
Intersections Engine Documentation

Release 1.0

GeoSolutions IT

November 17, 2009

CONTENTS

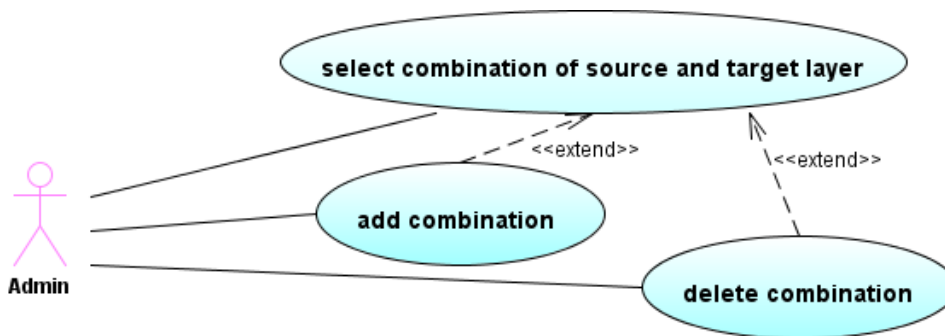
1	Intersection Engine Introduction	3
1.1	Use Cases UML	3
2	Intersection Engine Installation	9
2.1	Overview	9
2.2	Requirements	9
2.3	Troubleshooting	11
3	Intersections Engine Core Module	13
3.1	Algorithm Description	13
4	Service Mix JBI component	19
4.1	JSONP Callback	19
4.2	Get Combinations	19
4.3	Add Combination	19
4.4	Delete Combination	20
4.5	Enable/Disable Combination	20
4.6	Get all Computations	20
4.7	Rebuild All	21
5	Intersection Engine Web module	23
5.1	Download Manager	23
5.2	Admin Console	24
6	Extra Information	29
6.1	Tests	29
6.2	JUnit Coverage	29
6.3	Selenium Tests	29
6.4	Memory Consumption	29
7	Indices and tables	33

Contents:

INTERSECTION ENGINE INTRODUCTION

1.1 Use Cases UML

1.1.1 Add Combination



- Admin logs in with name and password
- Admin select water related source layer
- Admin selects water related target layer
- Admin adds the combination of source and target layer to the list of combinations

Note: The list of layers contains all actual layers published on Geoserver (this implies that the intersectionserver always asks Geoserver for the actual list of layers). It is up to the Admin to select only a water related layer. The fact that this can lead to faulty combination(s) is considered as not to be a problem.

1.1.2 Delete Combination

- Admin logs in with name and password
- Admin selects combination from the list of combinations
- Admin deletes combination

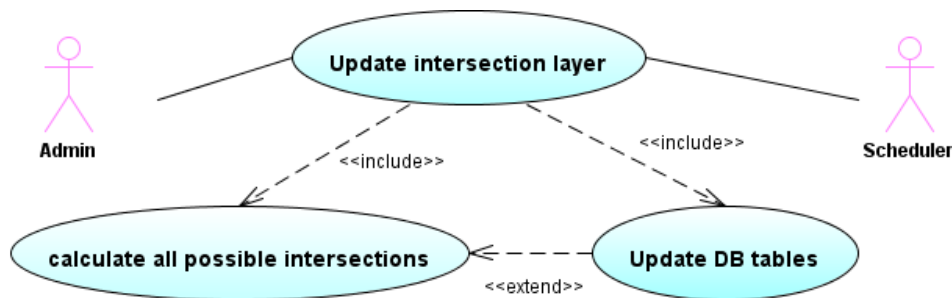
1.1.3 Trigger Batch

Admin

- Admin logs in with name and password
- Admin starts batch manually

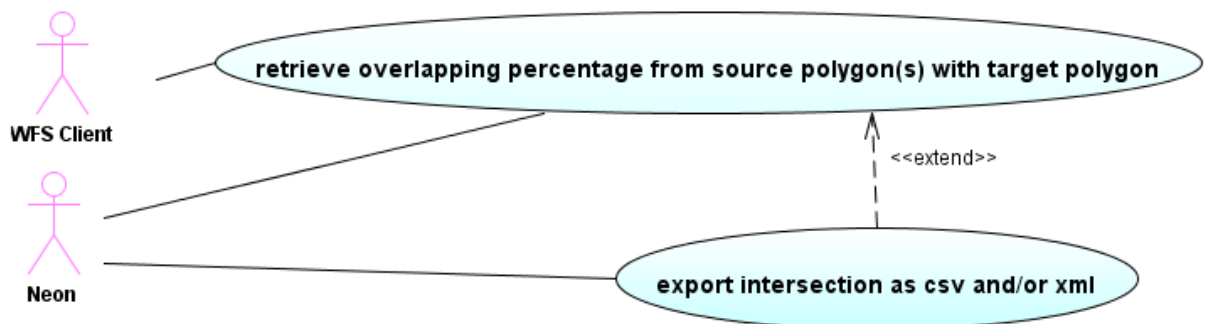
Scheduler

- Scheduler starts batch automatically



- The webapplication has a fixed scheduler and every week at Sunday 01:00AM the batch is started.
- The batch can also be started via the UI of that webapplication via a button.
- The button is reachable after having done a login into the webapplication.
- The login is a hardcoded login account.
- The definition of the scheduler is not adjustable via the UI, it is defined in a properties or xml file as being part of the application software.
- The server needs to be restarted before in order to effectuate the new scheduler definition.

1.1.4 Download Intersection



- Neon user selects outputmode (xml or csv)
- Neon user selects combination
- Neon user downloads combination

Note: The downloaded xml and csv do not contain geometry

1.1.5 Derived Use Cases

The derived usecases will not be implemented in this project. The above usecases need to be implemented before the derived usecases can be performed. The derived usecases are mentioned here to have a better understanding of the context of the above usecases.

Harmonization among area classifications as a basis to achieve application goals such as:

- Reallocation of statistical (catch) data
- Reallocation of species probability distributions
- Reference marine resource distributions
- Search and exploratory functions across integrated datab

