Pipelines for semantic annotation and FAIR data production

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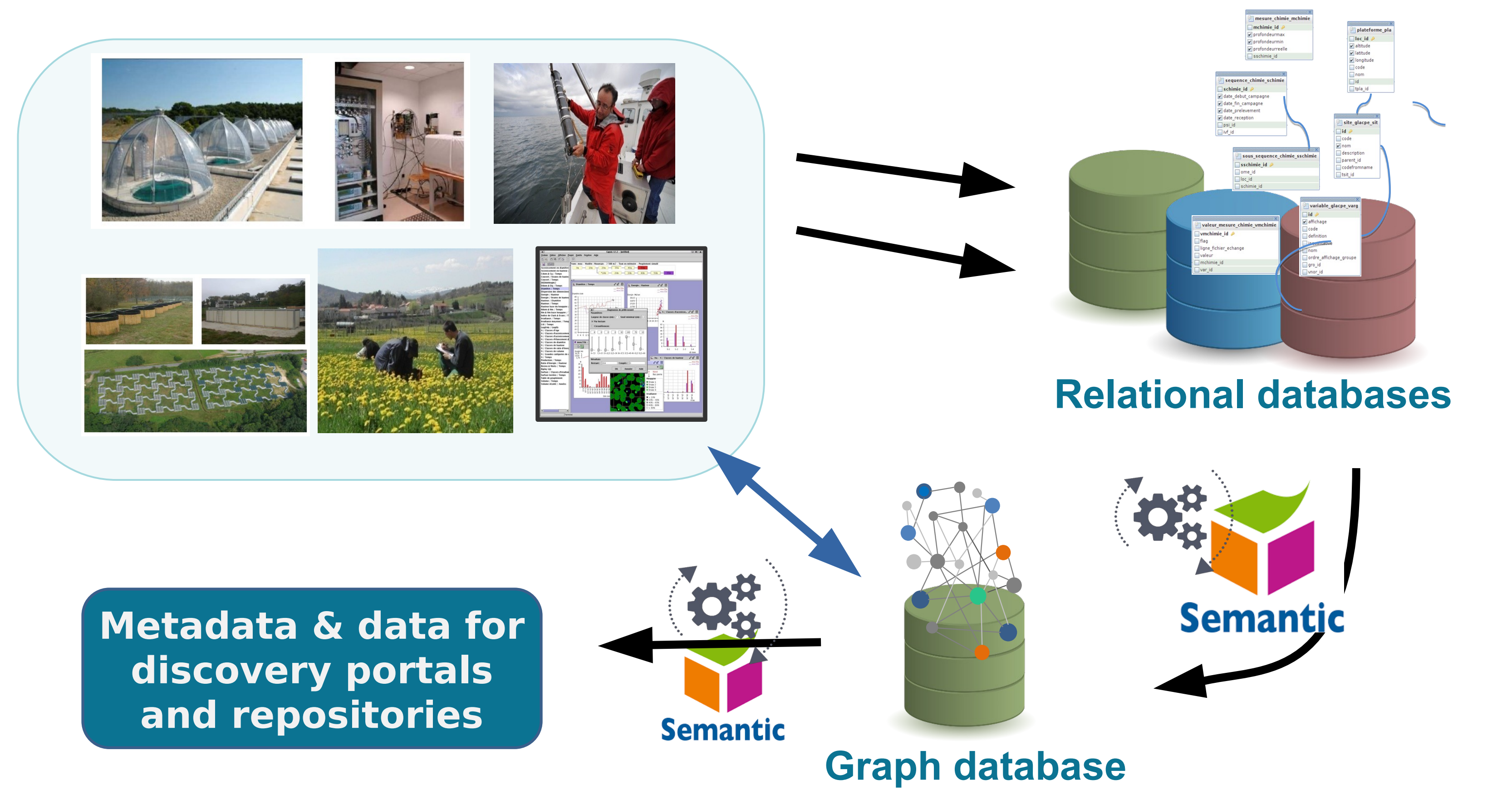
Context and objective

The AnaEE (Analysis and Experimentation on Ecosystems) Research Infrastructure offers experimental facilities for studying ecosystems and biodiversity. The data generated by the AnaEE platforms are most often managed in relational database.

A distributed Information System (IS) is developed, based on semantic interoperability of its components and using common vocabularies (AnaeeThes thesaurus and OBOE-based ontology). Discovery and access portals are fed by information (rdf triples) produced by the semantic annotation of the resources that also generate metadata and datasets.

