo). A profile is the set of modules that are assumed to be known (available or intelligible) by a user (or community of users), so this is an explicit representation of the concept of Designated Community (DC) Knowledge Base (KB). Utilising this model, the GapIS is able to check whether a digital object (module) is intelligible by a community, and to compute the intelligibility gap (e.g. new version of the object, new user, changes in user knowledge) of a digital object [Marketakis1].

GapIS provides these key functions:

(a) defining knowledge modules, task-based dependencies and (community) profiles
(b) checking intelligibility/task-performability
(c) identifying dependency-related risks and
(d) computing intelligibility gaps (gaps that can aid the preparation of self-describing archival packages for particular communities).

GapIS consists of two main subcomponents:

[1] OAIS - http://public.ccsds.org/publications/archive/650x0m2.pdf

(a) **GapIdentificationService-core (GapIS-core)**: It provides the concepts for defining modules (digital objects) and their dependencies, as well as the assumed knowledge on the basis of profiles. It has been implemented in JAVA. It exploits Semantic Web technologies for modeling the above information and performing its functionality. An ontology which extends CIDOC CRM[2] (Figure 1) has been created for expressing modules, dependencies and profiles. For storing the ontology and its instantiations, **GapIS-core** can be configured to work on top of two different persistence layers:

- main-memory layer, which (temporary) uses Sesame Sail[3] for storing and querying data, or
- triple-store layer, which (permanently) stores data in an OpenLink Virtuoso[4] triple store.

The former is a main-memory layer which means that all descriptions are stored in the main memory and are there as long as **GapIS-core** is being used. The latter is used for storing data permanently. Openlink Virtuoso is a general purpose RDF triple store with extensive SPARQL support. The RDF triples are stored in the form of quads *<g, s, p, o>* where *g* represents the graph, *s* the subject, *p* the predicate and *o* the object. We have chosen this system because of its efficient inference capabilities, in particular the backward chaining reasonining. Virtuoso does not materialize all inferred facts, but computes them at query level. Practically this means that triples which can be inferred (i.e. *subClassOf, subPropertyOf, etc.*) are not physically stored in the knowledge base, but they are added to the result set at query answering.

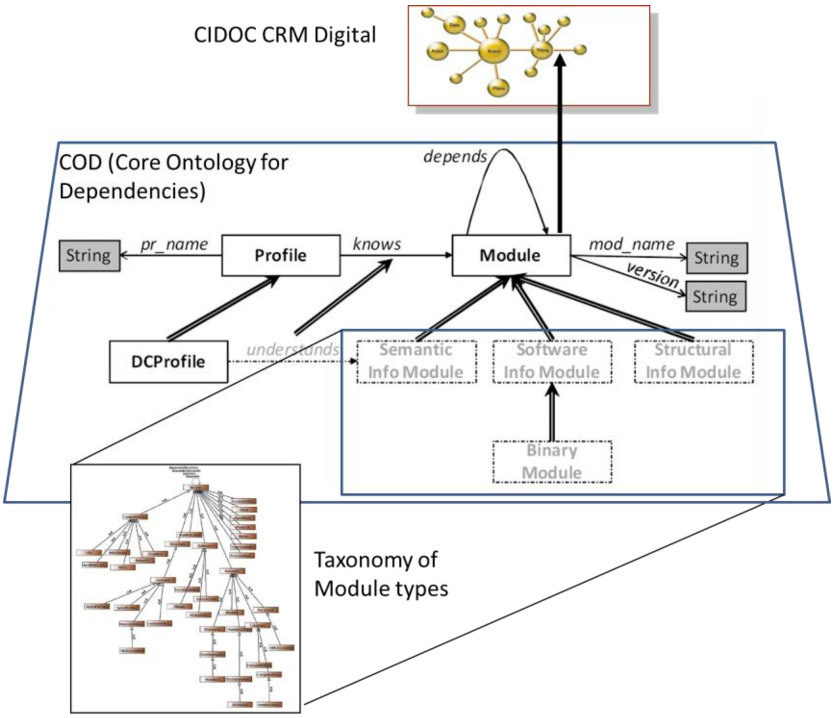


Figure 1 Core Ontology for Dependencies (COD)

[2] ISO 21127:2006 - http://www.cidoc-crm.org/
[3] http://www.openrdf.org/
[4] http://virtuoso.openlinksw.com/

(b) **GapIdentificationService-webApp (GapIS-webApp)**: It provides a graphical user interface client for GapIS and is implemented as a Java Web Application using the GWT[5] framework. The web application has a modular design which allows it to work properly on top of both persistent layers of **GapIS-core**. The web application contains the appropriate forms to allow users add or search for relevant information (i.e. modules, dependencies, profiles), as well as exploit the intelligibility related services (i.e. computation of intelligibility gaps, identification of obsolescence risks, etc). Furthermore, users can import or download contents from the persistent layer in various formats (i.e. RDF, NTriples, XML) by exploiting the corresponding servlets.

2 Installation Guide

2.1 Overview

GapIS-webApp is packaged as a web application archive (war). The web application can be deployed in a web server and users can access it using any web browser. Figure 2 shows the deployment of the GapIS.

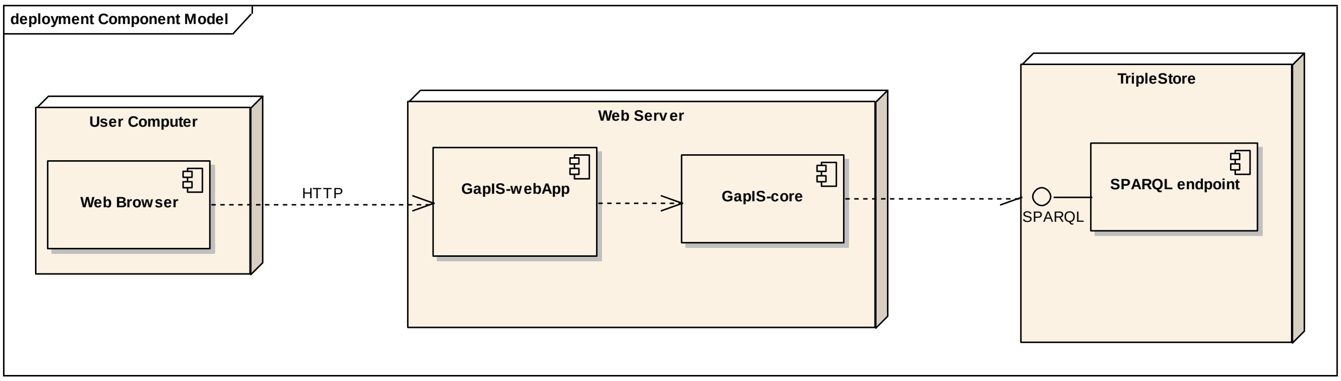


Figure 2 Gap Identification Service deployment diagram

2.2 License Information and Terms of Use

GapIS is licensed under the Apache License, Version 2.0 (the "License"). You may not use this file except in compliance with the License. A copy of the License could be obtained at: http://www.apache.org/licenses/LICENSE-2.0 Unless required by applicable law or agreed to in writing, software distributed under the License is distributed on an "AS IS" BASIS, WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied. See the License for the specific language governing permissions and limitations under the License.

2.3 Download information

[5] Google Web Toolkit, http://www.gwtproject.org/

The recent stable source code could be accessed from SVN at *Sourceforge*. The URL to the svn trunk is: svn://svn.code.sf.net/p/digitalpreserve/code/SCIDIP-ES/software/services/GapIndentificationService/trunk

Recent releases of the software could also be downloaded from the SCIDIP-ES maven nexus repository at: http://nexus.scidip-es.eu/content/repositories/releases/eu/scidipes/services/Gapidentificationservice-webapp/

2.4 Prerequisites

2.4.1 Software prerequisites

GapIS requires the following software components to be installed:

- JAVA SE (at least version 1.7).
- Apache Tomcat (at least version 7.0). GapIS has also been tested using Oracle Glassfish V3 application server, however Apache Tomcat is recommended.

Since GapIS is packaged as a web application archive, it can be deployed in any web server (e.g. Apache tomcat). Furthermore, GapIS can operate over two different persistence layers (see Section 2.1). The first one is a main-memory layer, while the second one is based on OpenLink Virtuoso triple store. The former has no specific requirements (apart from deploying it in a web server). The latter requires the existence of an Openlink Virtuoso instance (the recommended version is OpenSource Virtuoso version 6.1. The web server hosting the GapIS web application and the OpenLink Virtuoso server need not be located in the same (physical) node.

2.4.2 Hardware prerequisites

None

2.5 OSS/COTS Installation

2.5.1 JAVA SE Installation

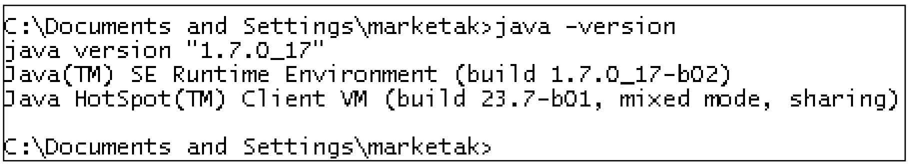
(a) Under Windows

Download a proper version of Java JDK from Java SE Download page[6]. (Note that JRE is not enough, the full JDK should be downloaded and installed. After downloading it, double-click on the executable file to start the installation process and follow the instructions.

After the installation process finishes, set the environment variables accordingly. To do so, right click on **My Computer** and select **Properties**. Click on **Advanced** tab and then select **Environment Variables**. Under **System** variables click on **New** to create a new environment variable with name **JAVA_HOME** and set the value to the path of the JDK installation (e.g. C:\Program Files\Java\jdk1.7.0_17).

To verify that the JDK has been installed properly, open a new console (by executing **cmd** under **start → run**) and execute “java –version”. The output should be similar to Figure 3.

[6] http://www.oracle.com/technetwork/java/javase/downloads/index.html



```
C:\Documents and Settings\marketak>java -version
java version "1.7.0_17"
Java(TM) SE Runtime Environment (build 1.7.0_17-b02)
Java HotSpot(TM) Client VM (build 23.7-b01, mixed mode, sharing)

C:\Documents and Settings\marketak>
```

Figure 3 Verifying Java installation under windows

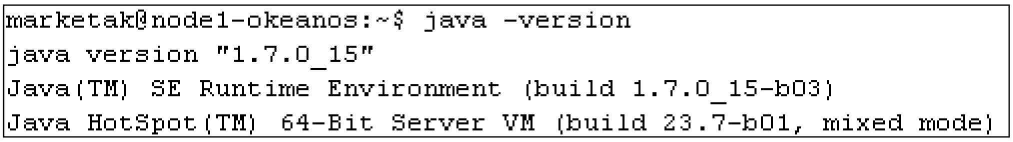
(a) Under Linux

Download a proper tar.gz version of Java JDK from Java SE Download page[6]. (Note that JRE is not enough, the full JDK should be downloaded and installed). After downloading it, extract the JDK under **/usr/share/**. The installation folder name should become **/usr/share/jdk1.7.0_15/** (note that the actual folder name will vary in line with the name of the downloaded JDK version).

Next set the environment variables accordingly. To do so open **~/.bashrc** file and add the following lines (the first line declares the location of the JDK and the second enables Java binaries to be executed from the shell).

- export JAVA_HOME=/usr/share/jdk.1.7.0_15
- export PATH=$PATH:$JAVA_HOME/bin

To verify that java has been installed successfully execute from a console “java –version”. The output should be similar to Figure 4.



```
marketak@node1-okeanos:~$ java -version
java version "1.7.0_15"
Java(TM) SE Runtime Environment (build 1.7.0_15-b03)
Java HotSpot(TM) 64-Bit Server VM (build 23.7-b01, mixed mode)
```

Figure 4 Verifying Java installation under linux

From this point onwards, we will refer to the location where JDK has been installed as **$JAVA_HOME**.

2.5.2 Apache Tomcat Installation

(a) Under Windows

Apache tomcat for windows can be installed in two different ways: using a service installer or the Apache Tomcat binaries. The first approach is the easiest since it is only necessary to download and execute the installer. Here we’ll describe the second, not-so-obvious approach of using the binaries.

