R_2O/ODEMapster Engine and Linked data Web service

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WWW09 - Madrid, Spain

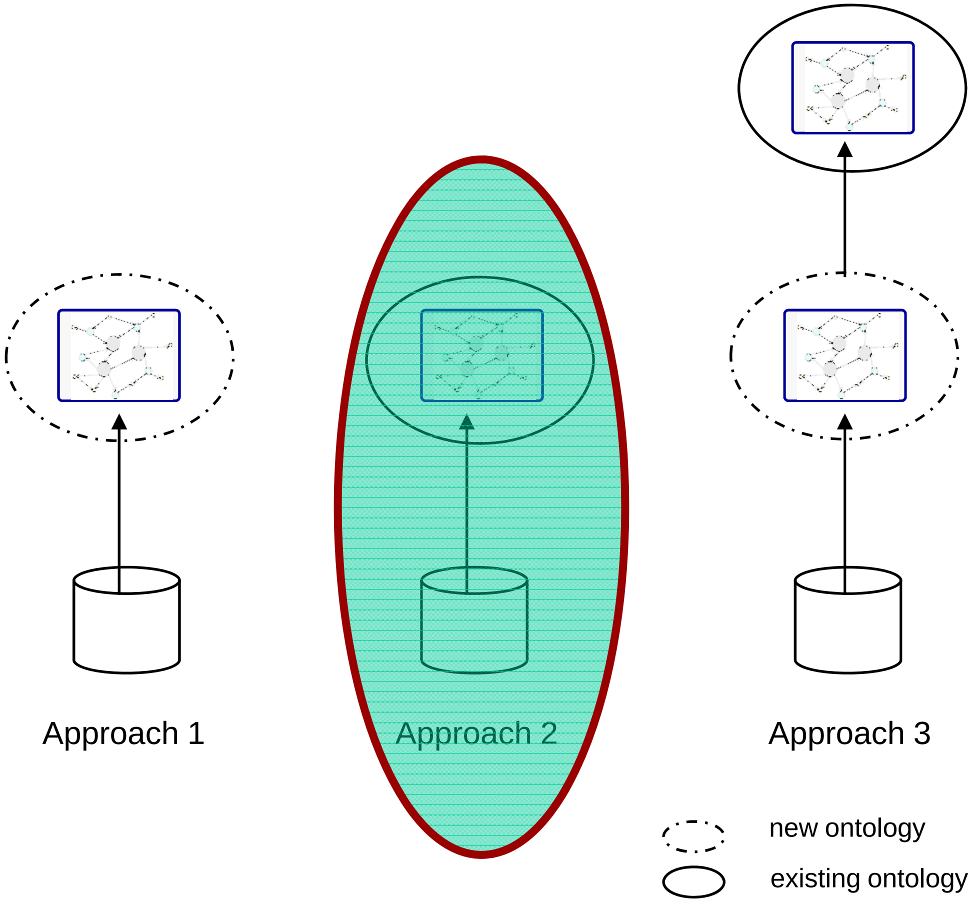
Speaker: Carlos Buil-Aranda

Date: 24/04/2009

ToC

- Introduction
- R_2O
- ODEMapster
- NeOn Toolkit plug in
- Service Based Access to provide linked data

Existing approaches



Lifting XML Schemas to Ontologies – The concept finder algorithmPhilipp Kunfermann, Christian Drumm
SAP Research Center CEC Karlsruhe
SAP AG

