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A9.5-D3: HUMBOLDT Protected Areas scenario Demonstrator final release
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## Introduction

The global perspective of the Protected Areas scenario focuses on the support for integrated management of Nature resources by national and regional bodies, also at a trans-border level. This implies the transformation of geoinformation, managed by park authorities, combining multiple information sources from different governance levels and exploits this newly combined information for the purposes of planning, management and tourism promotion.

The scenario uses data from 3 different countries and from different levels of administration and is mainly based on the transformation of the structure and geometry of datasets of Protected Areas.

The experiences gained in using the HUMBOLDT Framework tools and services in the Protected Areas HUMBOLDT Scenario are documented in the form of training material accessible from the training platform at <http://www.gisig.it/humboldt/training/> .

The Scenario Demonstrator aims to transform the Use Cases defined in the scenario System Specification in Application Cases. These Application Cases are documented examples of the use of the HUMBOLDT tools with real Protected Areas data to solve the harmonisation needs specified in the use cases. The Application Cases are mainly referred to solve harmonisation issues for the integrated management of cross border Protected Areas.

## Use Cases and Harmonisation issues for the Protected Areas Demonstrator

The use cases investigated by the Protected Areas scenario are related to a strategy of which the pursued aims are:

- Creation of a geo-spatial repository where stakeholders contribute and share available geoinformation from any source; final users can browse this information.
- Management (use of geo-information by planners and officers)
- Promotion of its assets for a sustainable use (access to geo-information by citizens in order to receive their useful feedback)

The Protected Areas scenario provide harmonisation support especially for the interaction between the following levels of work and administration:

- Between the protected area management bodies and the various local stakeholders,
- Between national Authorities and the European agencies for reporting
- Between administrative bodies of different Countries (regions) for joint projects and monitoring actions in the case of protected areas crossing the national (regional) borders.

Different use cases have been identified in the specification process of the scenario. This is a brief description of some of them:

- Management of a Protected Area

This use case refers to the management of the area. Users of geographic information are planners and officers, but the management of a Protected Area is a decision maker's

responsibility; in general, all of them are professional users at different levels, mutually exchanging information. The objective is to embed geographic information in a seamless flow that gathers information from all available sources and exploits it for planning and management. The main task is to create plans and managing the protected area.

- Tourism valorisation in a Protected Area

This use case refers to the promotion of the area and implies access to geographic information especially by citizens and commercial operators who are also final users looking for browsing tourism information. The objective is to embed geographic information in a seamless flow that gathers information from all available sources and exploits it for promotion. The main task is to exploit at the best the area and enjoy its offer of nature.

The scenario counts on a good and representative catalogue of datasets to enable understanding of harmonisation issues and the use of the HUMBOLDT tools, as well as the need of using and integrating several data layers.

A number of interoperability and data harmonisation issues are addressed within the Scenario. The following data harmonisation requirements have been identified for the different Protected Areas use cases:

- Data formats: There's a need for the creation-modification of Web Services (WMS, WFS) with standardized syntax
- Spatial reference systems: There's a need for a common reference system.
- Metadata Profile: Different metadata profile had been identified for the data made available for the scenario.
- Conceptual schemas (data models): Since the data structure for the datasets object of study in our scenario is different, there's the need for the creation of a Common Protected Areas Target data model for heterogeneous data from different protected areas data providers. The used approach is to be as much as possible compliant with the recent Protected Sites INSPIRE data model
- Classification schemes: Datasets have been created on different classification schemes
- Scale / resolution: It is important to be able to deal with de different planning and management levels
- Spatial consistency of data: The geometry of real-world objects must be consistent between different datasets.
- Multiple representation of the 'same' spatial objects

The Main Harmonisation issues of the scenario that had been investigated and documented in the Demonstrator Application cases are mapping of different schemas and transformation of the structure and geometry of datasets of Protected Areas.