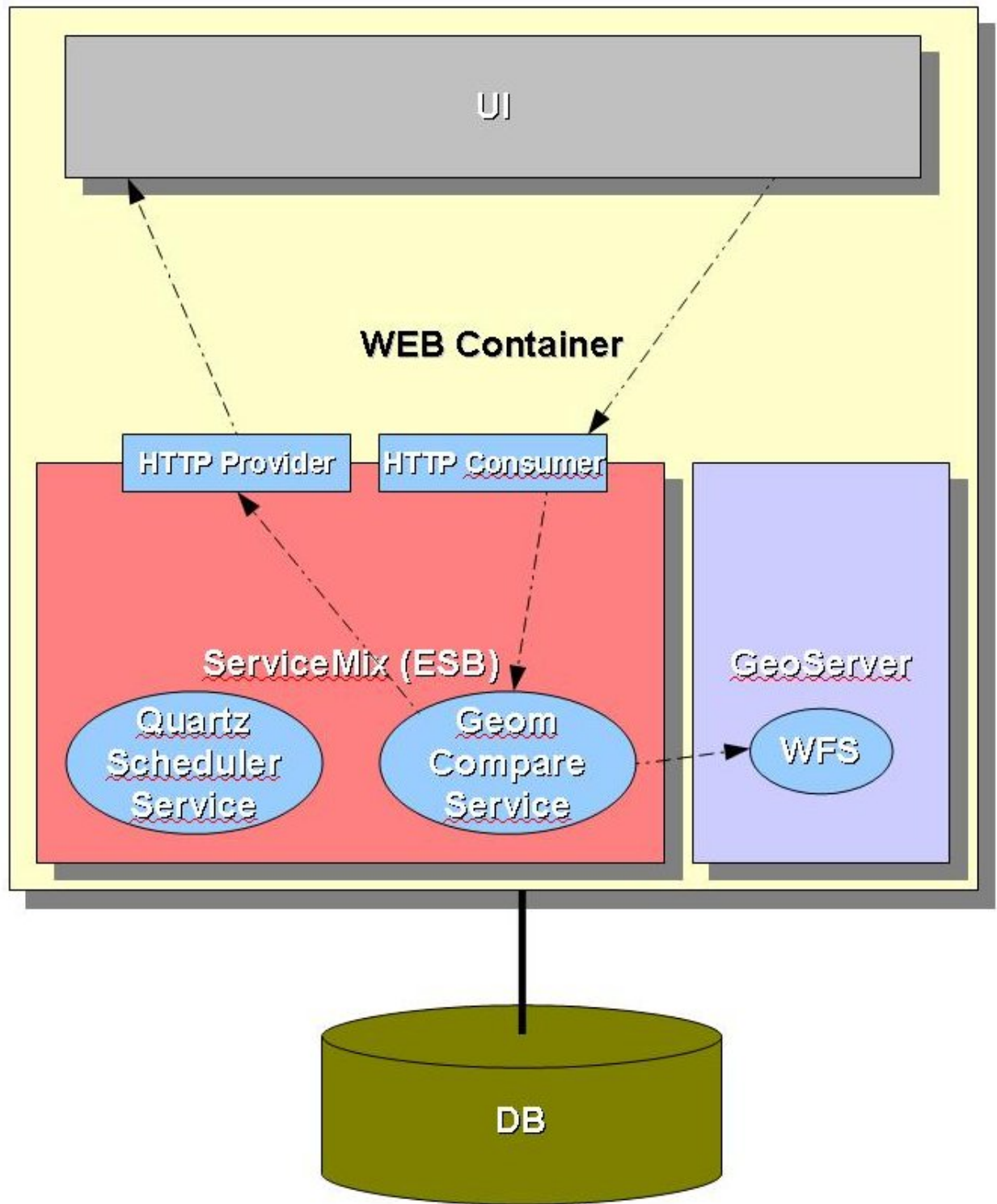
1.1.6 Class Diagram Context

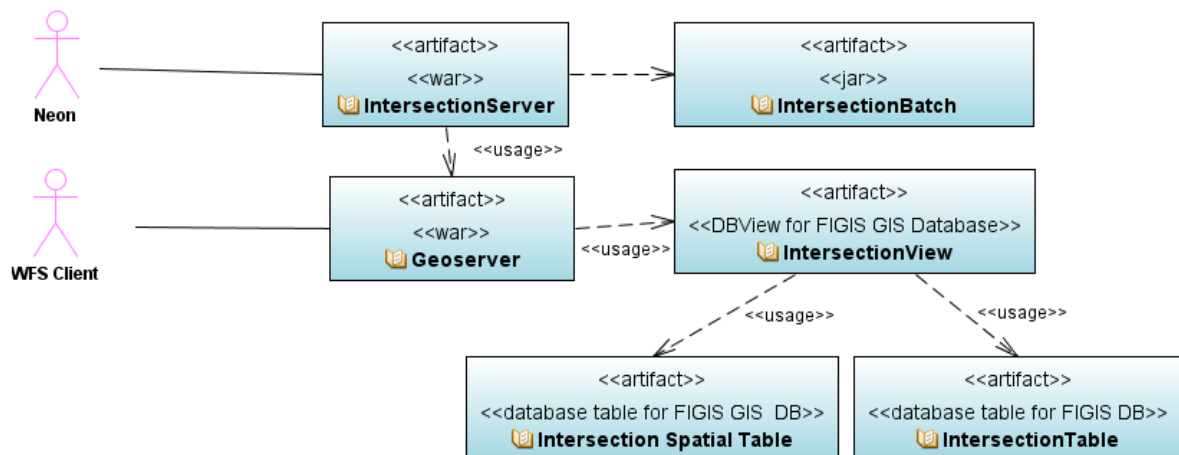
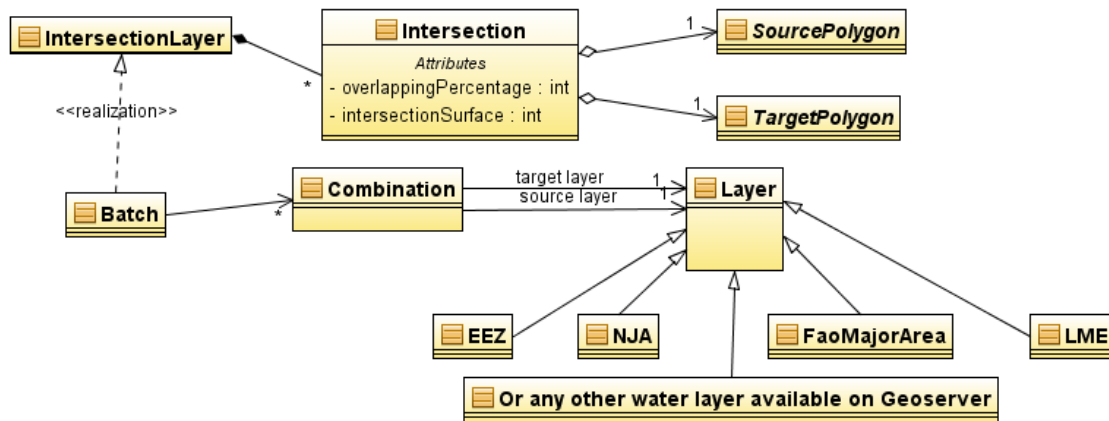
1.1.7 Class Diagram Intersection

- Resulting coastline intersection percentage and polygons are cut.
- Binary intersection means an intersection between 2 layers.
- An intersection is the based on 1 source and 1 target polygon.

1.1.8 Artefact Diagram

Note: All artefacts in the diagram are artefacts to be produced by GeoSolutions, except the GeoServer artefact.





INTERSECTION ENGINE INSTALLATION

2.1 Overview

In general, Intersection Engine (IE) installation requires:

1. *Java 5* and *Maven 2*
2. *Spatial Database (Oracle 10g)*
3. *Geotools 2.6* and *Geoserver 1.7.x*
4. *ServiceMix 3.3*

Details for each of the requirements and installation instructions are provided in the sections below.

2.2 Requirements

2.2.1 Java 5

Because of the use of annotations and some other features Java 5 is the minimum version supported by IE. Java 6 is of course recommended for performance reasons.

2.2.2 Maven 2

The project takes advantage of Maven for package management and building. It has been developed with version 2.0.9 but some earlier and further versions should work just fine.

2.2.3 Spatial Database (Oracle 10g)

Oracle 10g has been used for development, but any spatial database supported by *Geoserver 1.7.x* should work. If you use Oracle, please remember to use the [Oracle NG drivers](#).