ToC

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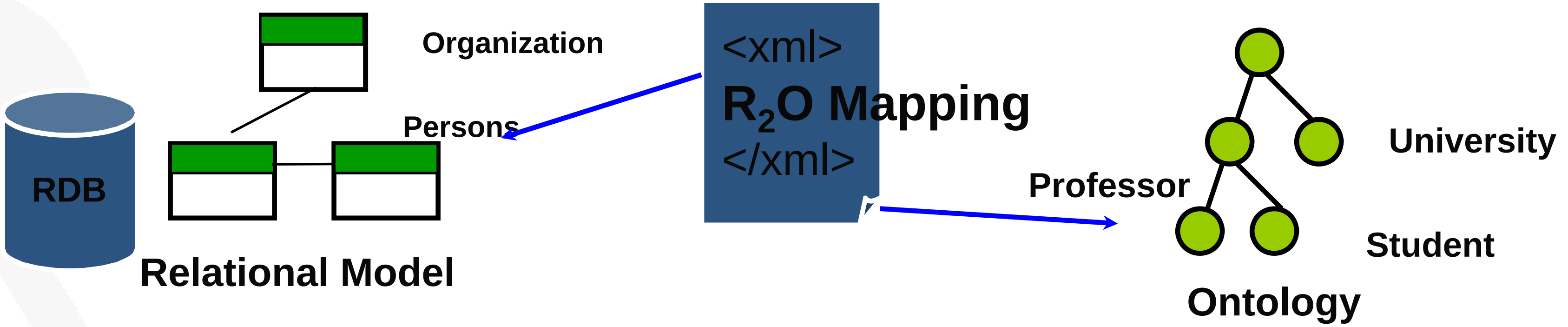
- R_2O is an extensible, fully declarative language to describe mappings between relational database schemas and ontologies.

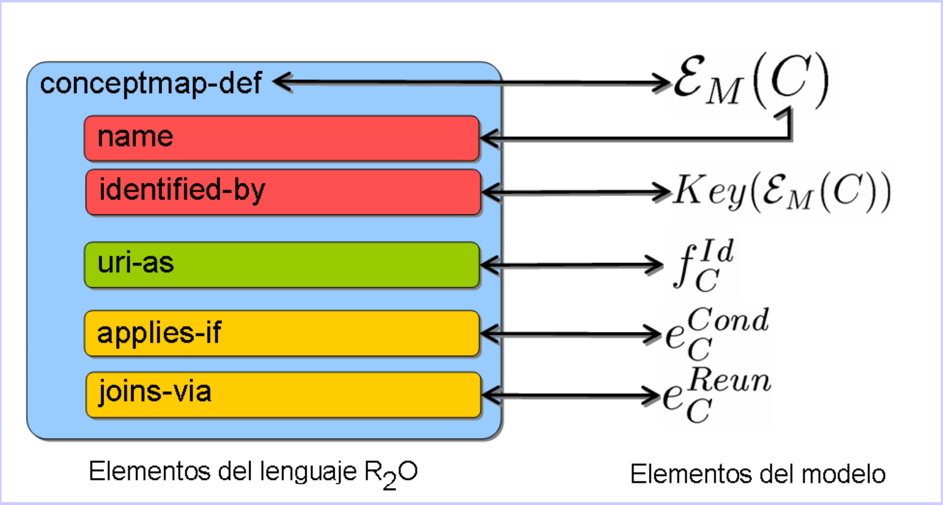


- Out of scope: to create an ontology that reflects the DB schema.

ConceptMap definition

$$\mathcal{E}_M(C) = [f_C^{Id}, e_C^{Cond}, e_C^{Reun}]$$

BNF:



conceptmap-def $\longleftrightarrow \mathcal{E}_M(C)$

name

identified-by $\longleftrightarrow Key(\mathcal{E}_M(C))$

uri-as $\longleftrightarrow f_C^{Id}$

applies-if $\longleftrightarrow e_C^{Cond}$

joins-via $\longleftrightarrow e_C^{Reun}$

Elementos del lenguaje R_2O

Elementos del modelo

conceptmapping-definition::= **conceptmap-def** name
identified-by+
(**uri-as** selector)?
(**applies-if** cond-expr)?
(**joins-via** concept-join-expr)?
documentation?
(**described-by** propertymap-def)*

identified-by::= **identified-by** literal

concept-join-expr::= (**join-expr** conceptJoinOpers cond-expr)?