## The Scenario Demonstrator as Training Material

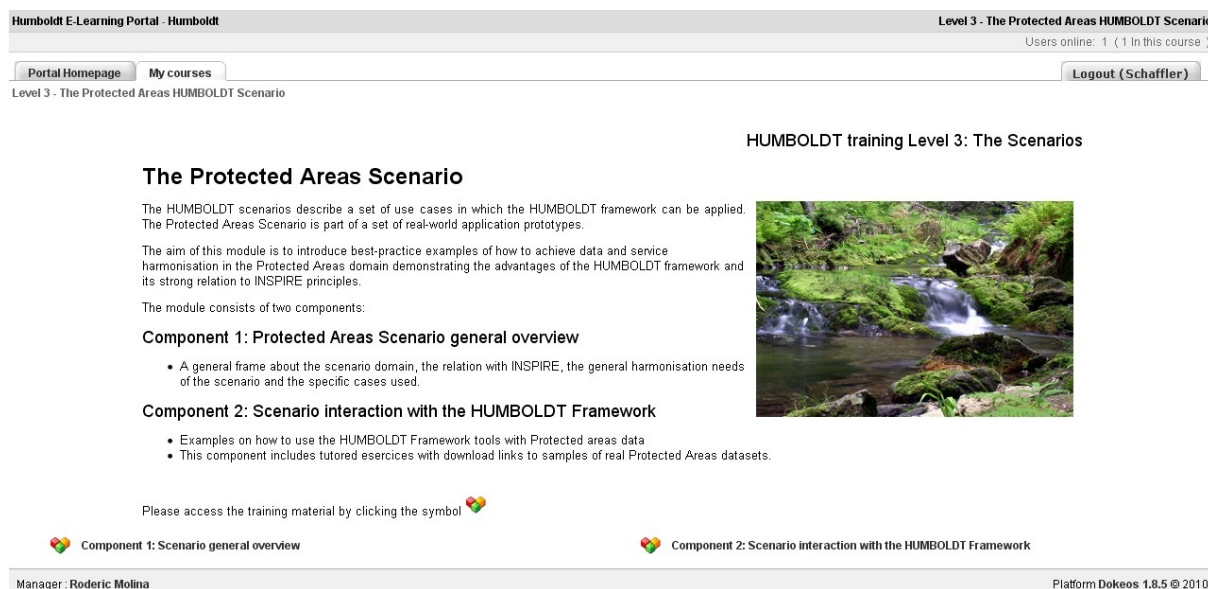
The Scenario Training Module is the main point of access to the description and the demonstration of the various examples of the use of the HUMBOLDT tools with Protected Areas data sets, and is

available from the HUMBOLDT Training Platform after subscription to the Level 3 “The HUMBOLDT Scenarios” Protected Areas training module.

The aim of this training module is to introduce good-practice examples of how to achieve data and service harmonisation in the Protected Areas domain demonstrating the advantages of the HUMBOLDT framework and its strong relation to INSPIRE principles.

The training material of the scenario is organized in two Components:

- Component 1 “Protected Areas Scenario general overview”: Giving a general frame about the scenario domain and the learning objectives, the relation with INSPIRE, the general harmonisation needs and the specific cases and data used.
- Component 2 “Protected Areas Scenario interaction with the HUMBOLDT Framework”: Divided in Application Cases and giving implementation examples using one or various tools of the Framework for the scenario. Application Cases are designed in a training prospective, giving an understandable example for the final users on the use of the HUMBOLDT tools in the Protected Areas domain offering material formatted as tutored step by step Harmonisation processes or screencast videos of the key steps of the process.



**HUMBOLDT training Level 3: The Scenarios**

### The Protected Areas Scenario

The HUMBOLDT scenarios describe a set of use cases in which the HUMBOLDT framework can be applied. The Protected Areas Scenario is part of a set of real-world application prototypes.

The aim of this module is to introduce best-practice examples of how to achieve data and service harmonisation in the Protected Areas domain demonstrating the advantages of the HUMBOLDT framework and its strong relation to INSPIRE principles.


The module consists of two components:



**Component 1: Protected Areas Scenario general overview**

- A general frame about the scenario domain, the relation with INSPIRE, the general harmonisation needs of the scenario and the specific cases used.

**Component 2: Scenario interaction with the HUMBOLDT Framework**

- Examples on how to use the HUMBOLDT Framework tools with Protected areas data
- This component includes tutored exercises with download links to samples of real Protected Areas datasets.

Please access the training material by clicking the symbol 

 **Component 1: Scenario general overview**       **Component 2: Scenario interaction with the HUMBOLDT Framework**

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### *Description of the Protected Areas module in the HUMBOLDT Training Platform*

## **Component 1: Protected Areas Scenario general overview**

This training Component introduces the concept and different classification of Protected Areas.