Download one of the compressed files on the Apache Tomcat Downloads page[7]. Extract the contents to a folder on the machine (e.g. C:\Program Files\apache_tomcat_7). Set a new environment variable (using the same process described in Section 2.5.1(a)) with name

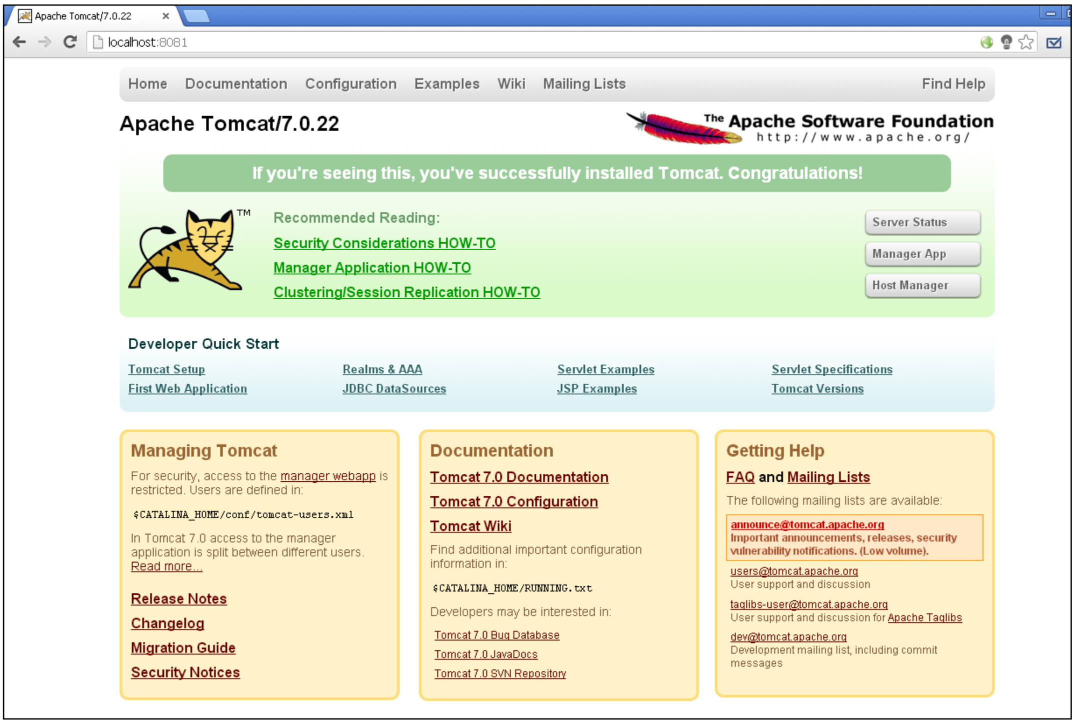
[7] http://tomcat.apache.org/download-70.cgi

CATALINA_HOME and set the value to the path of the Apache Tomcat installation folder (e.g. C:\Program Files\apache_tomcat_7).

(b) Under Linux

Download a proper version of the compressed files from the Apache Tomcat Downloads page. Extract the contents to a folder on the machine (e.g. /usr/share/apache_tomcat_7). Set a new environment variable (using the same process described in Section 2.5.1(b)) with name **CATALINA_HOME** and set the value to the path of the Apache Tomcat folder (e.g. /usr/share/apache_tomcat_7).

To verify that tomcat has been installed successfully, first start the Apache Tomcat server. To start it, execute **$CATALINA_HOME/bin/startup.bat** under Windows or **$CATALINA_HOME/bin/startup.sh** under Linux. Open a web browser and visit the url http://localhost:8080. The output should be similar to Figure 5.



Apache Tomcat/7.0.22

If you're seeing this, you've successfully installed Tomcat. Congratulations!

Recommended Reading:
Security Considerations HOW-TO
Manager Application HOW-TO
Clustering/Session Replication HOW-TO

Developer Quick Start

Tomcat Setup
First Web Application
Realms & AAA
JDBC DataSources
Servlet Examples
JSP Examples
Servlet Specifications
Tomcat Versions

Managing Tomcat

For security, access to the manager webapp is restricted. Users are defined in:

```
$CATALINA_HOME/conf/tomcat-users.xml
```

In Tomcat 7.0 access to the manager application is split between different users. Read more...

Release Notes
Changelog
Migration Guide
Security Notices

Documentation

Tomcat 7.0 Documentation
Tomcat 7.0 Configuration
Tomcat Wiki

Find additional important configuration information in:

```
$CATALINA_HOME/RUNNING.txt
```

Developers may be interested in:

Tomcat 7.0 Bug Database
Tomcat 7.0 JavaDocs
Tomcat 7.0 SVN Repository

Getting Help

FAQ and Mailing Lists

The following mailing lists are available:

announce@tomcat.apache.org
Important announcements, releases, security vulnerability notifications. (Low volume).

users@tomcat.apache.org
User support and discussion

taglibs-user@tomcat.apache.org
User support and discussion for Apache Taglibs

dev@tomcat.apache.org
Development mailing list, including commit messages

Figure 5 Verifying Apache Tomcat installation

From this point onwards, we will refer to the location where Apache Tomcat has been installed as **$CATALINA_HOME.**

2.5.3 OpenLink Virtuoso Installation

(a) Under Windows

Download a proper version of openLink virtuoso from Opensource Virtuoso Downloads[8]. Unzip the contents of the downloaded compressed file to a folder on the machinee (e.g. C:\Virtuoso).

[8] http://virtuoso.openlinksw.com/dataspace/doc/dav/wiki/Main/

Then install Virtuoso as a service; open a console and go to the folder C:\Virtuoso\bin and execute the following command:

```
virtuoso-t.exe +service create +instance MyService +configfile
C:\Virtuoso\database\virtuoso.ini
```

To start the virtuoso service, execute the following command:

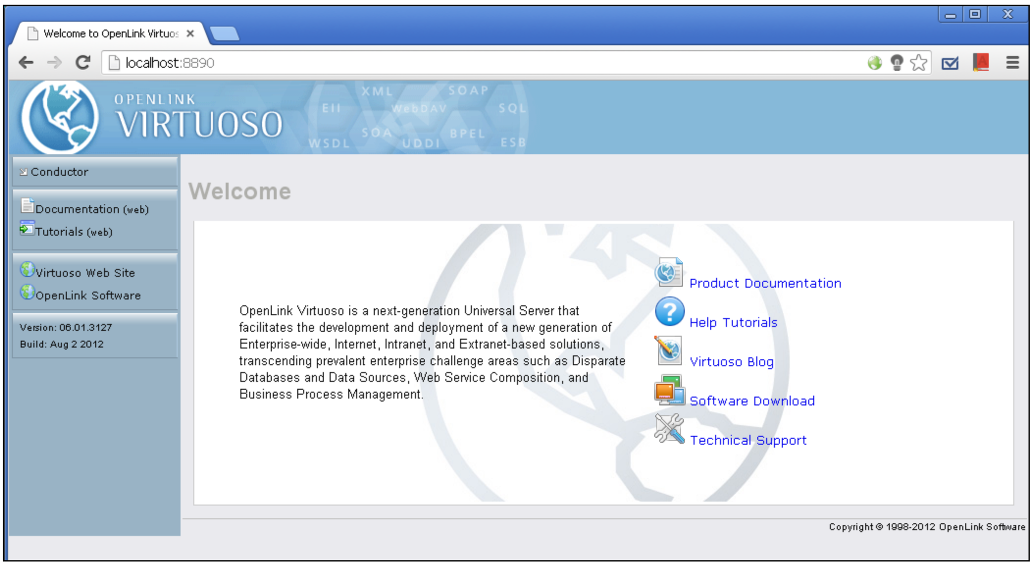
```
virtuoso–t +service start +instance MyService
```

(b) Under Linux

To download and install an open source version of OpenLink Virtuoso execute the following

```
sudo aptitude install  virtuoso-opensource
```

To verify that OpenLink Virtuoso has been successfully installed open a web browser and visit the url http://localhost:8890. The output should be similar to Figure 6



Version: 06.01.3127
Build: Aug 2 2012

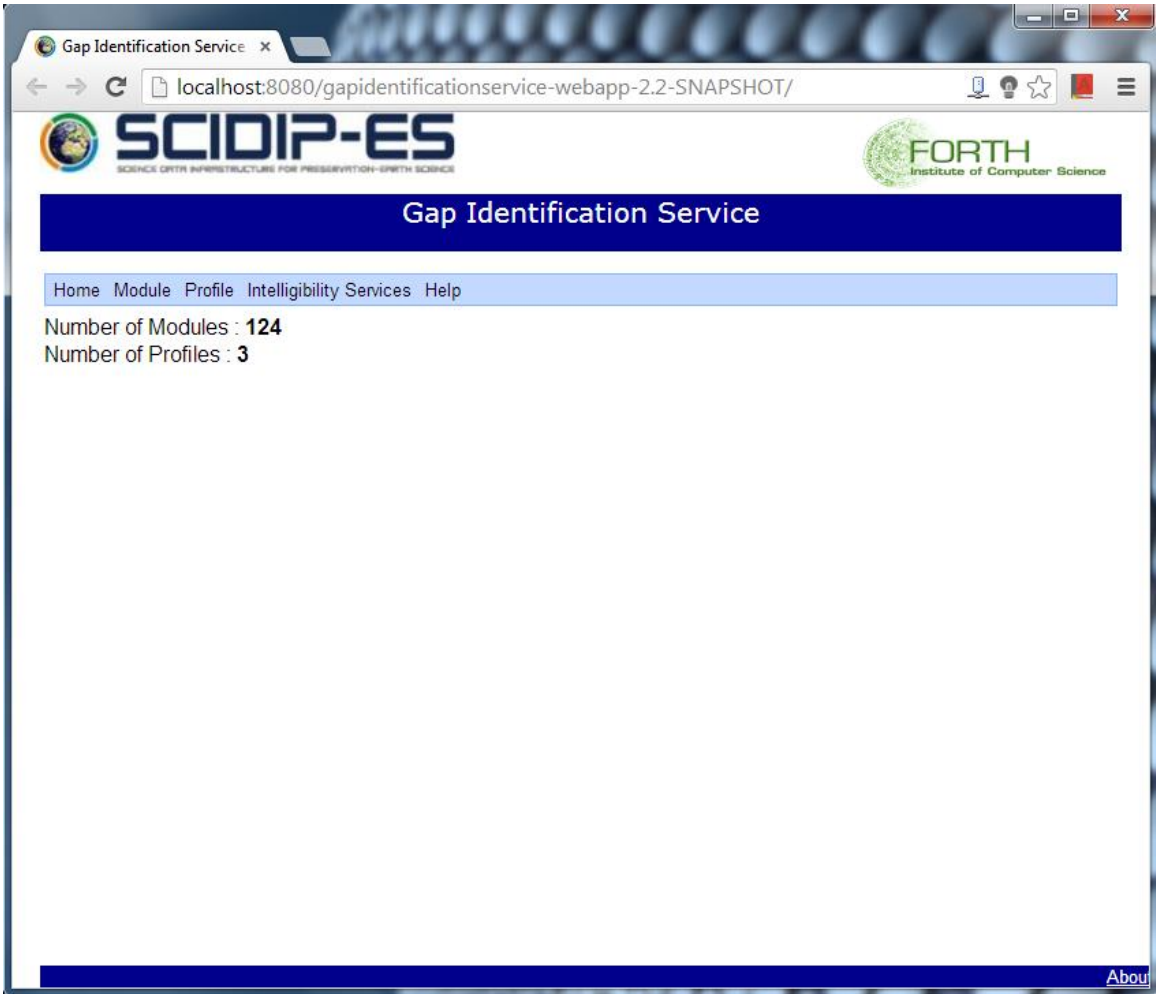
OpenLink Virtuoso is a next-generation Universal Server that facilitates the development and deployment of a new generation of Enterprise-wide, Internet, Intranet, and Extranet-based solutions, transcending prevalent enterprise challenge areas such as Disparate Databases and Data Sources, Web Service Composition, and Business Process Management.

Copyright © 1998-2012 OpenLink Software

Figure 6 Verifying OpenLink Virtuoso installation

2.6 Gap Identification Service Installation

In order to install GapIS, the web application archive of the service is required. Download the GapIdentificationService-webApp.war and place it under **$CATALINA_HOME/webapps** (see Section 2.3 for download information). After that start Apache Tomcat, and the web application will automatically be deployed (note that a folder named GapIdentificationService-webApp will be created under **$CATALINA_HOME/webapps**). GapIS is reachable by using a browser to visit the url http://localhost:8080/GapIdentificationService-webApp. The output of the homepage of GapIS should be similar to Figure 7.



Gap Identification Service
localhost:8080/gapidentificationservice-webapp-2.2-SNAPSHOT/
SCIDIP-ES
FORTH
Institute of Computer Science
Gap Identification Service
Home Module Profile Intelligibility Services Help
About

Number of Modules : **124**
Number of Profiles : **3**

Figure 7 The home page of Gap Identification Service

The default configuration for GapIS is to use the main-memory persistence layer. This can be changed (switching to triple store persistence layer) by modifying the **config.properties** file located under **$CATALINA_HOME/webapps/GapManager/WEB-INF/classes/eu/scidipes/impl/ gapidentificationservice/server/config.properties**

The file contains these key-value properties:

- **eu.scidipes.impl.gapidentificationservice.runmode**: it defines the persistence layer that will be used. The values that are accepted are **sesamesail** (main-memory persistence layer) and **virtuoso** (triple-store persistence layer)
- **eu.scidipes.impl.gapidentificationservice.mainmemory.modules**: it is used only with main memory persistence layer. It contains the urls (separated by commas) of the files containing modules (and their dependencies), that will be imported to GapIS during deployment
- **eu.scidipes.impl.gapidentificationservice.mainmemory.profiles**: It is used only with main memory persistence layer. It contains the urls (separated by commas) of the files containing designated communities profiles, that will be imported to GapIS during deployment
- **eu.scidipes.impl.gapidentificationservice.virtuoso.url**: it is used only with the triple store persistence layer. It defines the url where OpenLink Virtuoso has been installed

- **eu.scidipes.impl.gapidentificationservice.virtuoso.port**: it is used only with the triple store persistence layer. It defines the port where OpenLink Virtuoso is listening
- **eu.scidipes.impl.gapidentificationservice.virtuoso.graph**: it is used only with the triple store persistence layer. It defines the graph of GapIS resources
- **eu.scidipes.impl.gapidentificationservice.virtuoso.username**: it is used only with the triple store persistence layer. It is the username for accessing the OpenLink Virtuoso repository
- **eu.scidipes.impl.gapidentificationservice.virtuoso.password**: it is used only with the triple store persistence layer. It is the password for accessing the OpenLink Virtuoso repository.