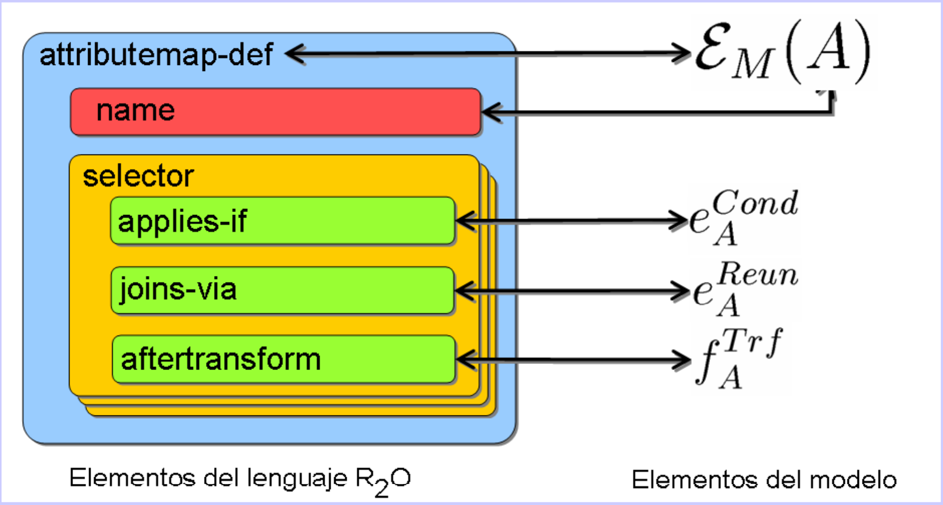
conceptJoinOpers::= **join** | **union** | **difference**

Example:

```
<conceptmap-def  name="Customer">
  <identified-by> Table key </identified-by>
  <uri-as> operation </uri-as>
  <applies-if> condition </applies-if>
  <joins-via> expression </joins-via>
  <documentation>description …</documentation>
  <described-by>attributes,relations</described-by>
</conceptmap-def>
```

AttributeMap definition

$$\mathcal{E}_M(A) = [C, e_A^{Cond}, e_A^{Reun}, f_A^{Trf}]$$



BNF:

attributemap-def::= **attributemap-def** name (selector* | use-dbcol) documentation?

use-dbcol::= **use-dbcol** literal

selector::= **selector** (**applies-if** cond-expr)? (**aftertransform** transformation)?

newobj-type::= **newobject-type** literal

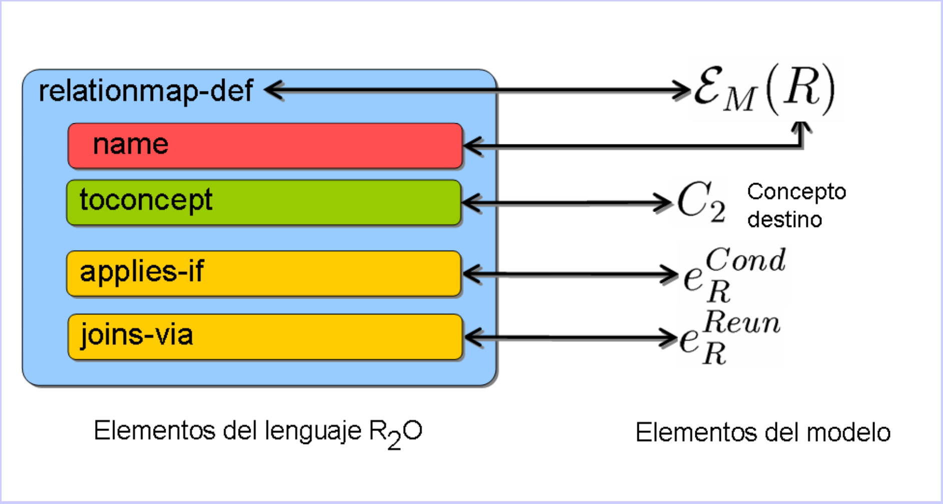
to-concept::= **to-concept** literal

Example:

```
<attributemap-def name="http://esperonto/ff#Title">
   <aftertransform>
      <operation oper-id="constant">
         <arg-restriction on-param="const-val">
            <has-column>fsb_ajut.titol</has-column>
         </arg-restriction>
      </operation>
   </aftertransform>
</attributemap-def>
```

RelationMap definition

$$\mathcal{E}_M(R) = [C_O, C_D, e_R^{Cond}, e_R^{Reun}]$$



BNF:

relationmap-def::= **relationmap-def** to-concept
(**applies-if** cond-expr)?
(**joins-via** relation-join-expr)?

relation-join-expr::= **join** (**join-expr** cond-expr)?