Two pipelines are developed for facilitating the semantic annotation and exploitation processes which may represent a huge conceptual and practical work.

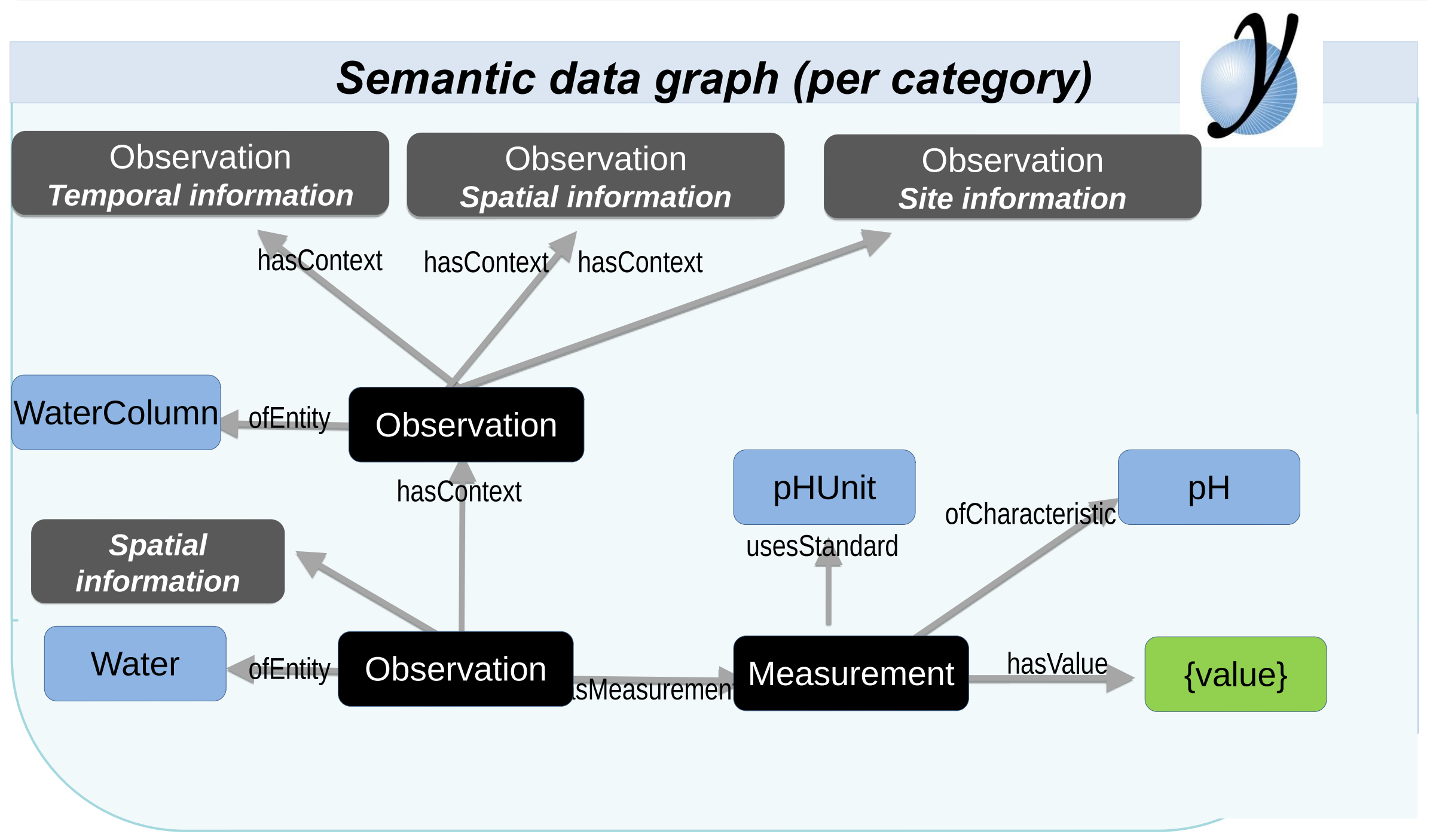

Experimental, analytical and modelling platforms
Relational databases
Semantic
Graph database
Semantic
Metadata & data for discovery portals and repositories