At the minimum, the following 2 tables and summary view will need to be created to store the results of the calculations:

```
create table FIGIS.STATISTICAL_TABLE (
  ID number primary key,
  SRC_NAME varchar2(100),
  SRC_CODE varchar2(255),
  TOT_AREA_SRC number,
  TRG_NAME varchar2(100),
  TRG_CODE varchar2(255),
  TOT_AREA_TRG number,
  AREA number,
  OV_SRC number,
  OV_TRG number,
  CONSTRAINT statistical_pk PRIMARY KEY (ID)
) TABLESPACE USERS;

create table FIGIS.SPATIAL_TABLE (
  ID number,
  THE_GEOM MDSYS.SDO_GEOMETRY,
  STATS number UNIQUE,
  CONSTRAINT spatial_pk PRIMARY KEY (ID),
) TABLESPACE USERS;

create view FIGIS.SPATIAL_STATISTICAL (
  ID, SRC_NAME, SRC_CODE, TOT_AREA_SRC,
  TRG_NAME, TRG_CODE, TOT_AREA_TRG, AREA,
  OV_SRC, OV_TRG, THE_GEOM,
  CONSTRAINT pk_spatial_statistical_view PRIMARY KEY (id)
  RELY DISABLE NOVALIDATE
) as
select ST.ID, ST.SRC_NAME, ST.SRC_CODE, ST.TOT_AREA_SRC, ST.TRG_NAME,
  ST.TRG_CODE, ST.TOT_AREA_TRG, ST.AREA, ST.OV_SRC, ST.OV_TRG, SP.THE_GEOM
from FIGIS.STATISTICAL_TABLE ST, FIGIS.SPATIAL_TABLE SP
where ST.ID = SP.STATS with check option;
```

2.2.4 Geotools 2.6

Geotools 2.6 is being used because WFS support is more mature.

..note:: As of Oct 15, 2009 there is a bug in the Geotools WFS module preventing the correct use of the project, it has been documented and the patch and status can be found in the JIRA [GEOT-2756](#), that requires downloading geotool 2.6 sources, applying the patch and installing to the local Maven repo so the IE project can find the updated dependency.

2.2.5 Geoserver 1.7.x

Geoserver is used both to serve the layers that will be used in the calculations, as well as to store the results in the database. The following 2 layers are required:

- `figis:statistical` Mapping to `FIGIS.STATISTICAL_TABLE`
- `figis:spatial` Mapping to `FIGIS.SPATIAL_TABLE`

2.2.6 ServiceMix 3.3

ServiceMix is used as the glue framework for the project, the easiest way to get it running is by using the binary distribution and then navigating to the `geomcompare-jbi` directory and running

```
mvn clean install jbi:projectDeploy
```

It will compile the project and load it in Service Mix, if some other container is used (for example Tomcat) you will have to manually deploy it using the administration console.

2.3 Troubleshooting

2.3.1 No Server running in localhost:8080

Please make sure there is a Geoserver instance up and running either in localhost or the configured location. The library performs the reads and writes using WFS.

2.3.2 No statistics layers

IE needs at least two layers available for writing via WFS: `figis:SPATIAL_TABLE` and `figis:STATISTICAL_TABLE` please refer to the [Geoserver 1.7.x](#) for their structure and other setup instructions.

2.3.3 Geometry not supported when writing to database

When full logging is enabled, Geoserver may fail to write some geometries to the database, more details in [GEOT-2771](#).

INTERSECTIONS ENGINE CORE MODULE

3.1 Algorithm Description

1. The algorithm takes as input two tables with a spatial geometry of type Multi-Polygon
2. The algorithm computes the percentages of the intersections of the source layer with the second one. The quantitative percentages have to be stored on a separate statistical table which does not have any kind of spatial column, while on another table will be stored the resulting intersection polygons. The keys must match of course, and the computation must take in consideration the COASTLINE polygons as mask taken from an other GIS layer outside.

Note:

- The resulting tables must be the same for each computation, a complex key reporting the source layer and the target layer IDs will be used to differentiate the computation records.
- In case a computation is issued again, the old related records must be removed from the table. Other than the final tables must be always consistent, so in order to do that the outcomes must be stored on a temporary table and copied when the computation finishes.
- The source layer and the target layer have to be both masked with the land layer before the computation, in order to take care only of the OCEAN areas.
- The resulting intersections have to be the cartesian product between the source layer polygons and the target layer polygons, basically we have to consider ALL the possible intersections among the target and source layer. As an example if 1 polygon of the source layer intersects 3 polygons of the target layer, we will have 3 records on the resulting statistical table.

3.1.1 STATISTICAL TABLE SCHEMA

Column	Description
ID	Automatically generated
SRC_NAME	Acronym of the source layer
SRC_CODE	Unique Code of the source layer (provided by external param)
TOT_AREA_SRC	Total surface in sqm of the whole src layer polygon
TRG_NAME	Acronym of the target layer
TRG_CODE	Unique Code of the target layer (provided by external param)
TOT_AREA_TRG	Total surface in sqm of the trg layer polygon
AREA	Surface in sqm of the resulting intersection polygon
OV_SRC	Single polygon vs area of source $(AREA/TOT_AREA_SRC) * 100$
OV_TRG	Single polygon vs area of target $(AREA/TOT_AREA_TRG) * 100$

3.1.2 SPATIAL TABLE SCHEMA

Column	Description
ID	Automatically generated
STATISTIC	Foreign Key to statistics table
THE_GEOM	Resulting Geometry

3.1.3 Example

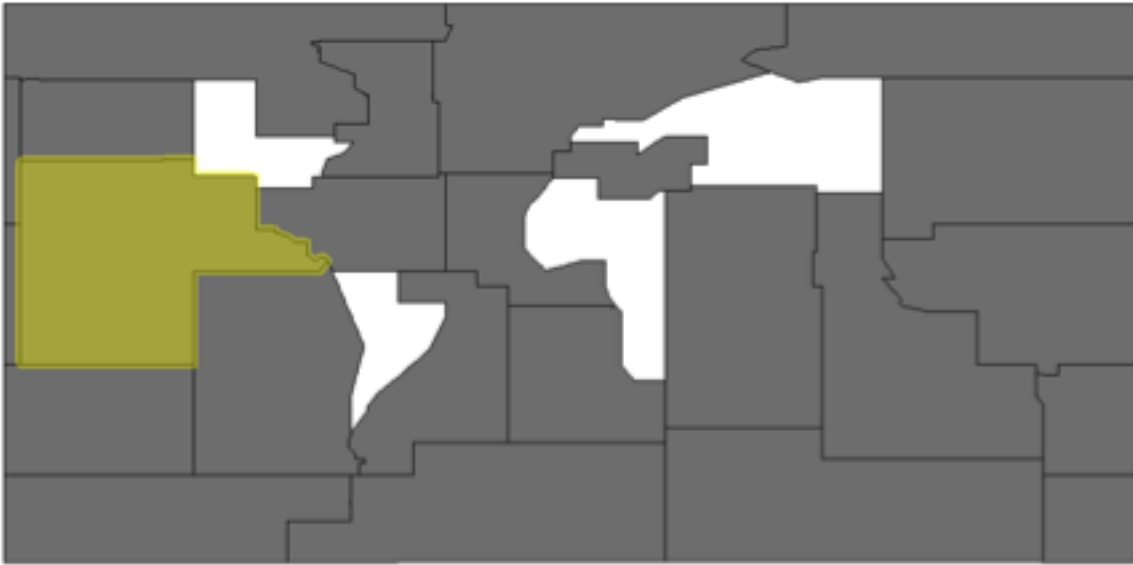
```
src->FAO_MAJOR; trg->NJA
ID: 1
SRC_NAME: FAO_MAJOR
SRC_CODE: 47
TOT_AREA_SRC: 1871,4226412174348
TRG_NAME: NJA
TRG_CODE: -
TOT_AREA_TRG: 37,575021697177185
AREA: 37,575021697177185
OV_SRC: 2,007831949320285027836175296668
OV_TRG: 100,00
```

```
ID: 2
SRC_NAME: FAO_MAJOR
SRC_CODE: 47
TOT_AREA_SRC: 1871,4226412174348
TRG_NAME: NJA
TRG_CODE: -
TOT_AREA_TRG: 78,3211774694
AREA: 78,3211774694
OV_SRC: 4,1851143480047329932696162579744
OV_TRG: 100,00
```