The text provides information on the different directives and networks involved in the nature protection domain (Birds, Habitats and Natura 2000 network) giving special attention to the relation between Protected Areas and INSPIRE.

The main scenario actors and use cases are introduced as well as the main harmonisation issues identified. The component also gives to the final user information on the datasets used for the scenario and the creation of a data model for Protected Areas data based on the INSPIRE specifications.

## Component 2: Protected Areas Scenario interaction with the HUMBOLDT Framework

The Component 2 of this training module is based on 2 Application Cases (or good-practice examples) focused on schema mapping and transformation of the structure and geometry of datasets of Protected Areas.

These Application Cases are documented examples of the use of the HUMBOLDT tools with real Protected Areas data to solve the harmonisation needs specified in the scenario use cases.

Application Cases developed in the Scenario training Module:

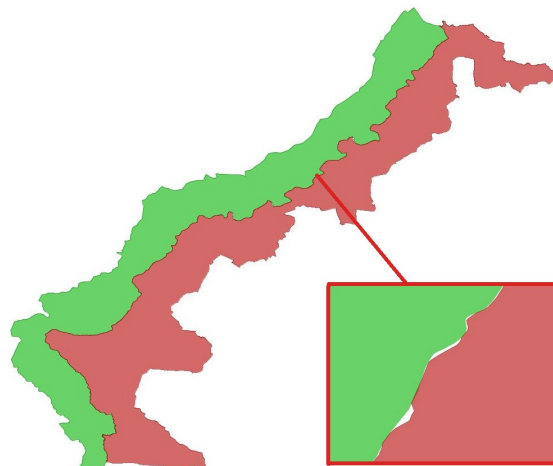
- Harmonizing Protected Areas data using the HUMBOLDT Coordinate Transformation Service (CTS) and Edge Matching Service (EMS).
- Harmonizing Protected Areas data using the HUMBOLDT Alignment Editor (HALE)

Application cases have been developed as support products for users wishing to use the harmonization tools in specific situations and thus makes a distinction of types of users participating in the process. For this Application Cases we can distinguish between:

1. Data Integrators: Represented by a programmers and IT experts responsible for maintaining the IT-infrastructure (for instance, a technician in a Protected Areas management agency). This actor has to download and deploy the HUMBOLDT components (in this case EMS and CTS) needed and is responsible of the infrastructure preparation. In this case that means setting up the server environment and the Web Processing Services client
2. End User: This actor could be a regional officer at the Territorial Planning Department that needs to prepare the datasets to be published in the web portal. In this case this actor will use the EMS and CTS for transforming the datasets to a common SRS, cleaning and aligning the geometries. This user is therefore responsible of the data processing: Coordinate Transformation, Data Cleaning and Coverage Alignment.

The first Application Case “Harmonizing Protected Areas data sets using the HUMBOLDT Coordinate Transformation Service and Edge Matching Service” is referred to solve harmonisation issues for the integrated management of cross border Protected Areas and the intention is to show understandable documentation for the use of some HUMBOLDT Components in a training prospective

The application case exposes the context, the problem and, of course, the solution/tools applied.



*The Edge Matching application case is implemented in the Douro/Duero river Transboundary Catchment between Portugal and Spain.*

The area covered has a protected status: the International Douro Natural Park on the Portuguese side (left) and los Arribes del Duero Natural Park on the Spanish bank.

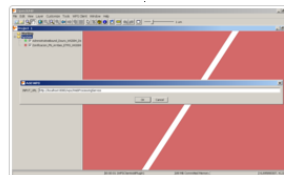
The harmonisation requirements to cover are: Coordinates transformation, Data Cleaning and Spatial Consistency.

The related INSPIRE requirements to cover are : Common CRS and Management of connections at international boundaries

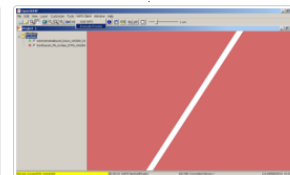
The Edge Matching application case also provides the visualisation of scenario web services and the possibility to compare the original data with those harmonised using the HUMBOLDT tools.

**Step 6:** Enter the URL to your WPS service. In this case, <http://localhost:8080/wps/WebProcessingService>. Press OK.

**Step 7:** Check that that the service has successfully been connected (bottom left) and execute the WPS (Click WPS Client --> Execute Process).