Semantic data generation from a pipeline for database annotation

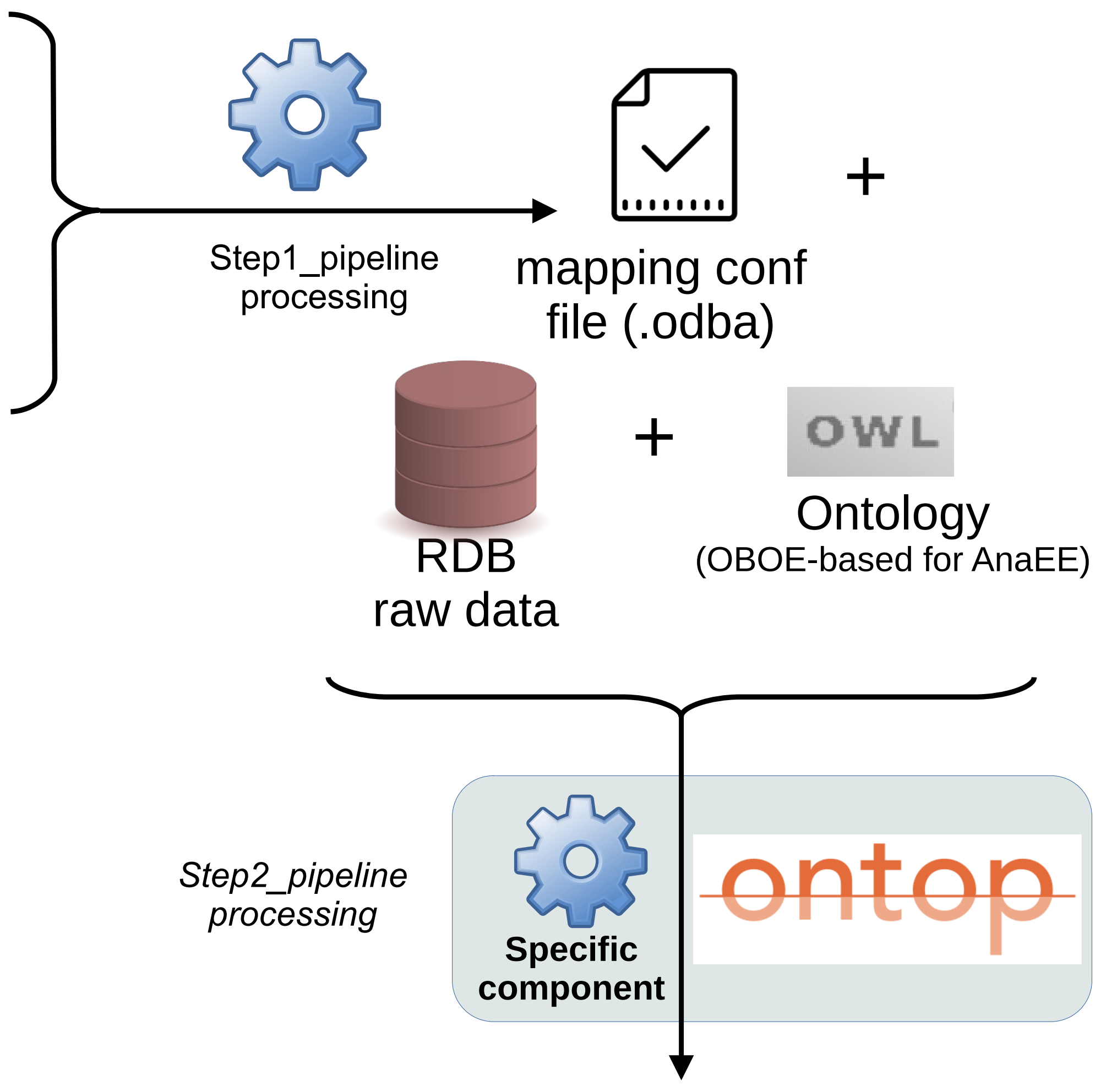
Variable semantic description

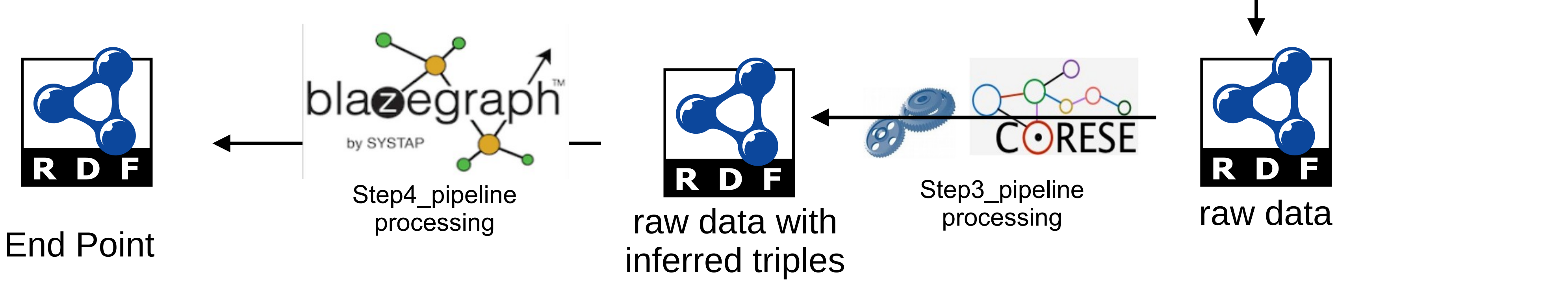
AnaEE standard	Category	Context	Entity	Characteristic	Unit
Phytoplankton	Biodiversity	Water	Phytoplankton	Volume Per Volume	MicroMeterCubed Per Millimeter
WaterPH	Physical Chemistry	Water Column	Water	pH	pHUnit
...	...	...	...	...	...

Semantic data graph (per category)



← A **csv input file** describes the main characteristics of the variables submitted for semantic annotation, allowing to parametrize generic semantic graphs (Yed* format).


Step1_pipeline processing
mapping conf file (.odba)
+
RDB raw data
+
OWL
Ontology (OBOE-based for AnaEE)
Step2_pipeline processing
Specific component
ontop


RDF
End Point
blazegraph by SYSTAP
Step4_pipeline processing
RDF
raw data with inferred triples
CORESE
Step3_pipeline processing
RDF