3.1.4 Graphical Overview

Source

FAO_MAJOR



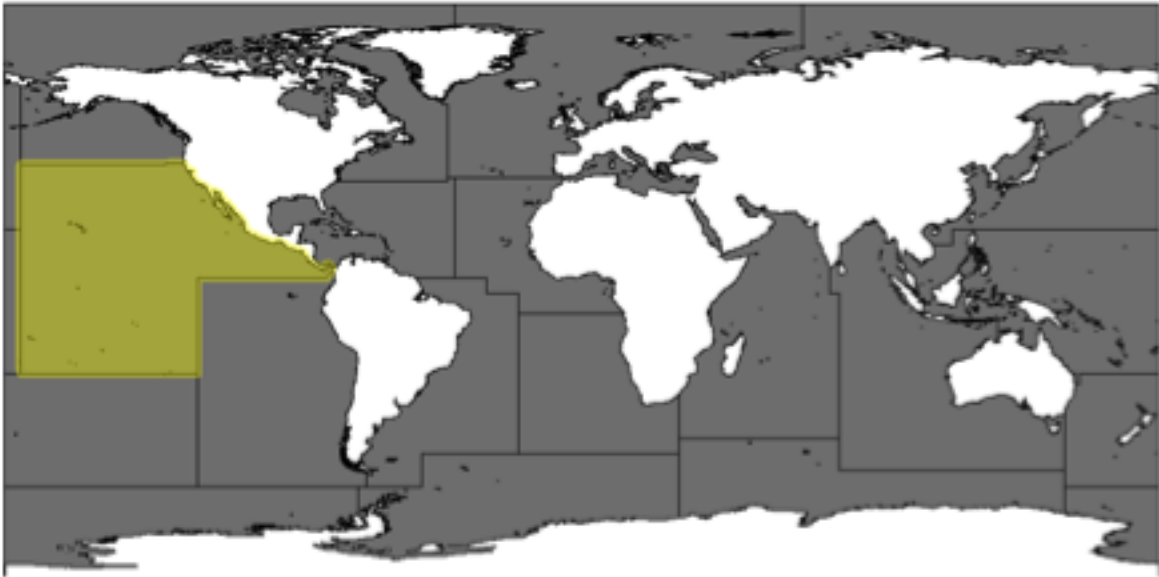
Mask source

UN_CONTINENT



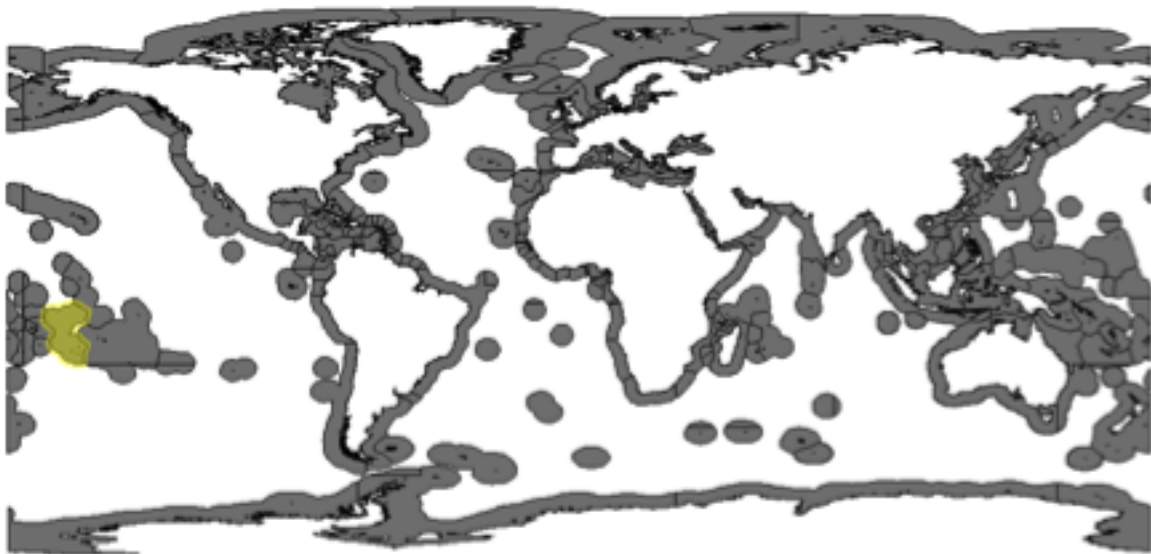
Masked source

FAO_MAJOR minus UN_CONTINENT



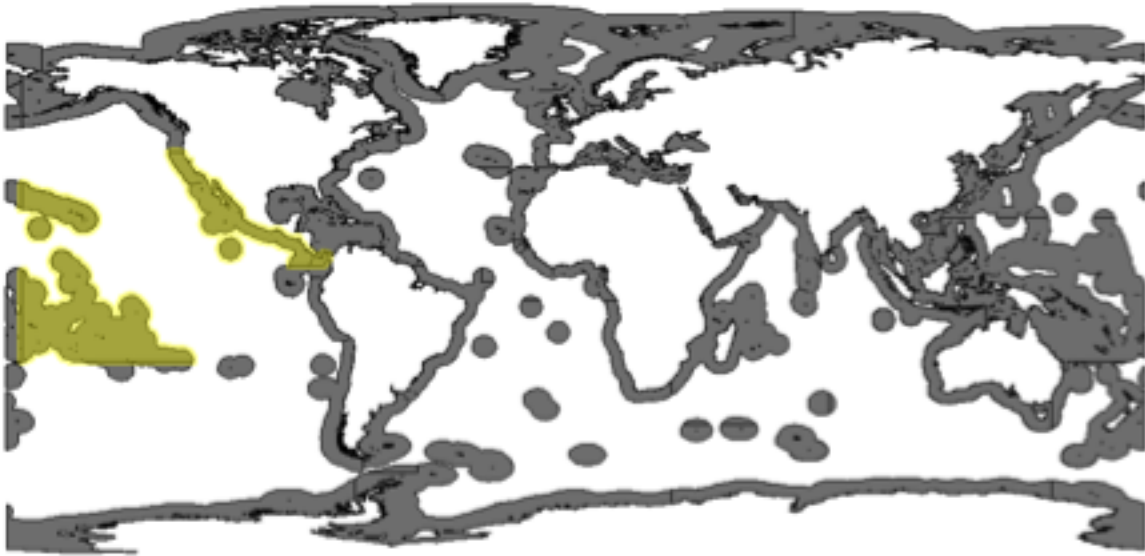
Target

NJA



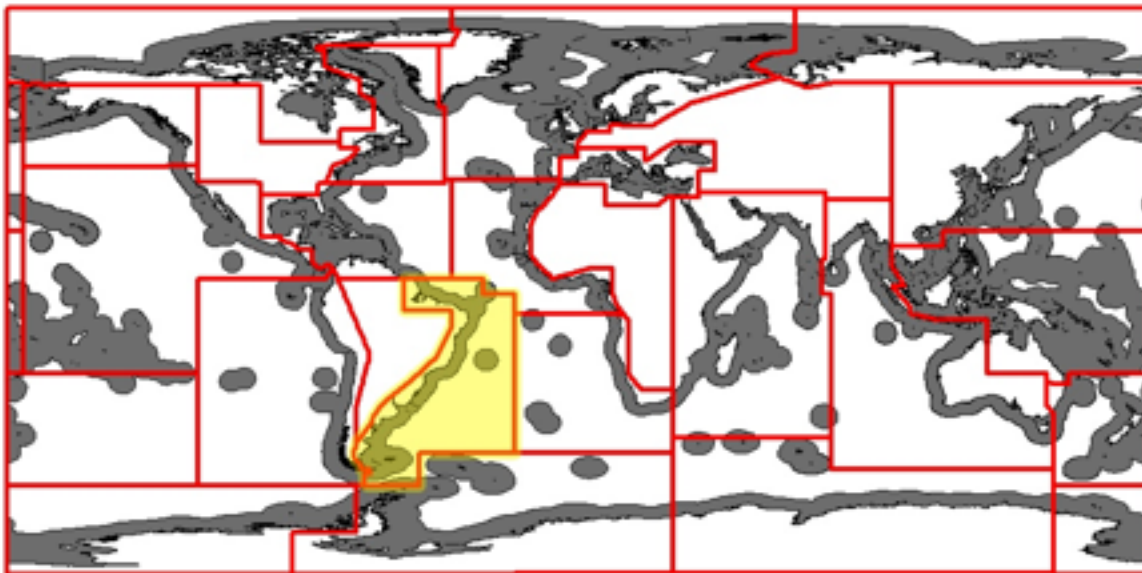
Intersection

Masked FAO_MAJOR intersected with NJA



Result

Nicer image showing final result



SERVICE MIX JBI COMPONENT

The ServiceMix component has the following services:

1. Get combinations
2. Add combination
3. Delete combination
4. Set combination (enable/disable)
5. Get computations
6. Rebuild all

In this chapter, we will describe each of the services, how they are called and what's the output format.

4.1 JSONP Callback

All the services accept and optional *jsoncallback* parameter for JSONP.

4.2 Get Combinations

Returns the list of combinations (source, target, mask, source_code, target_code), each combination is assigned an id which is used for the enable/disable operations.

`http://SERVICEMIX_URL/iedata/?service=getCombinations`

```
(({'status':'DONE', 'service':'getCombinations',  
  'combinations':[{"id":101,"source":"fifao:FAO_DIV",  
                    "status":"ENABLED","target":"fifao:NJA",  
                    "mask":"fifao:COUNTRY_BOUNDARY"}]}))
```

4.3 Add Combination

Adds a new combination, receives the following (non-optional) parameters:

- source
- target

- mask
- source_code
- target_code

```
http://SERVICEMIX_URL/iedata/?service=addCombination&source=fifao%3AFAO_DIV&target=fifao%3ANJA&mask=
```

```
{{'status':'DONE'}}
```

4.4 Delete Combination

Deletes a combination given an id.

```
http://SERVICEMIX_URL/iedata/?service=removeCombination&id=61
```

```
{{'status':'DONE'}}
```

4.5 Enable/Disable Combination

Enables or disables a computation given the id.

```