After changing any of the above properties, please restart Apache Tomcat for the changes to take effect.

2.7 Uninstallation

GapIS can be uninstalled from Apache Tomcat by simply removing it from **$CATALINA_HOME/webapps folder**. The following objects should also be deleted:

- $CATALINA_HOME/webapps/GapIdentificationService-webApp/
- $CATALINA_HOME/webapps/ GapIdentificationService-webApp.war

If using the triple store, you may also wish to remove the Virtuoso installation.

3 Using SCIDIP-ES Gap Identification Service

3.1 Getting Started

GapIS can be accessed using any web browser by visiting the url http://locahost:8080/GapManager. The home page of GapIS (Figure 7) shows some statistics about objects stored in the persistence layer of GapIS.

In the following sections (3.2, 3.3), we illustrate the GapIS operations using several GapIS-related notions.

3.2 Creating new Resources

3.2.1 Create a new Module

To create a new module the user must click on ***Module*** (from the upper menu bar) and select ***Add New*** (Figure 8). The page shown in Figure 9 will appear. The user must now enter an identifier, a name, a version for the module to be created. The user can also classify the new module to one of the given module types. Before creating it, the user can add any dependencies about this module (other modules that exist in the repository and which the new one depends on). Apart from adding the dependencies, the user can also choose a specific dependency type (Figure 10). When all the required information has been provided, then user can click on ***Insert*** button. GapIS will first validate the input (e.g. uniqueness of the given identifier, any cyclic dependencies, etc.) and if the validation tests are passed, create the module with its dependencies. A confirmation message will appear (Figure 11).

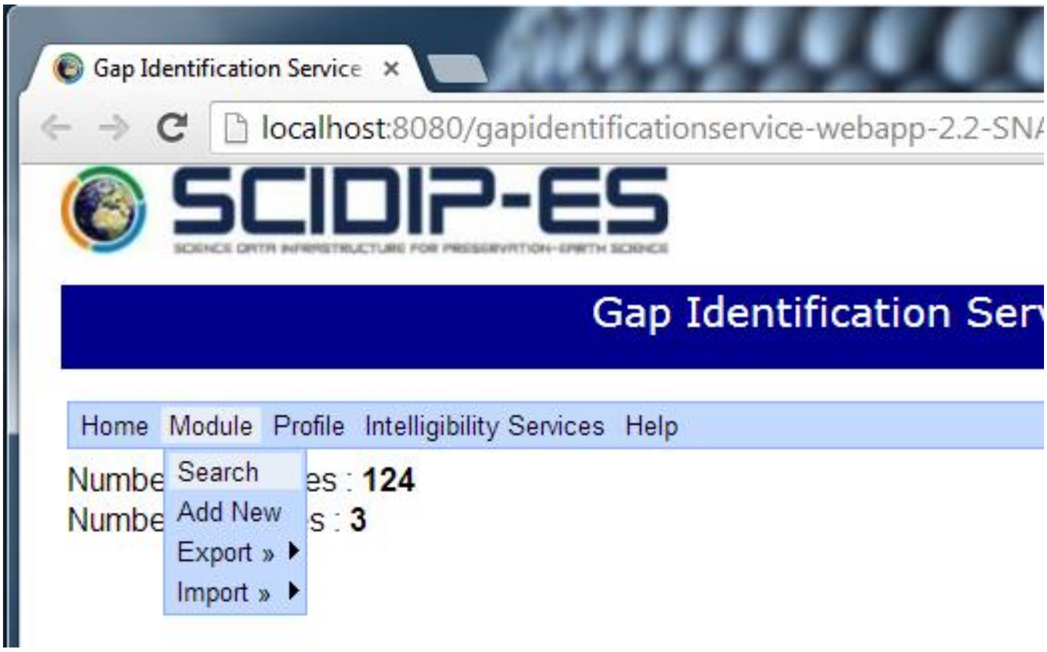

Gap Identification Service
localhost:8080/gapidentificationservice-webapp-2.2-SN
SCIDIP-ES
SCIENCE DATA INFRASTRUCTURE FOR PRESERVATION–EARTH SCIENCE
Gap Identification Ser
Home
Module
Profile
Intelligibility Services
Help
Search
Add New
Export »
Import »
Numbe es : 124
Numbe s : 3

Figure 8 Creating a new Module

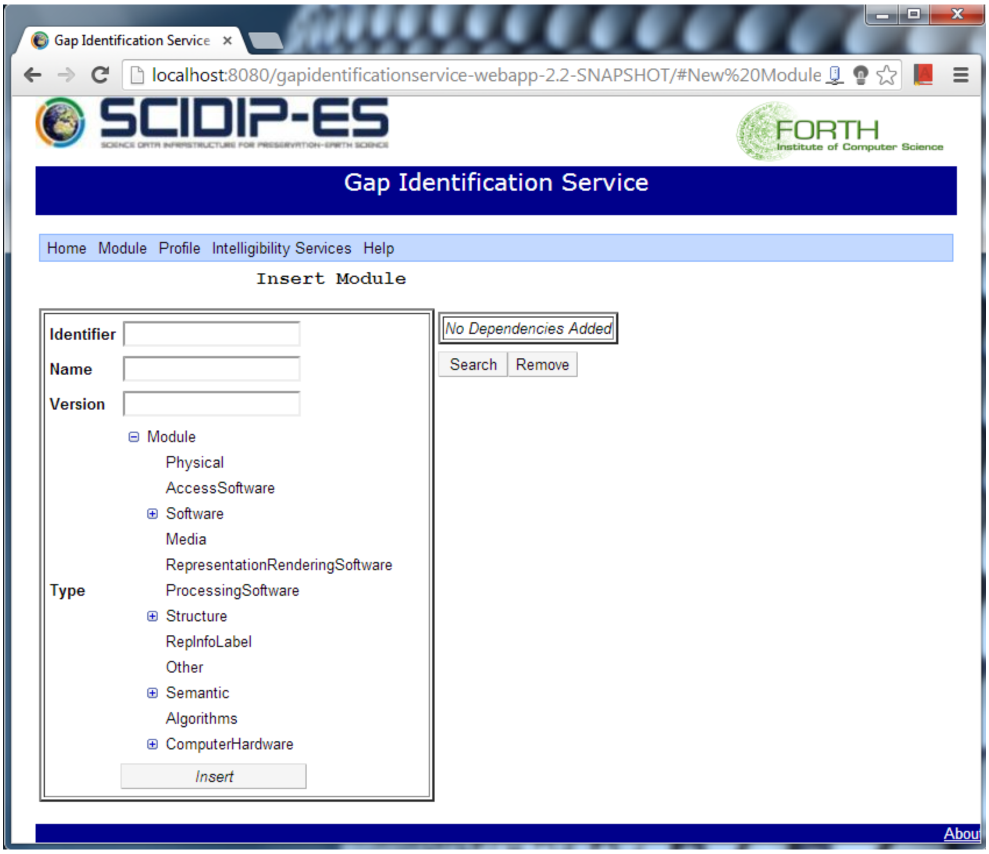
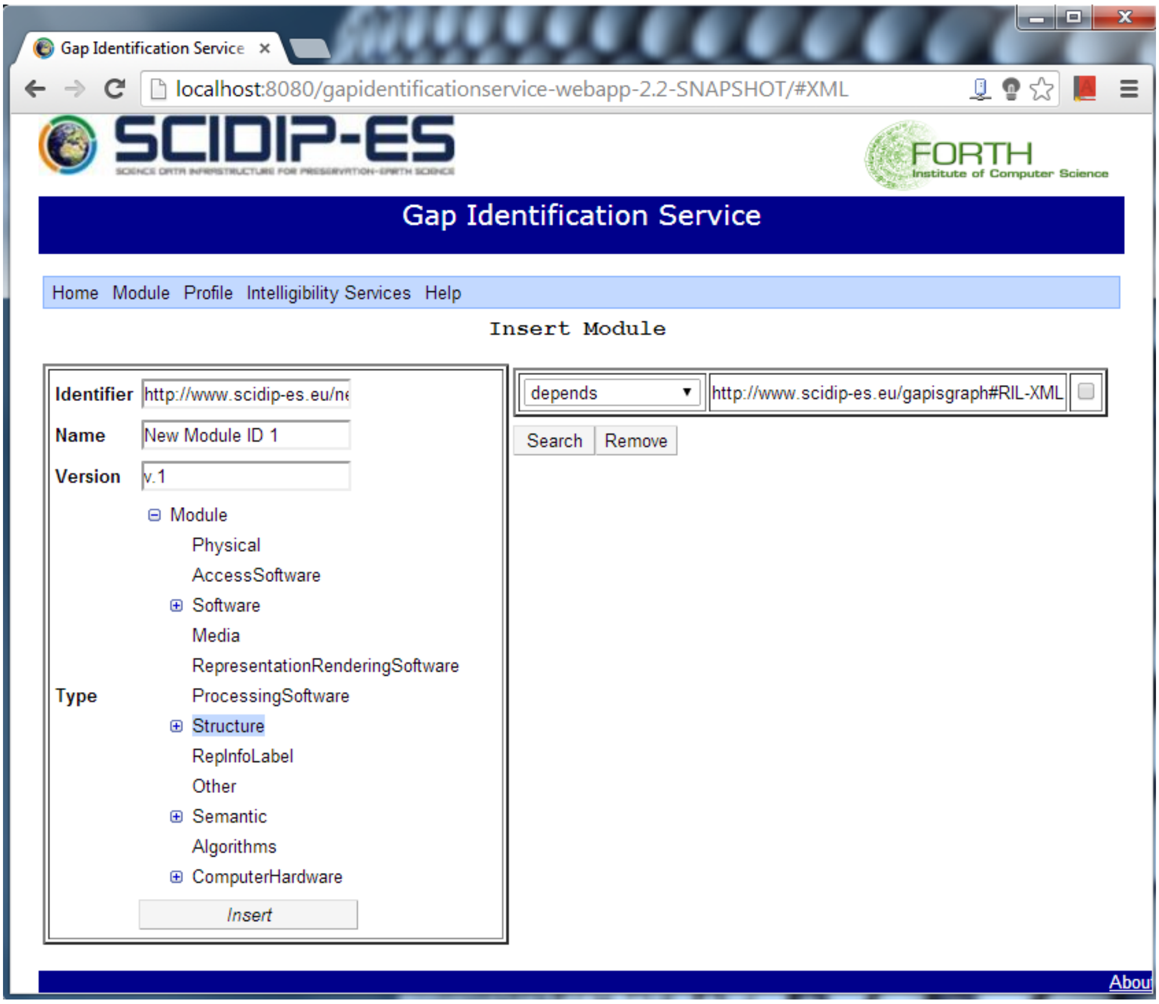


Figure 9 Creating a new Module dialogue



Gap Identification Service

localhost:8080/gapidentificationservice-webapp-2.2-SNAPSHOT/#XML

Home Module Profile Intelligibility Services Help

Insert Module

Identifier: http://www.scidip-es.eu/ne

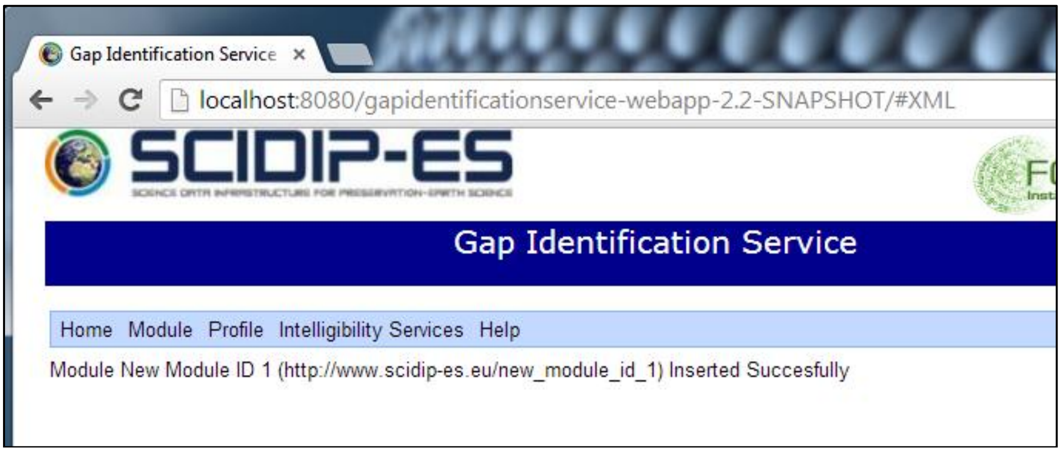
Name: New Module ID 1

Version: v.1

Type: Module – Physical, AccessSoftware, Software, Media, RepresentationRenderingSoftware, ProcessingSoftware, Structure, RepInfoLabel, Other, Semantic, Algorithms, ComputerHardware

depends http://www.scidip-es.eu/gapisgraph#RIL-XML

Figure 10 Creating a new Module – completing the dialogue



Gap Identification Service

localhost:8080/gapidentificationservice-webapp-2.2-SNAPSHOT/#XML

Home Module Profile Intelligibility Services Help

Module New Module ID 1 (http://www.scidip-es.eu/new_module_id_1) Inserted Succesfully

Figure 11 Creating a new Module – confirmation dialgoue

3.2.2 Creating a new Designated Community Profile

To create a new Designated Community (DC) Profile, the user must click on ***Profile*** and select ***Add New*** (Figure 12). A new screen will appear (Figure 13) for user to input information about the profile to be created. In particular the user has to provide an identifier for the profile, the profile name, and also a list of modules, if any, that are intelligible to this community (Figure 14). After adding all the required information, the user clicks ***Insert*** which triggers the necessary validation. After successful validation, the new profile is stored in GapIS repository and a confirmation message will appear.