Step 6 ↗

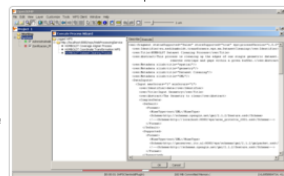


Step 7 ↗

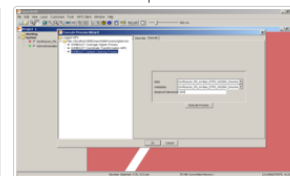
**Step 8:** Using the Edge Matching Service. After click Execute Process a window with the processes provided by the service appears. Choose the HUMBOLDT Dataset Cleaning Process. This process will remove the gaps and overlaps in the dataset. The Describe Tab is describing the process, i.e. DescribeProcess (OGC). Please read it.

**Step 9:** Press the Execute tab. Choose what dataset to clean and fill in the maximum distance of two edges to be matched:

- data= the geometry to clean,
- metadata= metadata document related to the dataset to be aligned,
- distanceTolerance= maximum distance of two edges to be matched.



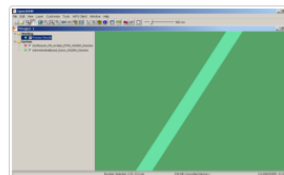
Step 8 ↗



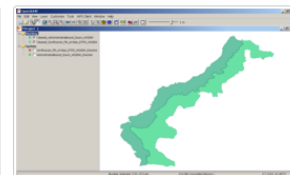
Step 9 ↗

**Step 10:** Results of Clean Dataset. The gaps and overlaps are removed. The result layer "Process Results" overlays the protected area layer (becomes more visible when the original layer is deactivated). If wanted, change name by double clicking the layer name.

**Step 11:** Perform the cleaning process for the other dataset and check the results.

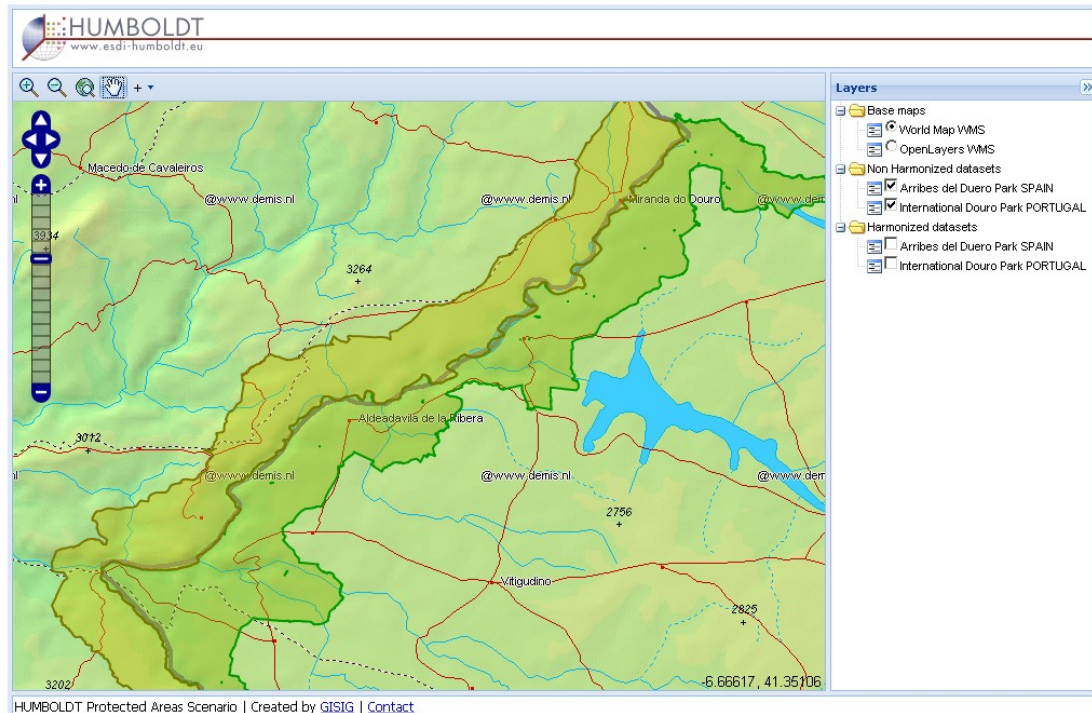


Step 10 ↗



Step 11 ↗

*Description of the steps to perform the Data Cleaning process in the Edge Matching Application Case*