http://SERVICEMIX_URL/iedata/?service=setCombination&id=61&enabled=true
```

```
{{'status':'DONE'}}
```

4.6 Get all Computations

```
http://SERVICEMIX_URL/iedata/?service=getComputations
```

```
{{'status':'DONE', 'service':'getComputations',  
  'computations': [  
    {"id":3,"duration":0,"status":"COMPLETED",  
     "finished":"2009-11-13T15:26:43.657Z",  
     "started":"2009-11-13T15:24:05.345Z"},  
    {"id":6,"duration":0,"status":"COMPLETED",  
     "finished":"2009-11-13T15:52:11.027Z",  
     "started":"2009-11-13T15:29:05.331Z"},  
    {"id":22,"duration":0,"status":"COMPLETED",  
     "finished":"2009-11-13T17:04:54.304Z",  
     "started":"2009-11-13T16:44:21.182Z"},  
    {"id":43,"duration":0,"status":"COMPLETED",  
     "finished":"2009-11-17T16:54:27.160Z",  
     "started":"2009-11-17T16:52:04.169Z"},  
    {"id":2,"duration":0,"status":"FAILED",  
     "finished":"2009-11-13T15:11:03.720Z",  
     "started":"2009-11-13T15:11:03.486Z"}]}}
```


4.7 Rebuild All

Performs a batch run of all the computations

`http://SERVICEMIX_URL/iedata/?service=rebuildAll`

INTERSECTION ENGINE WEB MODULE

The web interfaces has 2 sections:

- Download Manager
- Admin Console

The first one is accesible by any user, while the Admin Console is only enabled for admin users.

5.1 Download Manager

Contains a grid with all the combinations, for each one there is a plus sign that enables a contextual menu. There, 3 options are presented:

- CSV: Downloads the data in excel format.
- XML: Downloads the raw xml data.
- GML2: Download the data in xml with the geometries.

IEAdmin: Base

Geo Solutions

intersections engine
Admin console

username
password
Remember me ☐
[Login](#)

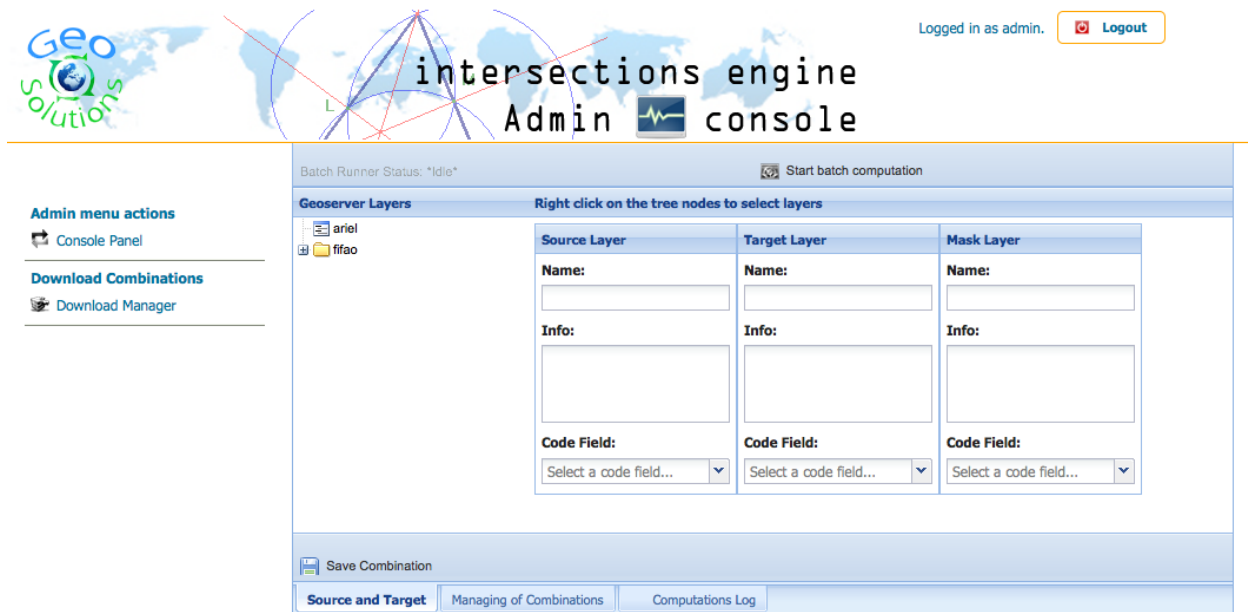
Download data

Id	Source	Source Code	Mask	Target	Target Code	Status
101	fifao:FAO_DIV	fifao:COUNTRY_BC	fifao:NJA			ENABLED