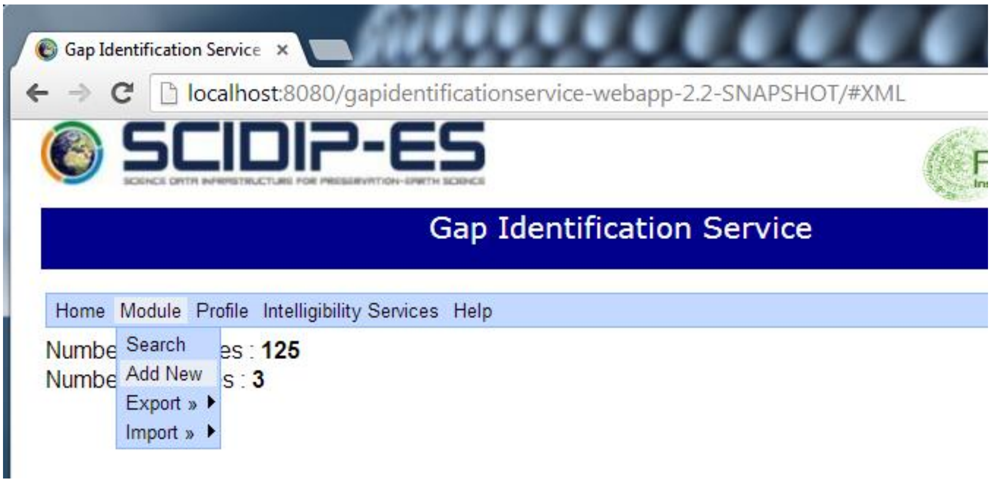

Gap Identification Service
localhost:8080/gapidentificationservice-webapp-2.2-SNAPSHOT/#XML
SCIDIP-ES
Gap Identification Service
Home
Module
Profile
Intelligibility Services
Help
Search
Add New
Export »
Import »
Numbe es : 125
Numbe s : 3

Figure 12 Creating a new DC Profile

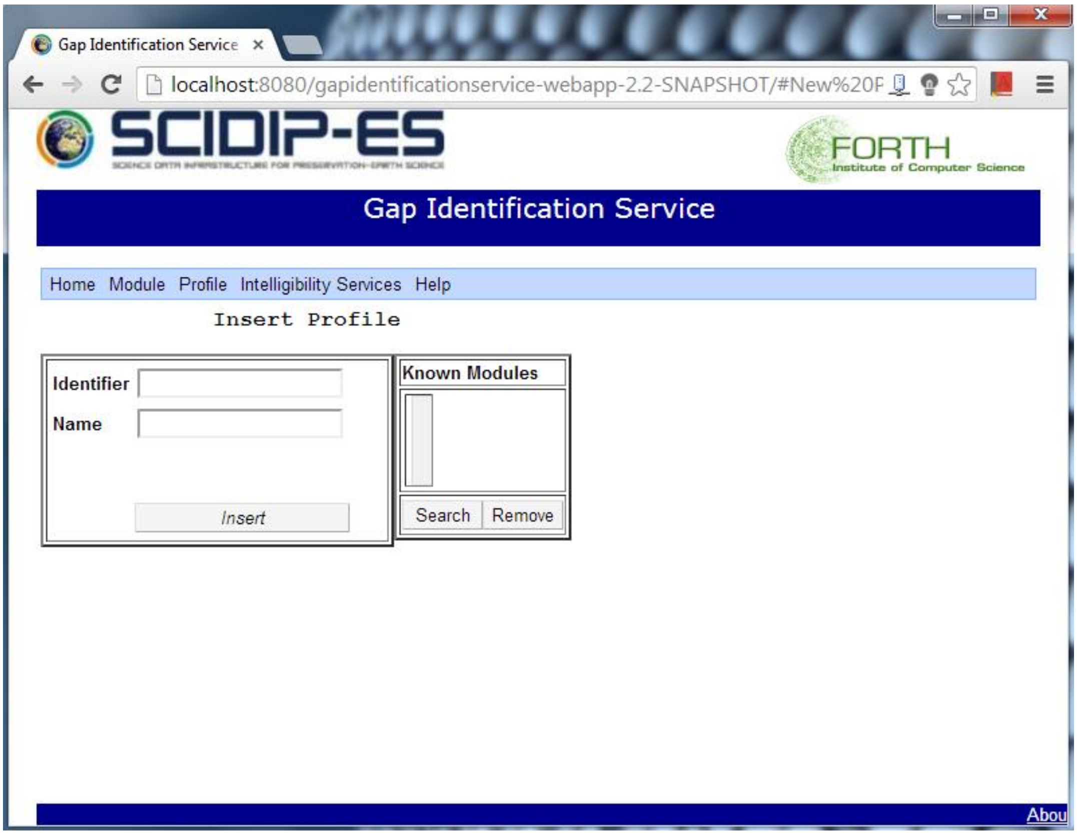
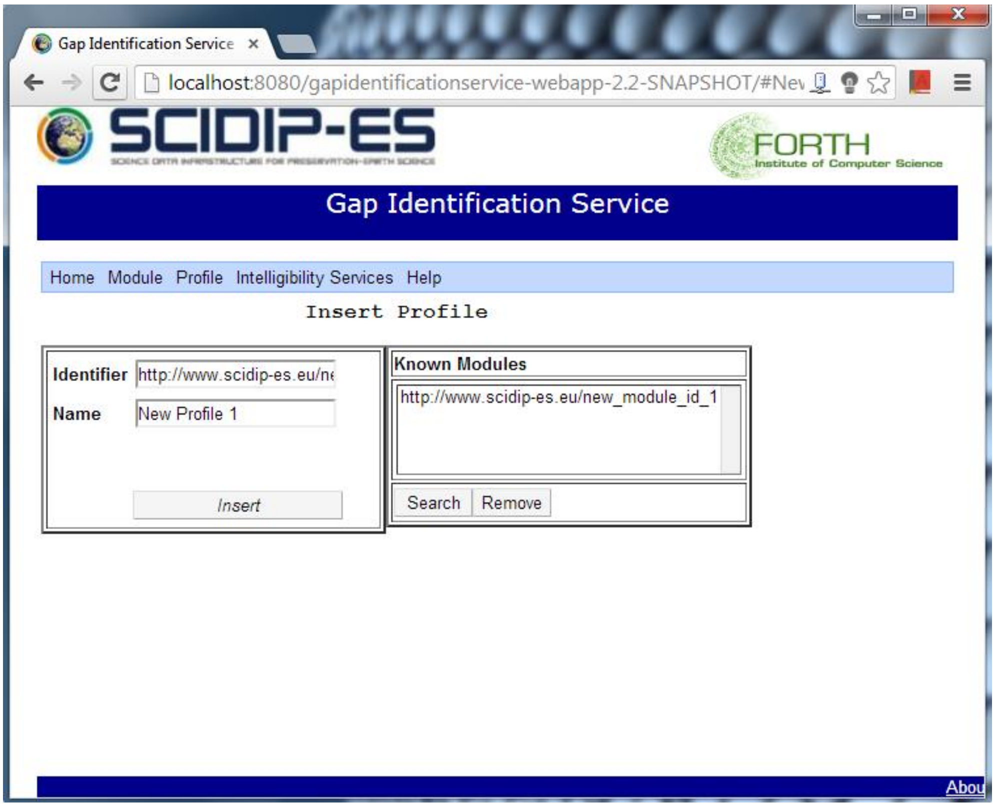

Gap Identification Service
localhost:8080/gapidentificationservice-webapp-2.2-SNAPSHOT/#New%20F
SCIDIP-ES
FORTH
Institute of Computer Science
Gap Identification Service
Home
Module
Profile
Intelligibility Services
Help
Insert Profile
Identifier
Name
Insert
Known Modules
Search
Remove
Abou

Figure 13 Creating a new DC Profile dialogue


Gap Identification Service
localhost:8080/gapidentificationservice-webapp-2.2-SNAPSHOT/#Nev
SCIDIP-ES
FORTH
Institute of Computer Science
Gap Identification Service
Home Module Profile Intelligibility Services Help
Insert
Known Modules
Search Remove
About

Insert Profile

Identifier: http://www.scidip-es.eu/ne

Name: New Profile 1

Known Modules: http://www.scidip-es.eu/new_module_id_1

Figure 14 Creating a new DC Profile – completing the dialogue

3.3 Intelligibility Related Services

3.3.1 Searching for a Module (and its dependencies)

A user can search for a specific module and inspect its information, its dependencies, etc. by clicking on ***Module*** and selecting ***Search*** (Figure 15). The Search Module page will appear; user can search for a module by providing its identifier, and/or its name. Exact matching of search term is supported (Figure 16). The results are presented as a list (Figure 17) and the user can select any item in the list by clicking it. This brings up the Module Information page which displays Information about the selected item (Figure 18). The information displayed includes the item's identifier, name, version, the modules that it depends on (direct dependencies list) as well as the modules that depend on it (direct dependents list). Apart from displaying all the dependencies of a specific module (the direct dependencies list), GapIS can resolve them and show the set of transitive dependencies of a module (by clicking on ***Get Closure*** button"). User can also edit the information of the retrieved module, by clicking on the ***Edit*** button in the upper right corner.

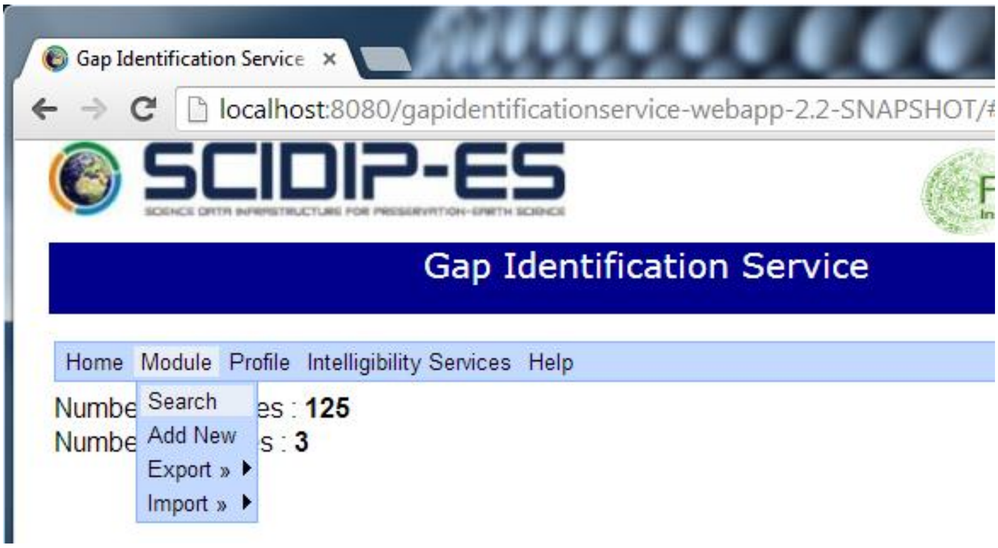
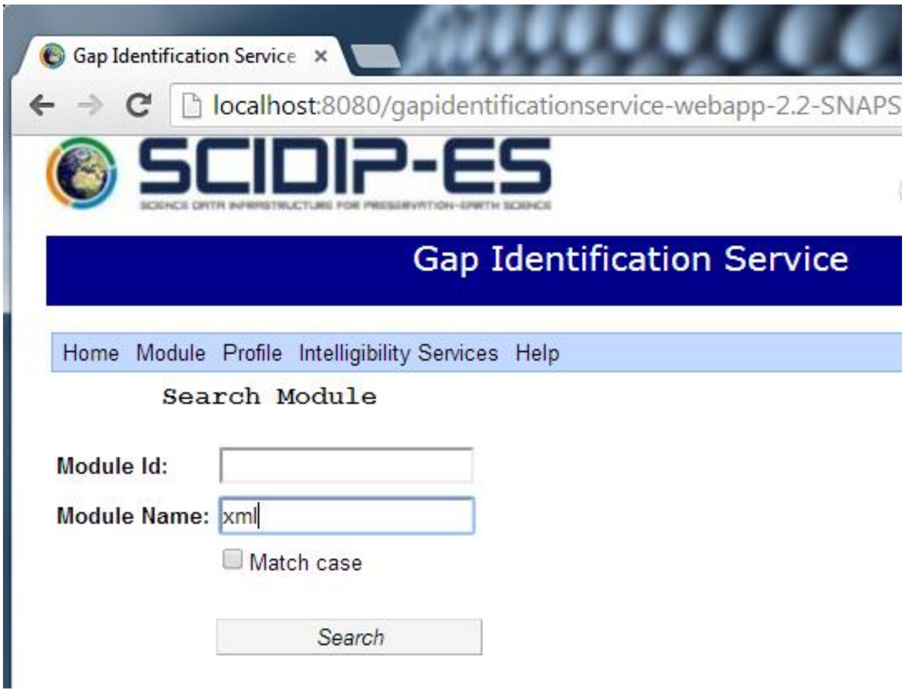