raw data

The **annotation pipeline**** can be used in different contexts of ontologies and databases.

It includes shell scripts and specific java developments and requires the Yed, Ontop, Corese and Blazegraph softwares. It is deployed as a classical scripted application or as a dockerised one.

The annotation pipeline consists in 4 steps:

1. generation of the mapping files to be used by Ontop*** (database connexion parameters, sets of sql queries and of the corresponding triples)
2. production of the initial triples (ttl files) by a specific program and Ontop tool.
3. production of inferred triples by Corese**** from the ontology rules
4. uploading of the ttl files within the Blazegraph***** software and initialisation of the end point

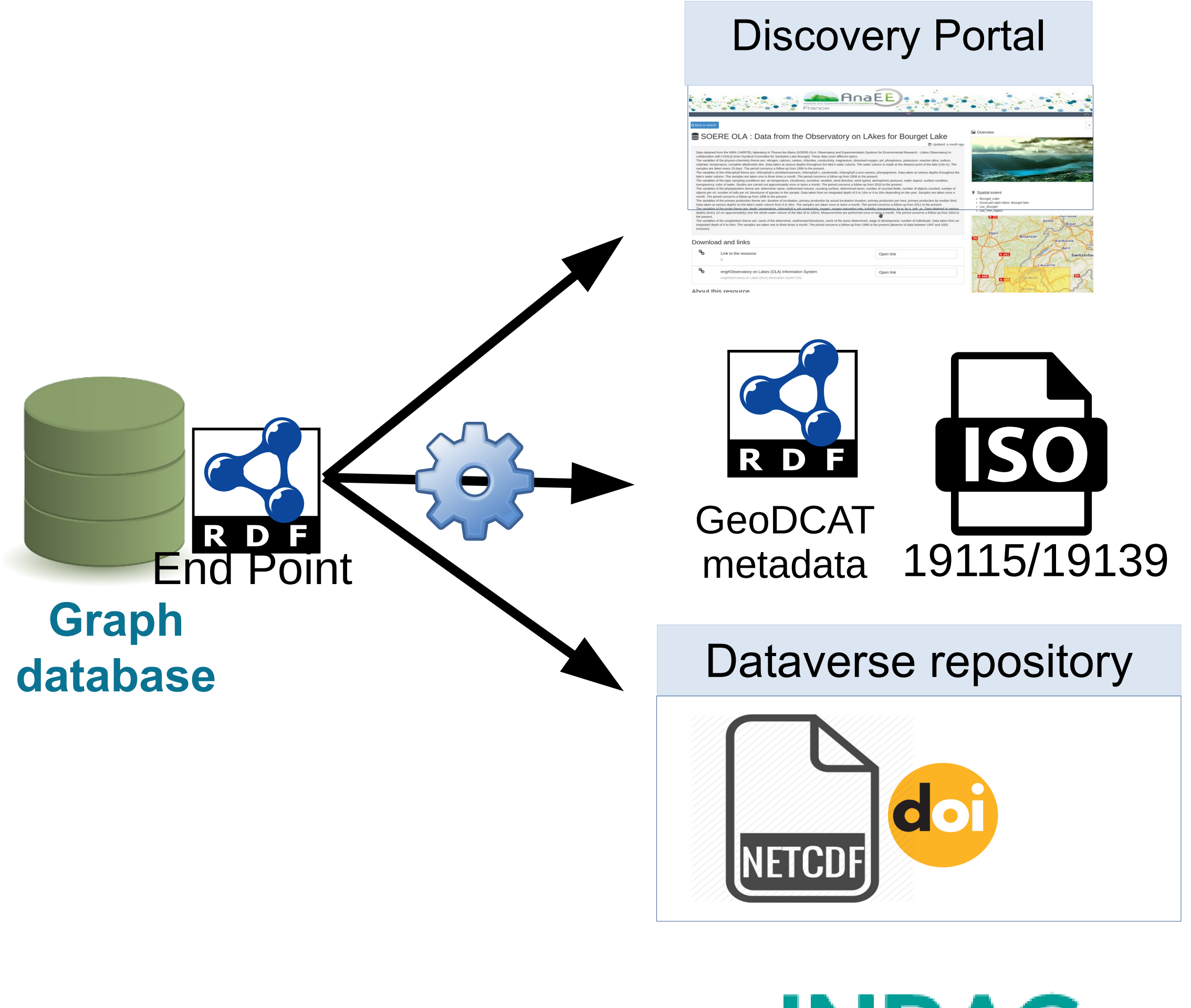
Current developments will allow data annotation from several relational database software (PostgreSQL, MySQL, …) and csv flat files.