Source: fifao:FAO_DIV
Target: fifao:NJA
Download: [CSV - XML - GML2](#)

[Download Combinations](#)
[Download Manager](#)

5.2 Admin Console



5.2.1 Save Combination

Select Layers

Use the tree on the left with right click to assign the layers

Select Layer Codes

Use the combo box under each layer to select the layer code

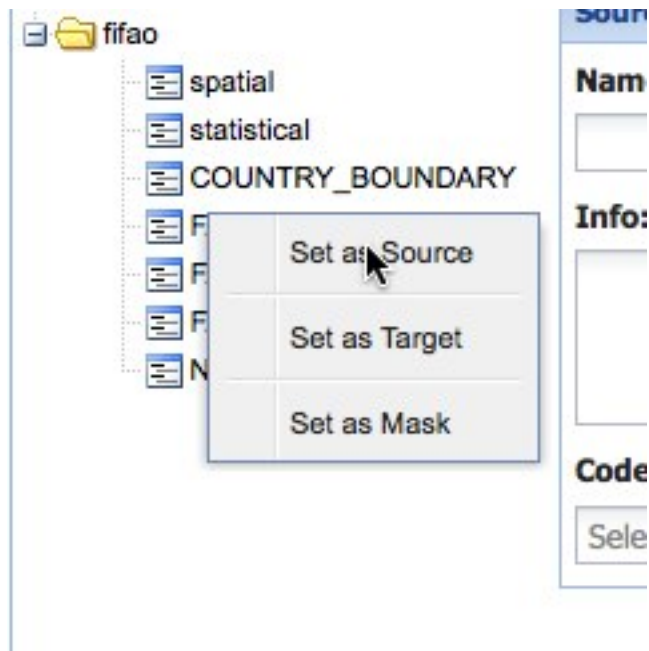
Save

Press the save button

5.2.2 Edit Combination

Delete, Enable or Disable combinations

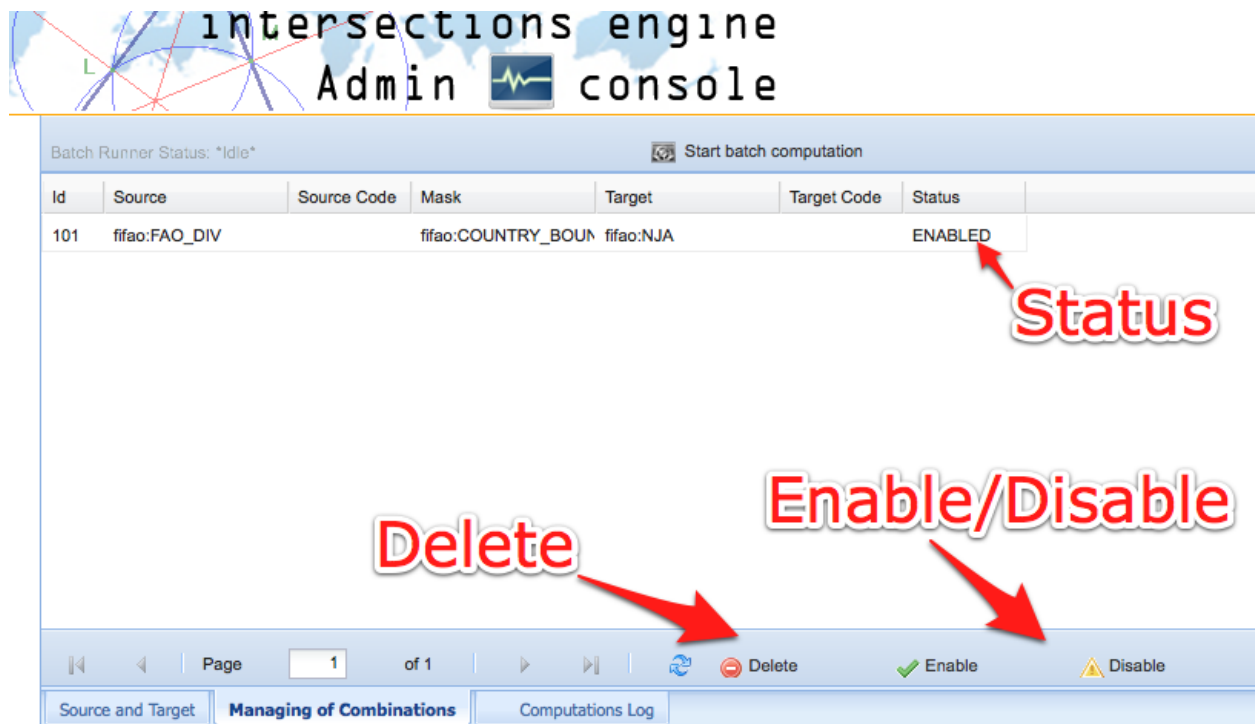
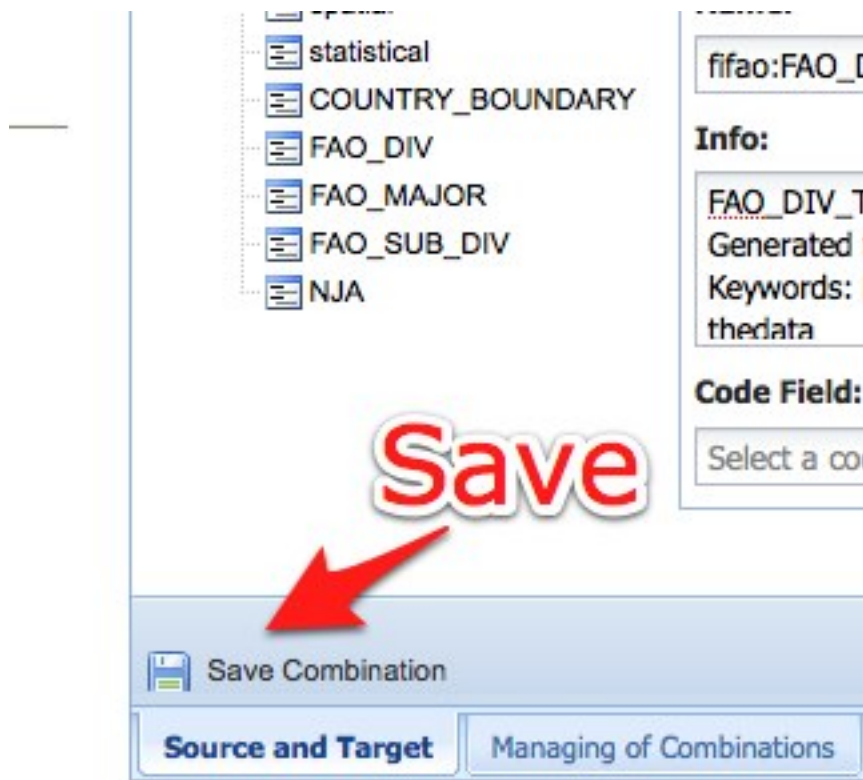
5.2.3 View Computation Log