Gap Identification Service
localhost:8080/gapidentificationservice-webapp-2.2-SNAPSHOT/#
SCIDIP-ES
Gap Identification Service
Home
Module
Profile
Intelligibility Services
Help
Search
Add New
Export »
Import »
Numbe
es : 125
Numbe
s : 3

Figure 15 Searching for a Module


Gap Identification Service
localhost:8080/gapidentificationservice-webapp-2.2-SNAPS
SCIDIP-ES
Gap Identification Service
Home
Module
Profile
Intelligibility Services
Help
Search

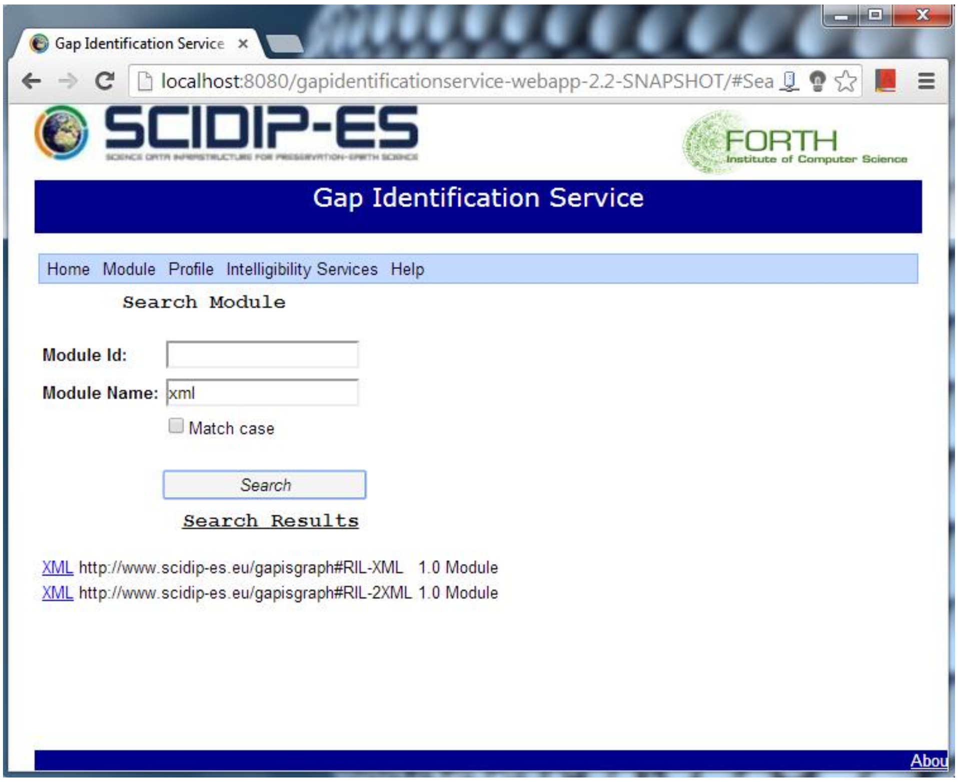
Search Module

Module Id:

Module Name: xml

☐ Match case

Figure 16 Searching for a Module dialogue



Gap Identification Service
localhost:8080/gapidentificationservice-webapp-2.2-SNAPSHOT/#Sea
SCIDIP-ES
FORTH Institute of Computer Science
Gap Identification Service
Home Module Profile Intelligibility Services Help
Search Module
Search
Search Results
Abou

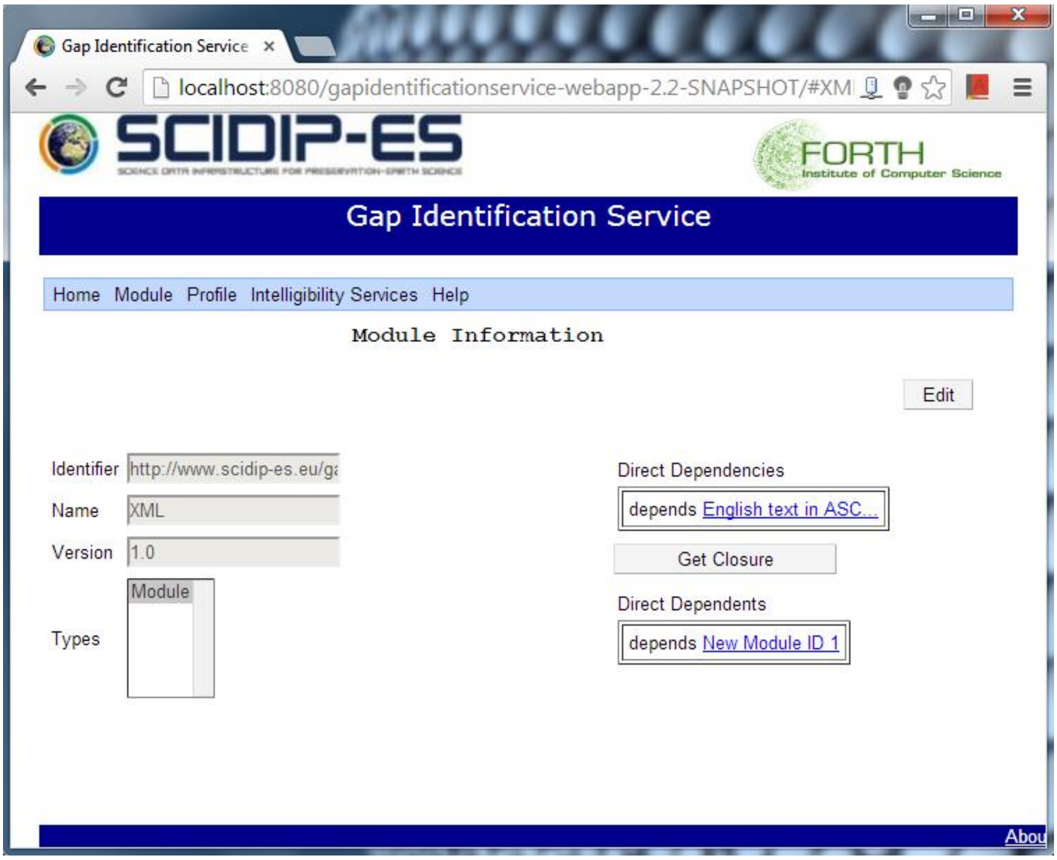
Module Id:

Module Name: xml

□ Match case

XML http://www.scidip-es.eu/gapisgraph#RIL-XML 1.0 Module
XML http://www.scidip-es.eu/gapisgraph#RIL-2XML 1.0 Module

Figure 17 Results from searching for a Module



Gap Identification Service
localhost:8080/gapidentificationservice-webapp-2.2-SNAPSHOT/#XMI
SCIDIP-ES
FORTH Institute of Computer Science
Gap Identification Service
Home Module Profile Intelligibility Services Help
Module Information
Edit
Get Closure
Abou

Identifier http://www.scidip-es.eu/ga

Name XML

Version 1.0

Types Module

Direct Dependencies
depends English text in ASC...

Direct Dependents
depends New Module ID 1

Figure 18 Inspecting the information of a Module

3.3.2 Search for a DC Profile (and its intelligible modules)

Searching for a Designated Community (DC) Profile can be done similarly. In particular the user selects ***Profile*** and then clicks on ***Search*** (Figure 19). A new page will appear where the user can search for a profile using its identifier or its name (Figure 20). The results are shown in a list (Figure 21) and the user can select an item to inspect its information, such as its identifier, its name, as well as the modules that are intelligible by the selected community (Figure 22). The user can also edit this profile by clicking on ***Edit*** button (on the upper right corner of the page).

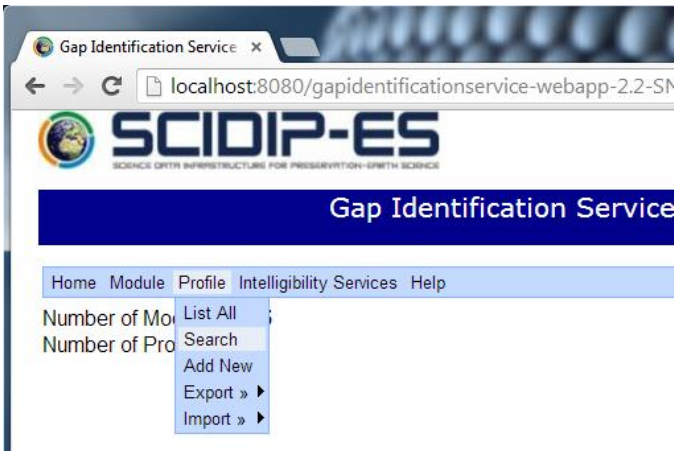

Gap Identification Service
localhost:8080/gapidentificationservice-webapp-2.2-SN
SCIDIP-ES
Gap Identification Service
Home Module Profile Intelligibility Services Help
Number of Mo
Number of Pro
List All
Search
Add New
Export »
Import »

Figure 19 Searching for a DC Profile

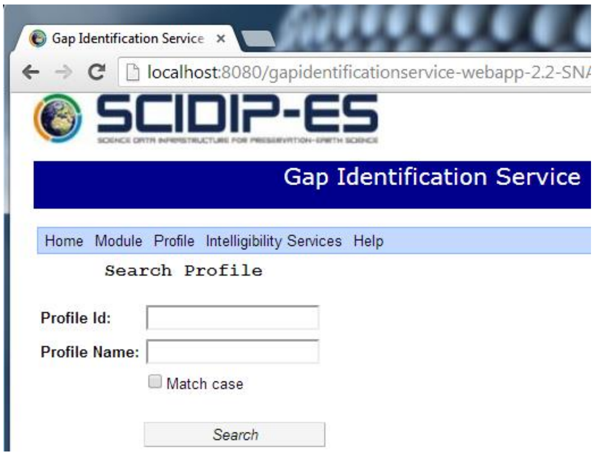
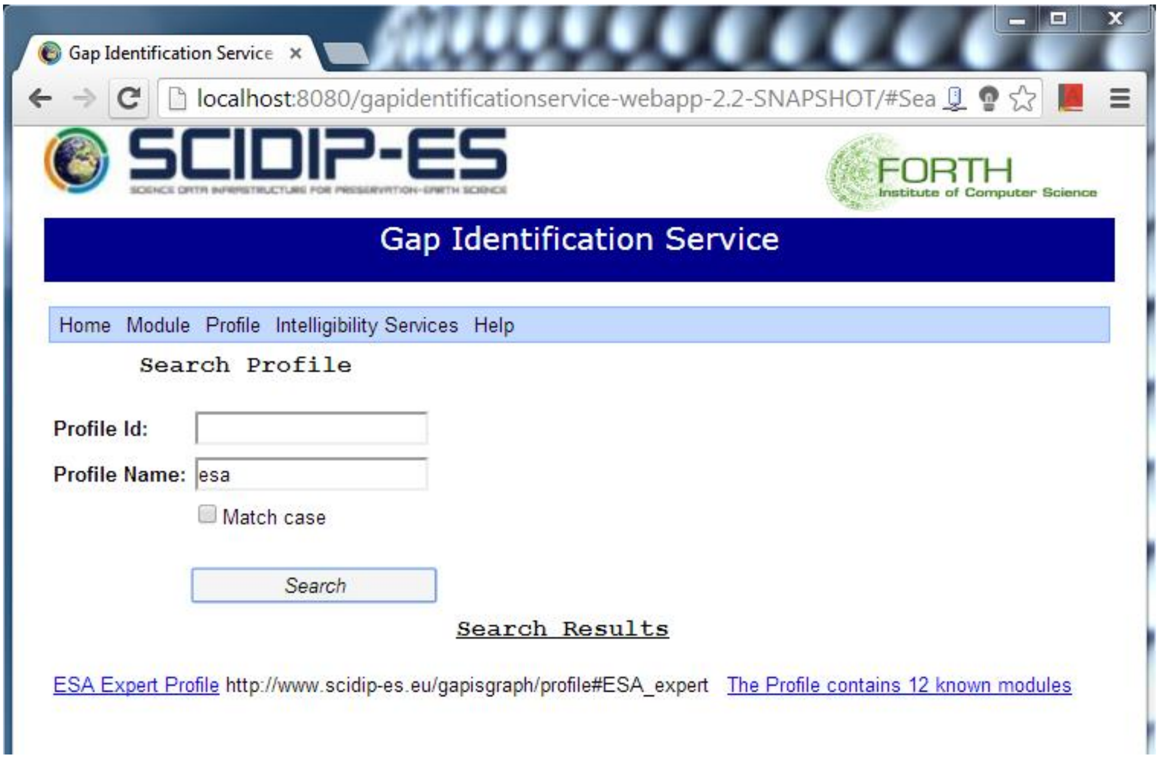