*https://www.yworks.com/products/yed
**https://forgemia.inra.fr/anaee-dev/coby
***Diego Calvanese, Benjamin Cogrel, Sarah Komla-Ebri, Roman Kontchakov, Davide Lanti, Martin Rezk, Mariano Rodriguez-Muro, and Guohui Xiao. Ontop: Answering SPARQL Queries over Relational Databases. In: Semantic Web Journal 8.3 (2017), pp. 471–487.
****http://wimmics.inria.fr/corese
*****https://wiki.blazegraph.com/wiki/index.php/Main_Page

Semantic data exploitation by a pipeline for metadata and datasets generation

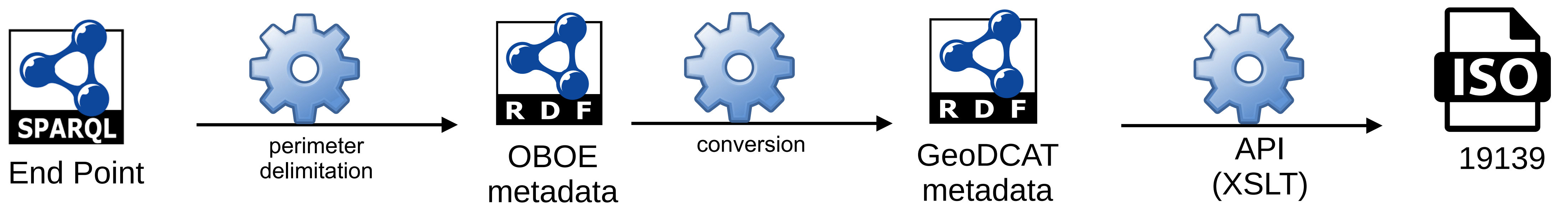
Outputs of the annotation pipeline are used by an **exploitation pipeline*** for:

1. generation (through a SPARQL query on raw data) of synthetic data that feeds the discovery portal,
2. generation of standardised GeoDCAT and ISO19115/19139 metadata records,
3. generation of data file (NetCDF as first format) from selected perimeters (e.g years, experimental sites , variable categories..). In that case, the annotation pipeline is launched using a dedicated webservice.



Metadata and data products are transferred to a Dataverse repository

* https://forgemia.inra.fr/anaee-dev/semdata


SPARQL
End Point
perimeter delimitation
RDF
OBOE metadata
conversion
RDF
GeoDCAT metadata
API (XSLT)
ISO
19139