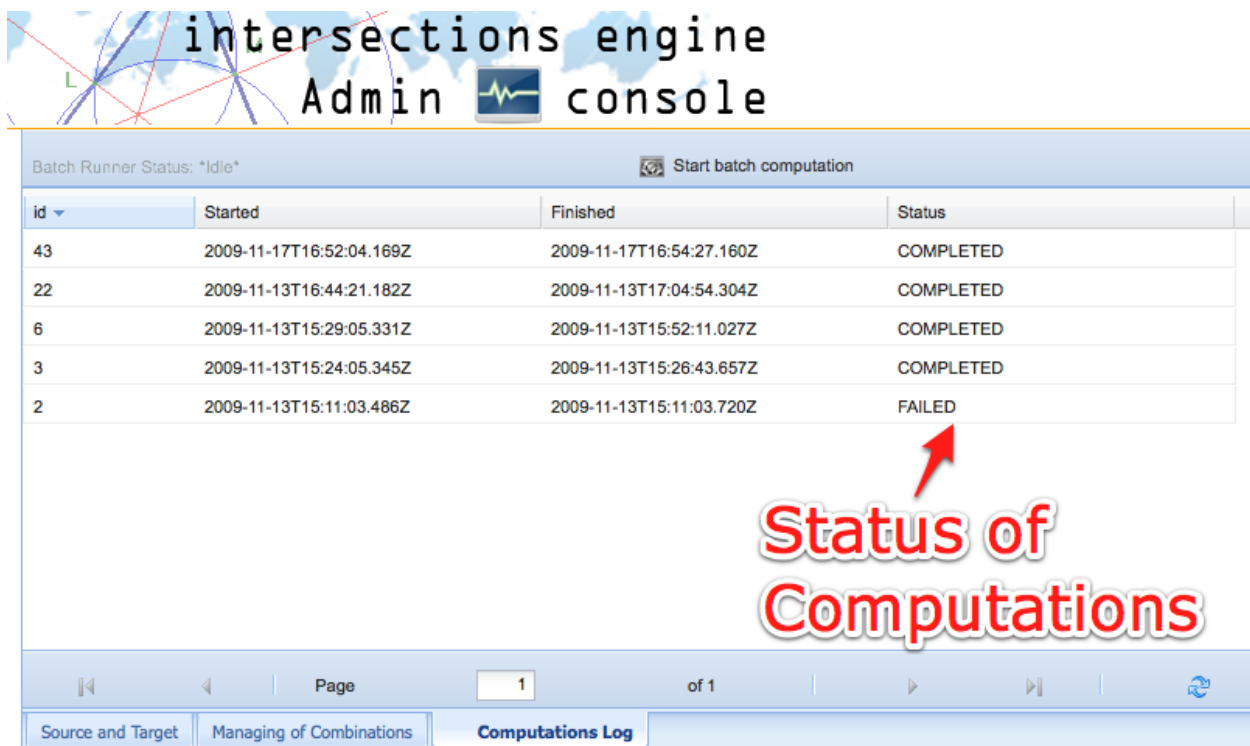


Source Layer	Target Layer	Mask Layer
Name: fifao:FAO_DIV	Name: fifao:NJA	Name: fifao:COUNTRY_BOUNDARY
Info: FAO_DIV_Type Generated from thedata Keywords: FAO_DIV thedata	Info: NJA_Type Generated from thedata Keywords: thedata NJA	Info: COUNTRY_BOUNDARY_T ype Generated from thedata Keywords:
Code Field: Select a code field... ▼	Code Field: ▼ THE_GEOM F_AREA OCEAN EEZ COUNTRY SOVEREIGN REMARKS LAST_CHANG TYPE DISPUTE ISO3 ISO3_TERRI OID_ FMAJOR_COD	Code Field: Select a code field... ▼

Combinations Computations L

Code Field





The screenshot displays the 'intersections engine Admin console' interface. At the top, there is a header with the text 'intersections engine Admin console' and a small icon. Below the header, a status bar indicates 'Batch Runner Status: *Idle*' and a button labeled 'Start batch computation'. The main content area features a table with four columns: 'id', 'Started', 'Finished', and 'Status'. The table contains five rows of data, with the last row showing a 'FAILED' status. A red arrow points from the text 'Status of Computations' to the 'Status' column header. At the bottom, there is a navigation bar with three tabs: 'Source and Target', 'Managing of Combinations', and 'Computations Log' (which is currently selected). The page number '1 of 1' is also visible.

id	Started	Finished	Status
43	2009-11-17T16:52:04.169Z	2009-11-17T16:54:27.160Z	COMPLETED
22	2009-11-13T16:44:21.182Z	2009-11-13T17:04:54.304Z	COMPLETED
6	2009-11-13T15:29:05.331Z	2009-11-13T15:52:11.027Z	COMPLETED
3	2009-11-13T15:24:05.345Z	2009-11-13T15:26:43.657Z	COMPLETED
2	2009-11-13T15:11:03.486Z	2009-11-13T15:11:03.720Z	FAILED

Status of Computations

Page 1 of 1

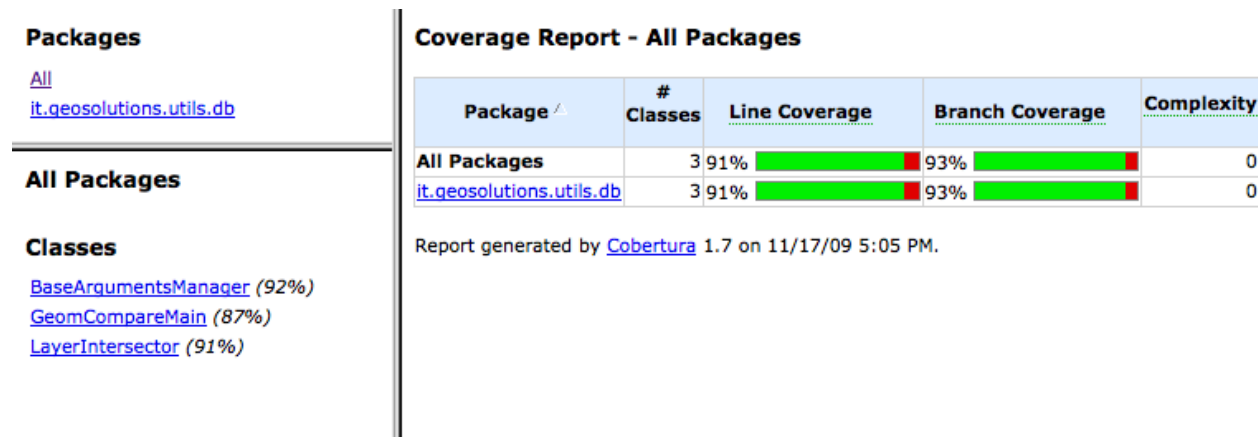
Source and Target | Managing of Combinations | **Computations Log**

EXTRA INFORMATION

6.1 Tests

There are two kinds of tests shipped with the module, JUnit tests for the core engine and Selenium tests for the web interface and api endpoints.