Gap Identification Service
localhost:8080/gapidentificationservice-webapp-2.2-SNA
SCIDIP-ES
Gap Identification Service
Home Module Profile Intelligibility Services Help
Search Profile
Profile Id:
Profile Name:
Match case
Search

Figure 20 Searching of a DC Profile


Gap Identification Service
localhost:8080/gapidentificationservice-webapp-2.2-SNAPSHOT/#Sea
SCIDIP-ES
FORTH
Institute of Computer Science
Gap Identification Service
Home Module Profile Intelligibility Services Help
Search Profile
Match case
Search

Profile Id:

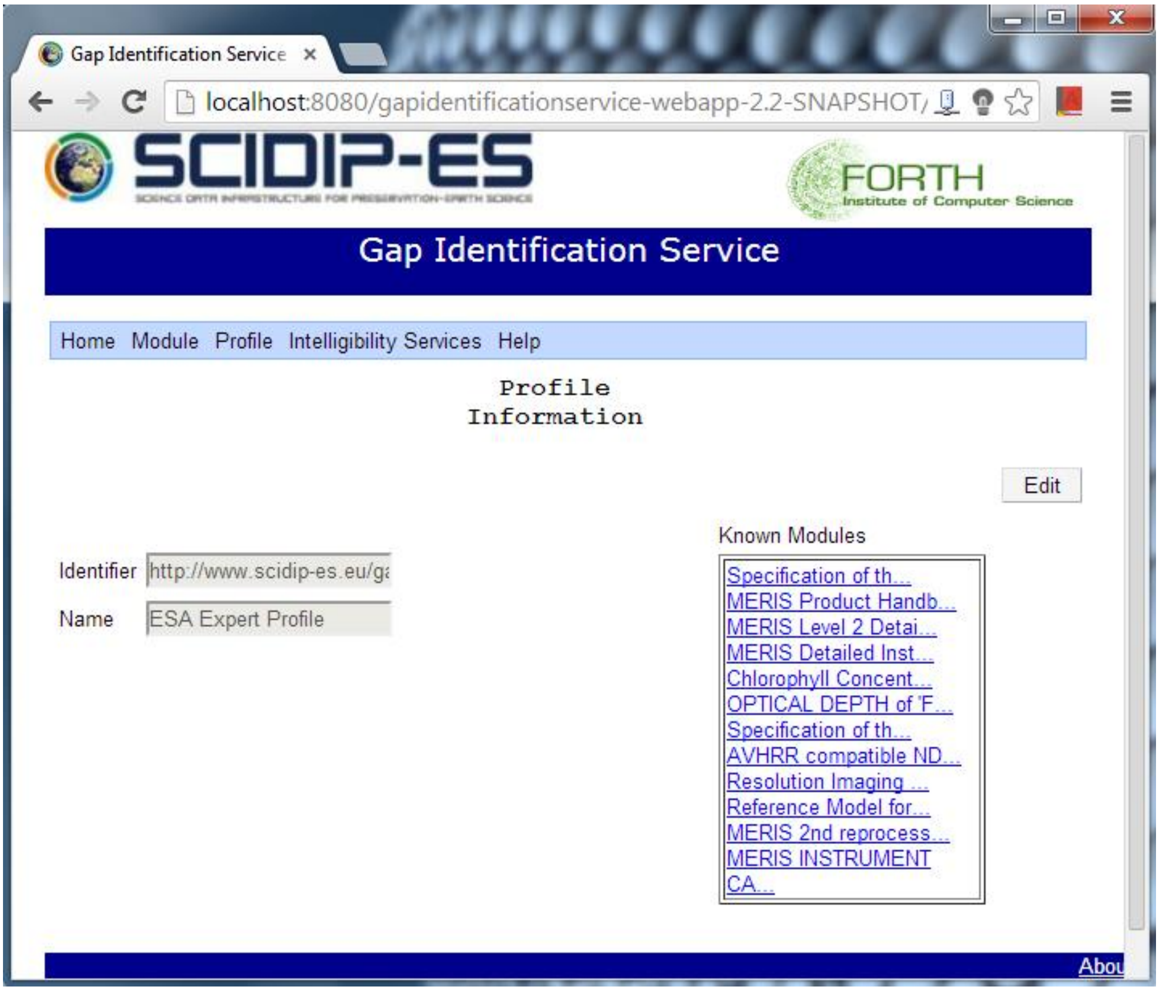
Profile Name: esa

☐ Match case

Search Results

ESA Expert Profile http://www.scidip-es.eu/gapisgraph/profile#ESA_expert The Profile contains 12 known modules

Figure 21 Searching for a DC Profile



Gap Identification Service
localhost:8080/gapidentificationservice-webapp-2.2-SNAPSHOT/
SCIDIP-ES
FORTH Institute of Computer Science
Gap Identification Service
Home Module Profile Intelligibility Services Help
Edit
Abou

Profile Information

Identifier http://www.scidip-es.eu/g

Name ESA Expert Profile

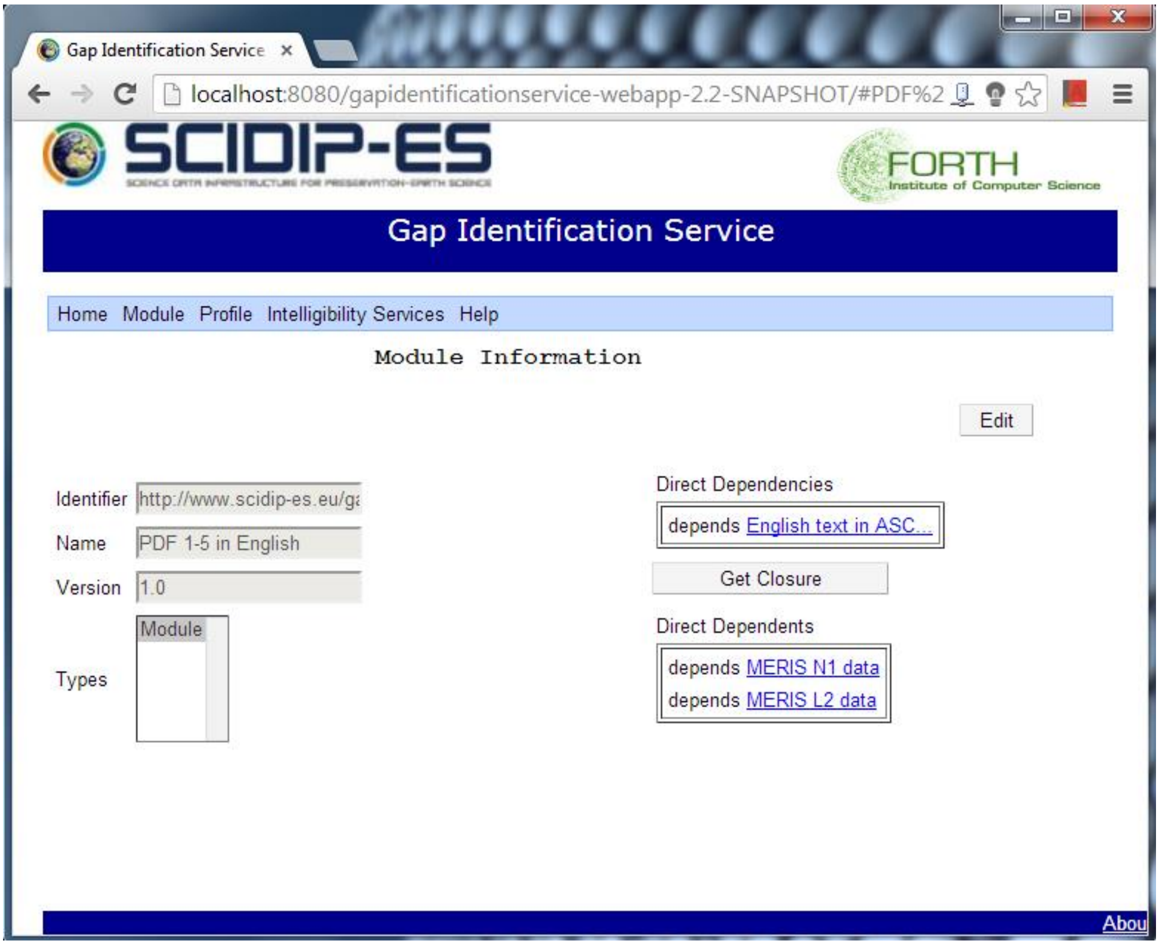
Known Modules

- Specification of th...
- MERIS Product Handb...
- MERIS Level 2 Detai...
- MERIS Detailed Inst...
- Chlorophyll Concent...
- OPTICAL DEPTH of 'F...
- Specification of th...
- AVHRR compatible ND...
- Resolution Imaging ...
- Reference Model for...
- MERIS 2nd reprocess...
- MERIS INSTRUMENT CA...

Figure 22 Inspecting the information of a DC Profile

3.3.3 Identifying Risks

GapIS provides an easy way of identifying obsolescence risks (i.e. which modules will be affected if a specific module will be removed). To better illustrate this, assume that the user wants to identify the modules that are at risk if the module “PDF Reader” is being removed. First of all the user must search for this module (by following the procedure described in 3.3.1). Figure 23 displays the “PDF Reader” module. The list “Direct Dependencies” contains all modules that directly depend on “PDF Reader” and therefore are at risk if “PDF Reader” is removed (they’ll become unreadable).


Gap Identification Service
localhost:8080/gapidentificationservice-webapp-2.2-SNAPSHOT/#PDF%2
SCIDIP-ES
FORTH Institute of Computer Science
Gap Identification Service
Home Module Profile Intelligibility Services Help
Edit
Get Closure
About

Module Information

Identifier: http://www.scidip-es.eu/ga

Name: PDF 1-5 in English

Version: 1.0

Types: Module

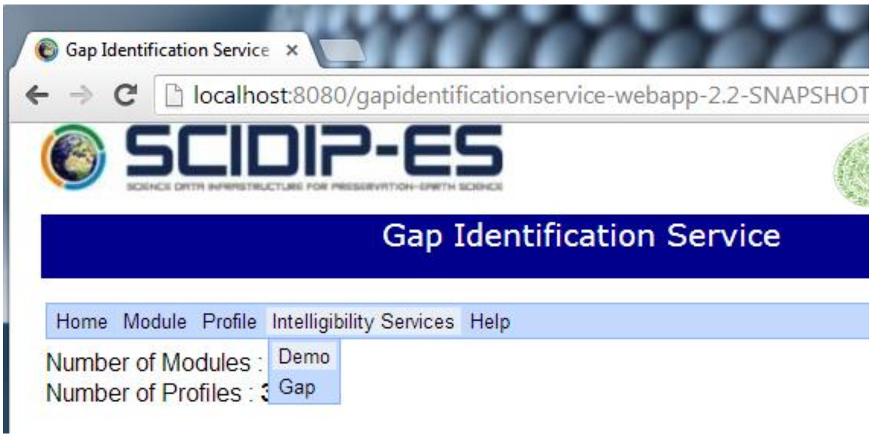
Direct Dependencies
depends English text in ASC...

Direct Dependents
depends MERIS N1 data
depends MERIS L2 data

Figure 23 Information about a Module

3.3.4 Searching for an Intelligibility Gap

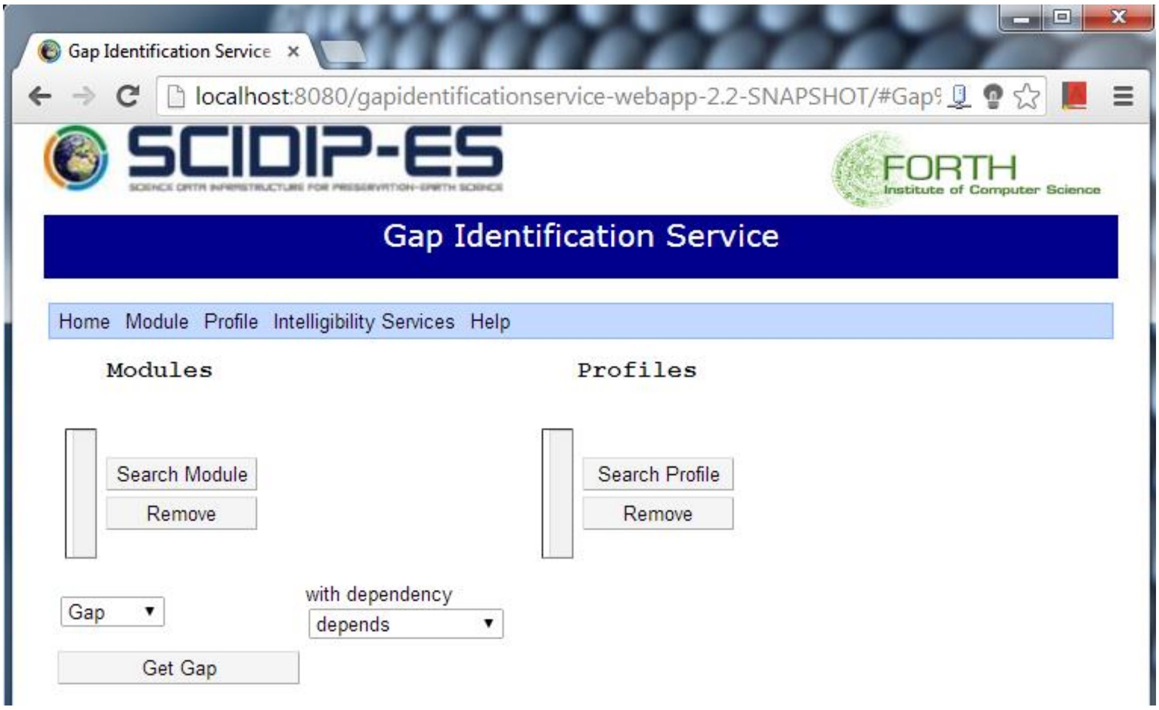
GapIS can compute intelligibility gaps; the smallest set of extra modules required to make a module (or a set of modules) intelligible for a designated community (or a set of communities). To find the intelligibility gap, the user must click on ***Intelligibility Services*** and click on ***Gap*** (Figure 24). A new page will appear (Figure 25) where user can add the module (or the set of modules) that should be checked, against a Profile (or a set of Profiles). Furthermore the user can specify dependency type by selecting the desired type from the corresponding drop down list. GapIS will compute intelligibility gap by resolving dependencies of the specified type. After specifying the parameters, the user clicks on ***Get Gap*** button and gets the results as shown in Figure 26.