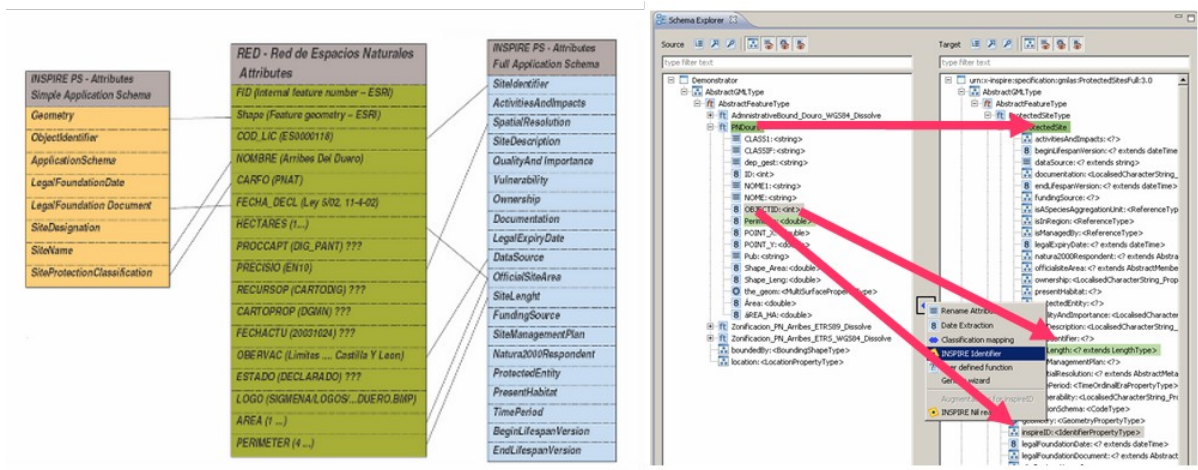
*Visualisation of the “before and after” harmonisation datasets in the HUMBOLDT Edge Matching Service Application Case*

The second Application Case, “Harmonizing Protected Areas data using the HUMBOLDT Alignment Editor” is divided in three different examples based on Protected Areas datasets from Italy, Spain and Portugal. This Application case has a focus on INSPIRE data provision, that is the creation of a new data structure for protected areas datasets based on the INSPIRE schema for Protected Sites. But an example shows also a schema harmonisation case using the data model created in the scenario.

Tests developed:

- Alignment between an Italian Protected Areas dataset and the INSPIRE Protected Sites schema.
- Alignment between a Portuguese Protected Areas dataset and the INSPIRE Protected Sites schema.
- Alignment between a Spanish Protected Areas dataset and the HUMBOLDT Protected Areas schema (The data model developed in the scenario)

All these tests are made in collaboration with data providers and modelling experts.



**Matching table and alignment using HALE between a Protected Areas scenario dataset and the INSPIRE schema for Protected Sites**

The tests are designed as tutored step-by-step test examples on how to use the HALE tool covering different aspects and functions in terms of data import and attribute transformation options. All of them are real examples of schema transformation using as target the Inspire Protected Sites Full application schema and the Protected Areas HUMBOLDT schema.

**Attribute transformations**

Now we will follow our matching table mappings and apply the transformations in the schema explorer selecting the appropriate mapping function.

**Protected Areas Name**

For the source attribute "NOME\_SITO", we identified in the Inspire schema the "SiteName" target attribute so we will use the specific "Inspire Geographic Name" function for this transformation.

The name attribute in the ProtectedSite class uses the GeographicalName data type from the INSPIRE Geographical Names Data Specification. This data type includes a number of attributes that specify the language and pronunciation of the name. Let's select both attributes, click the central arrow, run the "Inspire Geographic Name" function and fill in the correct values.

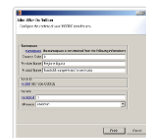


HALE's "Inspire Geographic Name" function

**Protected Areas Identifier**

In the INSPIRE schema, "InspireID" corresponds to an external object identifier published by the responsible body, which may be used by external applications to reference the spatial object.

In this case we have identified in our source data the attribute "CODICE" that we will map to the "InspireID" attribute in the target model. For this transformation we will use the specific HALE "INSPIRE Identifier Function" that enables you to create a IdentifierPropertyType easily. Doing this, HALE will make sure your ID is INSPIRE-compliant. Let's select both attributes, click the central arrow, run the "Inspire Identifier" function and fill in the correct values.