6.2 JUnit Coverage

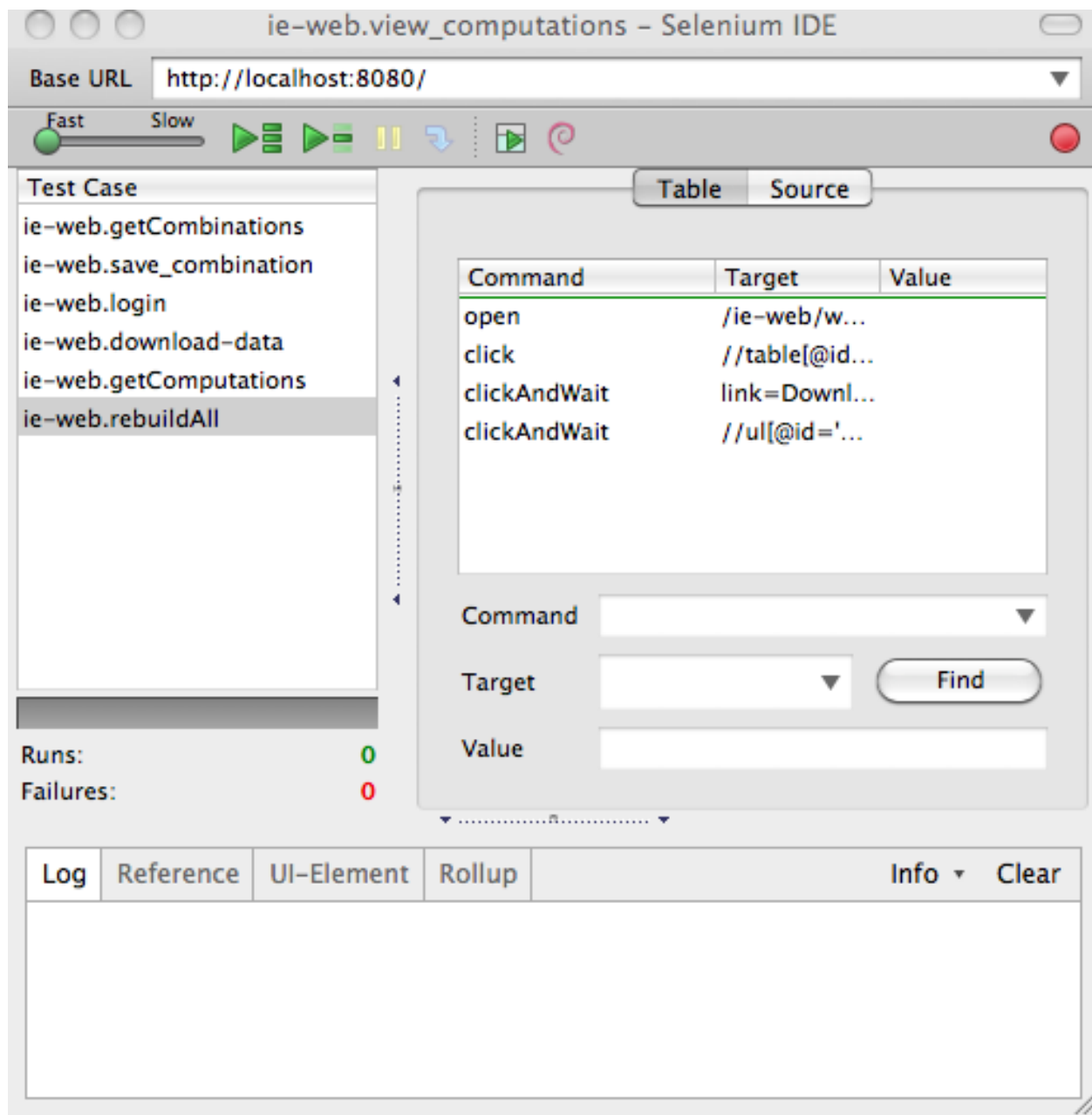


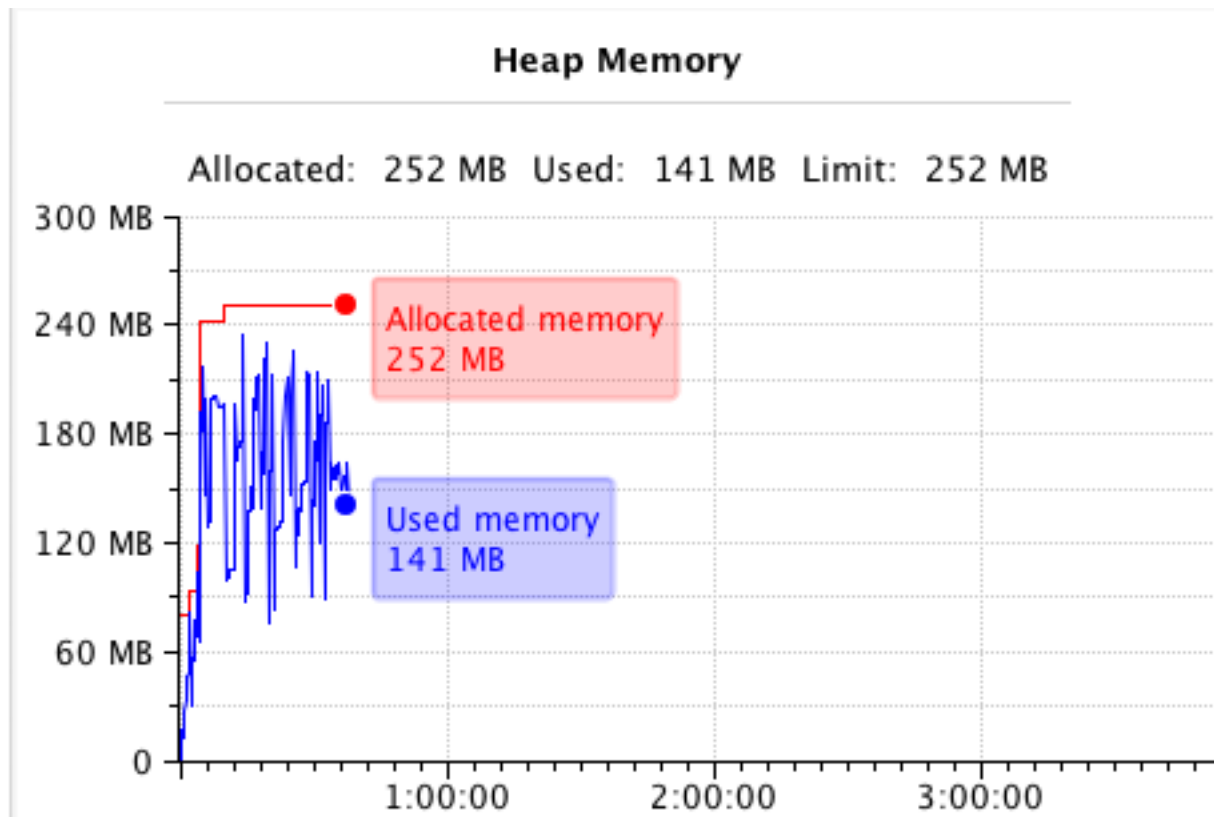
6.3 Selenium Tests

6.4 Memory Consumption

The web server running the computation engine, will need at least 256MB of heap memory.

Here is a sample output of the memory curve for FAO_MAJOR vs NJA masked by UN_CONTINENT it was obtained using the YourKit Java Profiling Platform.





INDICES AND TABLES

- *Index*
- *Module Index*
- *Search Page*