Gap Identification Service
localhost:8080/gapidentificationservice-webapp-2.2-SNAPSHOT
SCIDIP-ES
Gap Identification Service
Home Module Profile Intelligibility Services Help
Demo
Gap

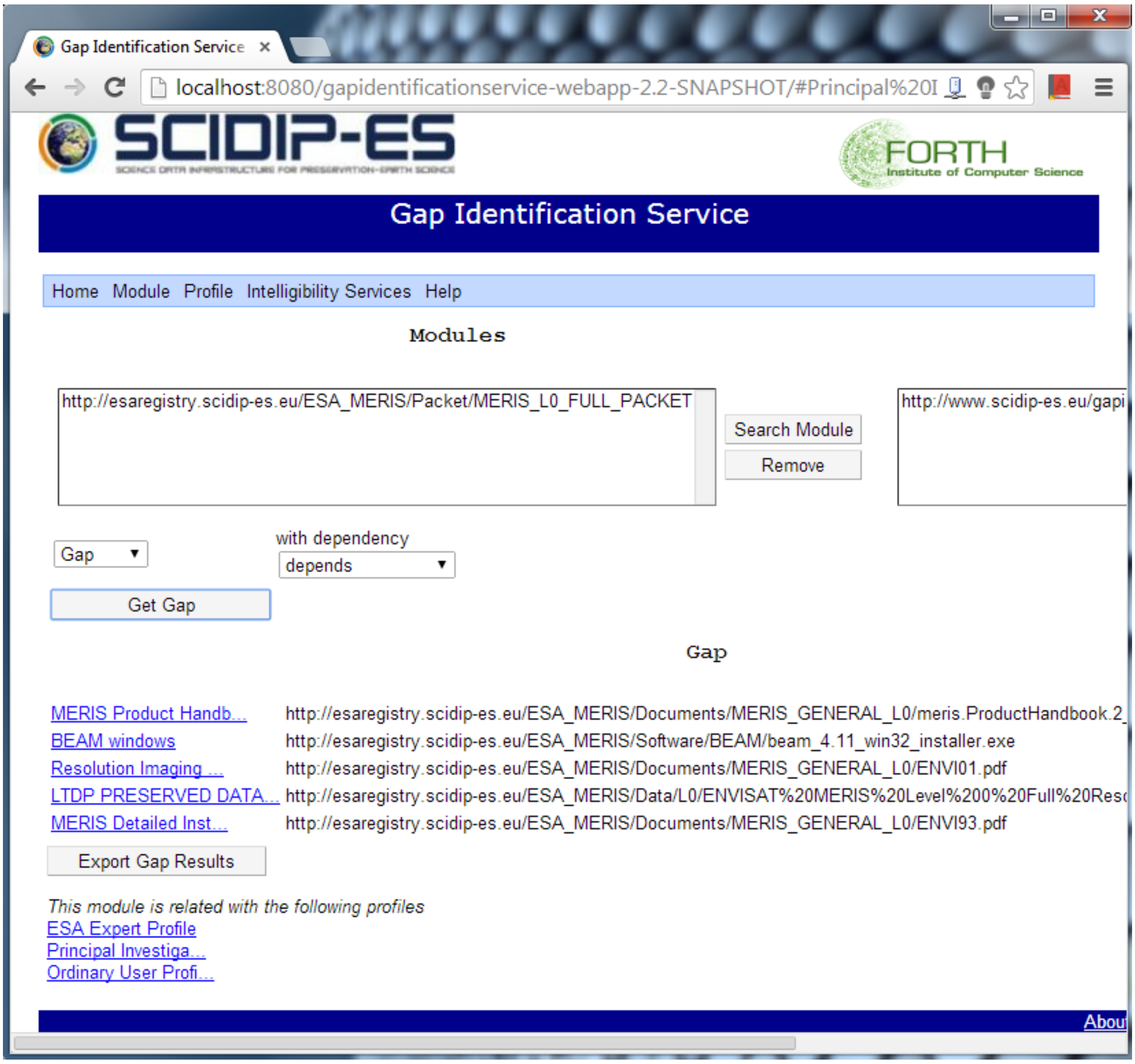
Number of Modules :
Number of Profiles : 3

Figure 24 Computing Intelligibility Gap



Gap Identification Service
localhost:8080/gapidentificationservice-webapp-2.2-SNAPSHOT/#Gap
SCIDIP-ES
FORTH
Institute of Computer Science
Gap Identification Service
Home Module Profile Intelligibility Services Help
Modules
Profiles
Search Module
Remove
Search Profile
Remove
Gap
with dependency
depends
Get Gap

Figure 25 Computing Intelligibility Gap



Gap Identification Service
localhost:8080/gapidentificationservice-webapp-2.2-SNAPSHOT/#Principal%20I
SCIDIP-ES
SCIENCE DATA INFRASTRUCTURE FOR PRESERVATION-EARTH SCIENCE
FORTH
Institute of Computer Science
Home Module Profile Intelligibility Services Help
Search Module
Remove
Get Gap
Export Gap Results
About

Gap Identification Service

Modules

http://esaregistry.scidip-es.eu/ESA_MERIS/Packet/MERIS_L0_FULL_PACKET

http://www.scidip-es.eu/gapi

Gap

with dependency
depends

Gap

MERIS Product Handb...	http://esaregistry.scidip-es.eu/ESA_MERIS/Documents/MERIS_GENERAL_L0/meris.ProductHandbook.2_
BEAM windows	http://esaregistry.scidip-es.eu/ESA_MERIS/Software/BEAM/beam_4.11_win32_installer.exe
Resolution Imaging ...	http://esaregistry.scidip-es.eu/ESA_MERIS/Documents/MERIS_GENERAL_L0/ENVI01.pdf
LTDP PRESERVED DATA...	http://esaregistry.scidip-es.eu/ESA_MERIS/Data/L0/ENVISAT%20MERIS%20Level%200%20Full%20Reso
MERIS Detailed Inst...	http://esaregistry.scidip-es.eu/ESA_MERIS/Documents/MERIS_GENERAL_L0/ENVI93.pdf

This module is related with the following profiles
ESA Expert Profile
Principal Investiga...
Ordinary User Profi...

Figure 26 Computing Intelligibility Gap

3.3.5 Import/Export Resources

GapIS supports importing/exporting resources in several formats. The acceptable formats are RDF/XML, NTriples, and plain XML format. To import a set of modules, user should click on ***Module***, select ***Import*** and the source format (Figure 27) to upload the file containing the modules. The same procedure can be followed to import profiles.

In addition, GapIS supports exporting the contents of the GapIS repository in several formats (RDF/XML, NTriples, plain XML). To export modules, user should click on ***Module***, select ***Export*** (in the desired format) to export them. The same procedure can be followed to export profiles.

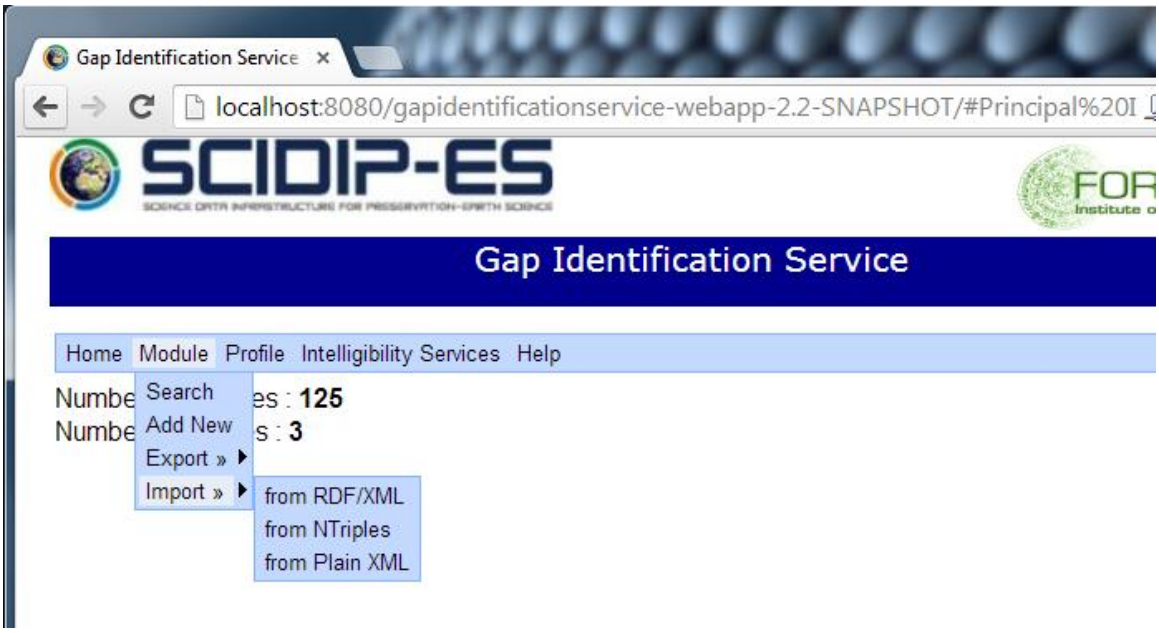
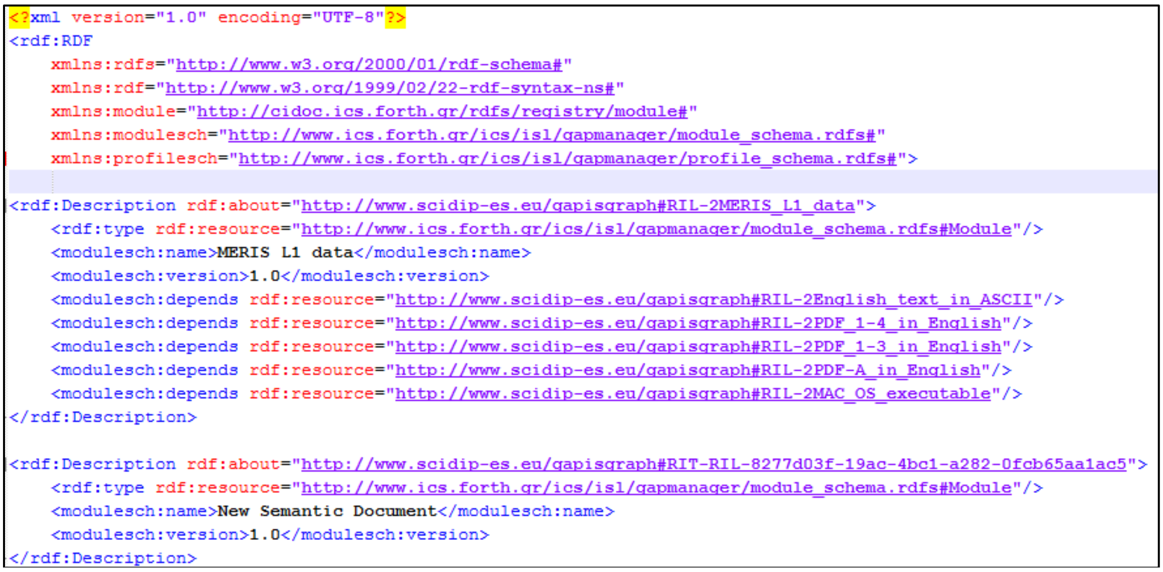

Gap Identification Service
localhost:8080/gapidentificationservice-webapp-2.2-SNAPSHOT/#Principal%20I
SCIDIP-ES
SCIENCE DATA INFRASTRUCTURE FOR PRESERVATION-EARTH SCIENCE
FOR
Institute o
Gap Identification Service
Home
Module
Profile
Intelligibility Services
Help
Numbe
es : 125
Numbe
s : 3
Search
Add New
Export »
Import »
from RDF/XML
from NTriples
from Plain XML

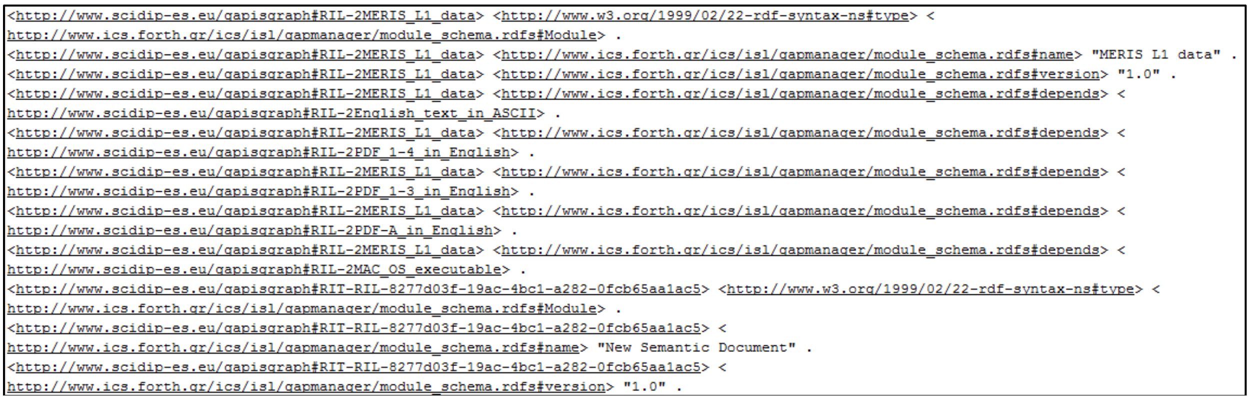
Figure 27 Importing Modules

The following figures show data according to RDF (Figure 28), Ntriples (Figure 29) and plain XML (Figure 30) format.