HALE's "Inspire Identifier" function

**The Data Perspective**

Let's control our transformation status now for one selected area in the map view (highlighted in red). Until now we had renamed the geometry (that was automatically transformed), the protected area name and identifier attributes.

You can verify directly within HALE the results of your mappings: The features in the "Transformed Data" view are already transformed using the alignment mapping. By expanding the attributes (click on the arrow on the left of an attribute), you can view what value HALE assigns to them.



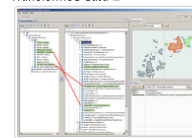
Transformed data

**Other attribute transformations**

We continue the mapping with the other attributes in our matching table using the "Rename Attribute" function.

- Rename Source "SUP\_MGE\_HA" to Target "officialsiteArea"
- Rename Source "PERIMETER" to Target "siteLength"

To use the Attribute Rename function, click on the attribute in the source schema you'd like to rename, then select the element in the target schema that the attribute should be copied to.



Transformed data

**Adding attributes**

Now, to create a "compliant" dataset we need to insert some values (common for all fields) to some attributes that are mandatory in the "Simple application schema" attribute subset of the Inspire schema. Read carefully the Protected Sites data Specification to have more information on this.

So we use the "Attribute Default Value" function to fill some mandatory fields with no data in the source.



Attribute default value

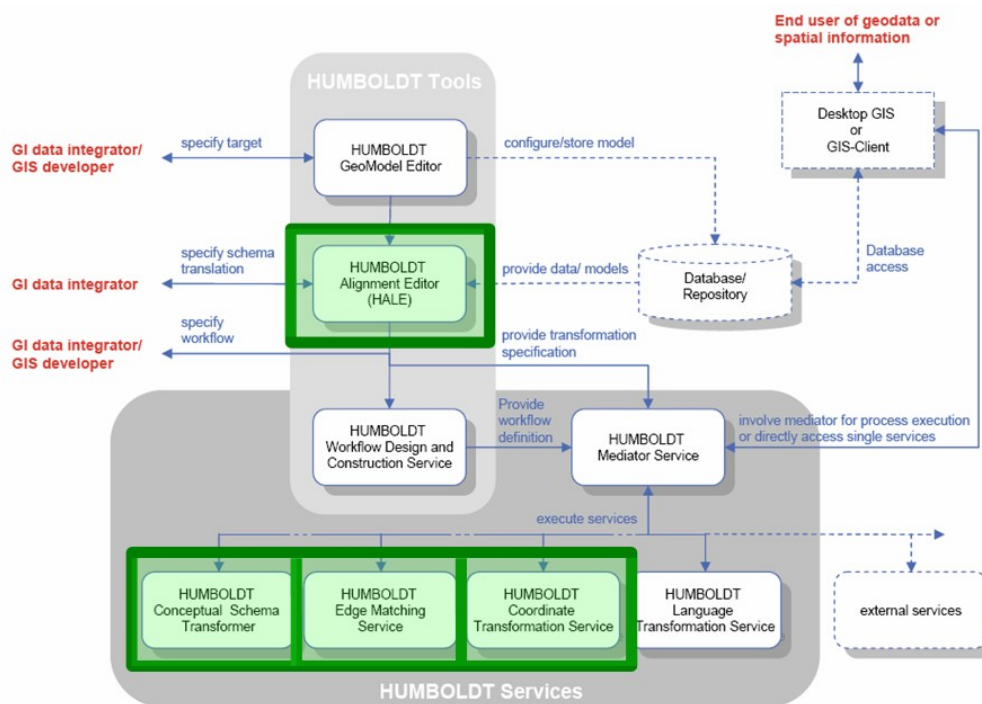
**Step-by step alignment process using HALE as described in the training documentation**

## System Architecture

The following HUMBOLDT Framework components had been used and tested within the Protected Areas Scenario:

- HUMBOLDT Alignment Editor (HALE): to describe the matching between source and target schemas
- Conceptual Schema Translation Service (CST): to perform the schema transformation (based on the file created using HALE)
- HUMBOLDT processing components: Coordinate Transformation Service and the Edge Matching Service (EMS)

All the operations have been done using Opensource tools: From the pre-processing of the data sets to the visualisation of final results.



*HUMBOLDT Tools and Components used and tested in the Protected Areas scenario*