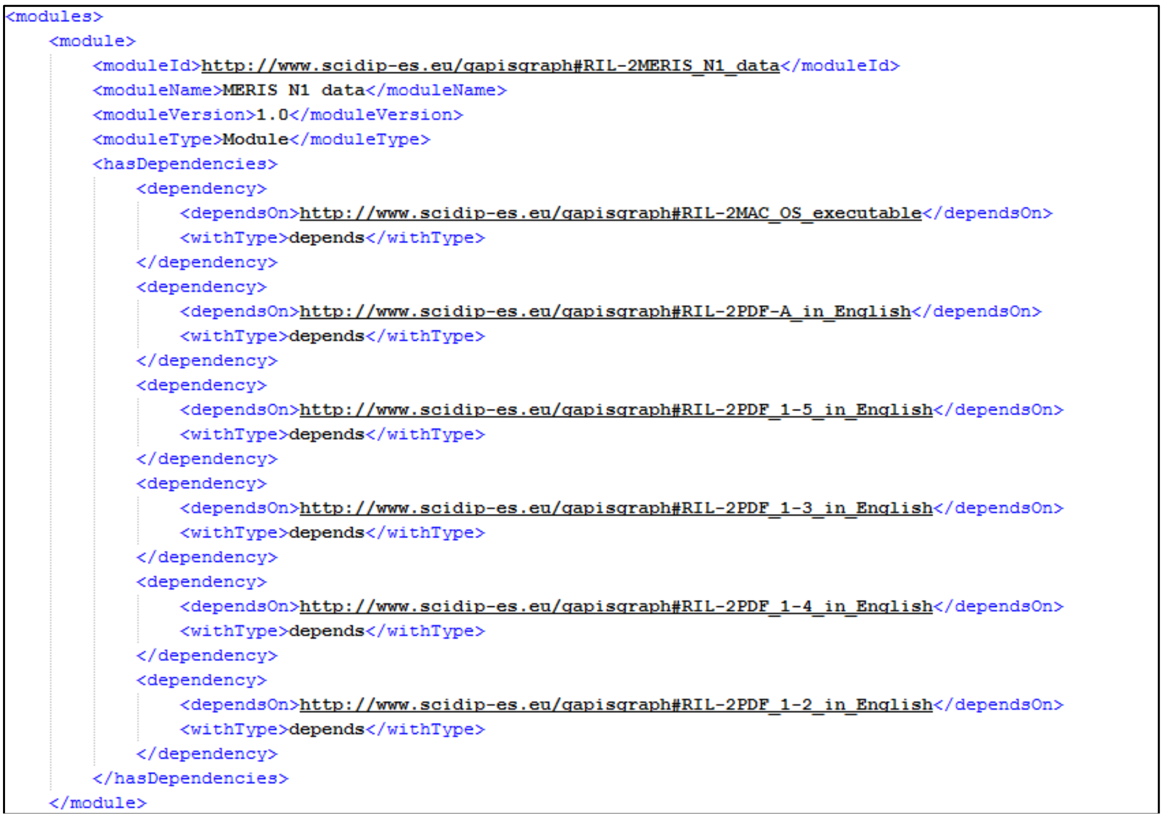
```
<?xml version="1.0" encoding="UTF-8"?>
<rdf:RDF
    xmlns:rdfs="http://www.w3.org/2000/01/rdf-schema#"
    xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
    xmlns:module="http://cidoc.ics.forth.gr/rdfs/registry/module#"
    xmlns:modulesch="http://www.ics.forth.gr/ics/isl/gapmanager/module_schema.rdfs#"
    xmlns:profilesch="http://www.ics.forth.gr/ics/isl/gapmanager/profile_schema.rdfs#">

<rdf:Description rdf:about="http://www.scidip-es.eu/gapisgraph#RIL-2MERIS_L1_data">
    <rdf:type rdf:resource="http://www.ics.forth.gr/ics/isl/gapmanager/module_schema.rdfs#Module"/>
    <modulesch:name>MERIS L1 data</modulesch:name>
    <modulesch:version>1.0</modulesch:version>
    <modulesch:depends rdf:resource="http://www.scidip-es.eu/gapisgraph#RIL-2English_text_in_ASCII"/>
    <modulesch:depends rdf:resource="http://www.scidip-es.eu/gapisgraph#RIL-2PDF_1-4_in_English"/>
    <modulesch:depends rdf:resource="http://www.scidip-es.eu/gapisgraph#RIL-2PDF_1-3_in_English"/>
    <modulesch:depends rdf:resource="http://www.scidip-es.eu/gapisgraph#RIL-2PDF-A_in_English"/>
    <modulesch:depends rdf:resource="http://www.scidip-es.eu/gapisgraph#RIL-2MAC_OS_executable"/>
</rdf:Description>

<rdf:Description rdf:about="http://www.scidip-es.eu/gapisgraph#RIT-RIL-8277d03f-19ac-4bc1-a282-0fcb65aa1ac5">
    <rdf:type rdf:resource="http://www.ics.forth.gr/ics/isl/gapmanager/module_schema.rdfs#Module"/>
    <modulesch:name>New Semantic Document</modulesch:name>
    <modulesch:version>1.0</modulesch:version>
</rdf:Description>
```

Figure 28 Module-related data in RDF format



```
<http://www.scidip-es.eu/gapisgraph#RIL-2MERIS_L1_data> <http://www.w3.org/1999/02/22-rdf-syntax-ns#type> <
http://www.ics.forth.gr/ics/isl/gapmanager/module_schema.rdfs#Module> .
<http://www.scidip-es.eu/gapisgraph#RIL-2MERIS_L1_data> <http://www.ics.forth.gr/ics/isl/gapmanager/module_schema.rdfs#name> "MERIS L1 data" .
<http://www.scidip-es.eu/gapisgraph#RIL-2MERIS_L1_data> <http://www.ics.forth.gr/ics/isl/gapmanager/module_schema.rdfs#version> "1.0" .
<http://www.scidip-es.eu/gapisgraph#RIL-2MERIS_L1_data> <http://www.ics.forth.gr/ics/isl/gapmanager/module_schema.rdfs#depends> <
http://www.scidip-es.eu/gapisgraph#RIL-2English_text_in_ASCII> .
<http://www.scidip-es.eu/gapisgraph#RIL-2MERIS_L1_data> <http://www.ics.forth.gr/ics/isl/gapmanager/module_schema.rdfs#depends> <
http://www.scidip-es.eu/gapisgraph#RIL-2PDF_1-4_in_English> .
<http://www.scidip-es.eu/gapisgraph#RIL-2MERIS_L1_data> <http://www.ics.forth.gr/ics/isl/gapmanager/module_schema.rdfs#depends> <
http://www.scidip-es.eu/gapisgraph#RIL-2PDF_1-3_in_English> .
<http://www.scidip-es.eu/gapisgraph#RIL-2MERIS_L1_data> <http://www.ics.forth.gr/ics/isl/gapmanager/module_schema.rdfs#depends> <
http://www.scidip-es.eu/gapisgraph#RIL-2PDF-A_in_English> .
<http://www.scidip-es.eu/gapisgraph#RIL-2MERIS_L1_data> <http://www.ics.forth.gr/ics/isl/gapmanager/module_schema.rdfs#depends> <
http://www.scidip-es.eu/gapisgraph#RIL-2MAC_OS_executable> .
<http://www.scidip-es.eu/gapisgraph#RIT-RIL-8277d03f-19ac-4bc1-a282-0fcb65aa1ac5> <http://www.w3.org/1999/02/22-rdf-syntax-ns#type> <
http://www.ics.forth.gr/ics/isl/gapmanager/module_schema.rdfs#Module> .
<http://www.scidip-es.eu/gapisgraph#RIT-RIL-8277d03f-19ac-4bc1-a282-0fcb65aa1ac5> <
http://www.ics.forth.gr/ics/isl/gapmanager/module_schema.rdfs#name> "New Semantic Document" .
<http://www.scidip-es.eu/gapisgraph#RIT-RIL-8277d03f-19ac-4bc1-a282-0fcb65aa1ac5> <
http://www.ics.forth.gr/ics/isl/gapmanager/module_schema.rdfs#version> "1.0" .
```

Figure 29 Module-related data in NTriples format



```
<modules>
    <module>
        <moduleId>http://www.scidip-es.eu/gapisgraph#RIL-2MERIS_N1_data</moduleId>
        <moduleName>MERIS N1 data</moduleName>
        <moduleVersion>1.0</moduleVersion>
        <moduleType>Module</moduleType>
        <hasDependencies>
            <dependency>
                <dependsOn>http://www.scidip-es.eu/gapisgraph#RIL-2MAC_OS_executable</dependsOn>
                <withType>depends</withType>
            </dependency>
            <dependency>
                <dependsOn>http://www.scidip-es.eu/gapisgraph#RIL-2PDF-A_in_English</dependsOn>
                <withType>depends</withType>
            </dependency>
            <dependency>
                <dependsOn>http://www.scidip-es.eu/gapisgraph#RIL-2PDF_1-5_in_English</dependsOn>
                <withType>depends</withType>
            </dependency>
            <dependency>
                <dependsOn>http://www.scidip-es.eu/gapisgraph#RIL-2PDF_1-3_in_English</dependsOn>
                <withType>depends</withType>
            </dependency>
            <dependency>
                <dependsOn>http://www.scidip-es.eu/gapisgraph#RIL-2PDF_1-4_in_English</dependsOn>
                <withType>depends</withType>
            </dependency>
            <dependency>
                <dependsOn>http://www.scidip-es.eu/gapisgraph#RIL-2PDF_1-2_in_English</dependsOn>
                <withType>depends</withType>
            </dependency>
        </hasDependencies>
    </module>
```

Figure 30 Module-related data in plain XML format

4 Reference Manual

None

4.1 Keyboard shortcuts

None

4.2 Command-line commands

None

4.3 Public APIs

None

5 Troubleshooting Common Issues

NA

Annex A. References

[Tzitzikas1] Y. Tzitzikas and G. Flouris. 2007. Mind the (Intelligibility) Gap, *Proceeding of the 11th European Conference on Research and Advanced Technology for Digital Libraries,* ECDL'2007, Budapest, Hungary, September, 2007.

[Tzitzikas2] Y. Tzitzikas and G. Flouris. 2007. Dependency Management for the Preservation of Digital Information. *Proceeding of the 18th International Conference on Database and Expert Systems Applications,* DEXA'2007. Regensburg, Germany, September, 2007.

[Marketakis1] Y. Marketakis and Y. Tzitzikas: Dependency management for digital preservation using semantic web technologies. Int. J. on Digital Libraries 10(4): 159-177 (2009).

Annex B. Figures and Tables

B.1. List of Figures

B.2. List of Tables

No table of figures entries found.

Annex C. Terminology

ACRONYM	DESCRIPTION
AIP	Archival Information Package
ARK	Archival Resource Key
CIDO-CRM	CIDOC Conceptual Reference Model (CRM)
DOI	Digital Object Identifier
ES	Earth Science
GapIS	Gap Identification Service
KB	Knowledge Base
OS	Orchestration Service
OWL	Web Ontology Language
PI	Persistent Identifier
PNM	Preservation Network Model
PURL	Persistent Uniform Resource Locator
RDF	Resource Description Framework
RepInfo	Representation Information
SNIA	Storage Networking Industry Association
SWKM	Semantic Web Knowledge Middleware
VM	Virtual Machine
WP	Work Package
XAM	eXtensible Access Method
XML	eXtensible Mark-up Language