to-concept::= **to-concept** literal

Example:

```
<relationmap-def name="http://esperonto/ff#isCandidateFor">
   <to-concept name="http://esperonto/ff#FundOpp">
   <joins-via>
      <operation oper-id=“equals">
         <arg-restriction on-param="value1">
            <has-column>fsb_ajut.id</has-column>
         </arg-restriction>
         <arg-restriction on-param="value2">
            <has-column>fsb_candidate.forFund</has-column>
         </arg-restriction>
      </operation>
   </joins-via>
</attributemap-def>
```

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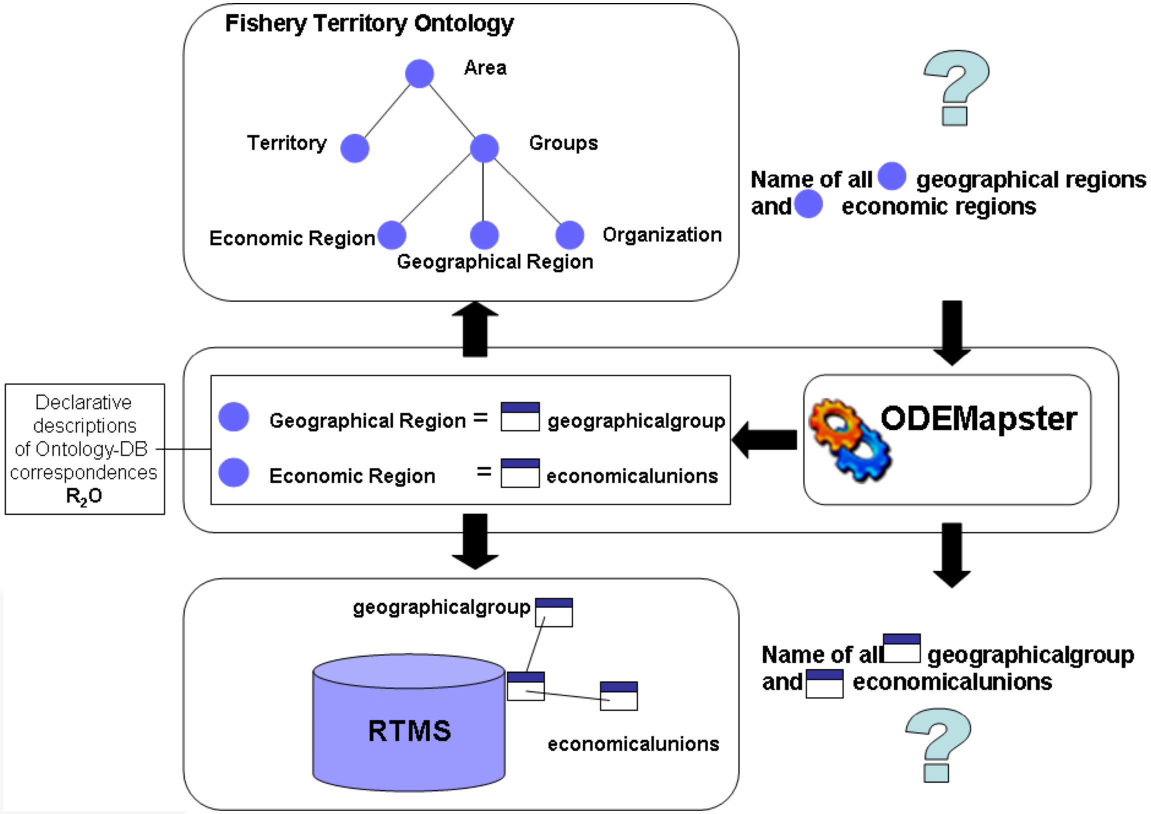
ODEMapster

- The ODEMapster processor generates Semantic Web instances from relational instances based on the mapping description expressed in the R_2O document
  - Batch process/materialization: DB records migrated to the ontology
  - On demand/virtualization: Querying the DB in terms of ontological terms


Fishery Territory Ontology
Area
Territory
Groups
Economic Region
Geographical Region
Organization
?
Name of all ● geographical regions
and ● economic regions
Declarative descriptions of Ontology-DB correspondences
R_2O
Geographical Region = geographicalgroup
Economic Region = economicalunions
ODEMapster
geographicalgroup
RTMS
economicalunions
Name of all geographicalgroup
and economicalunions
?

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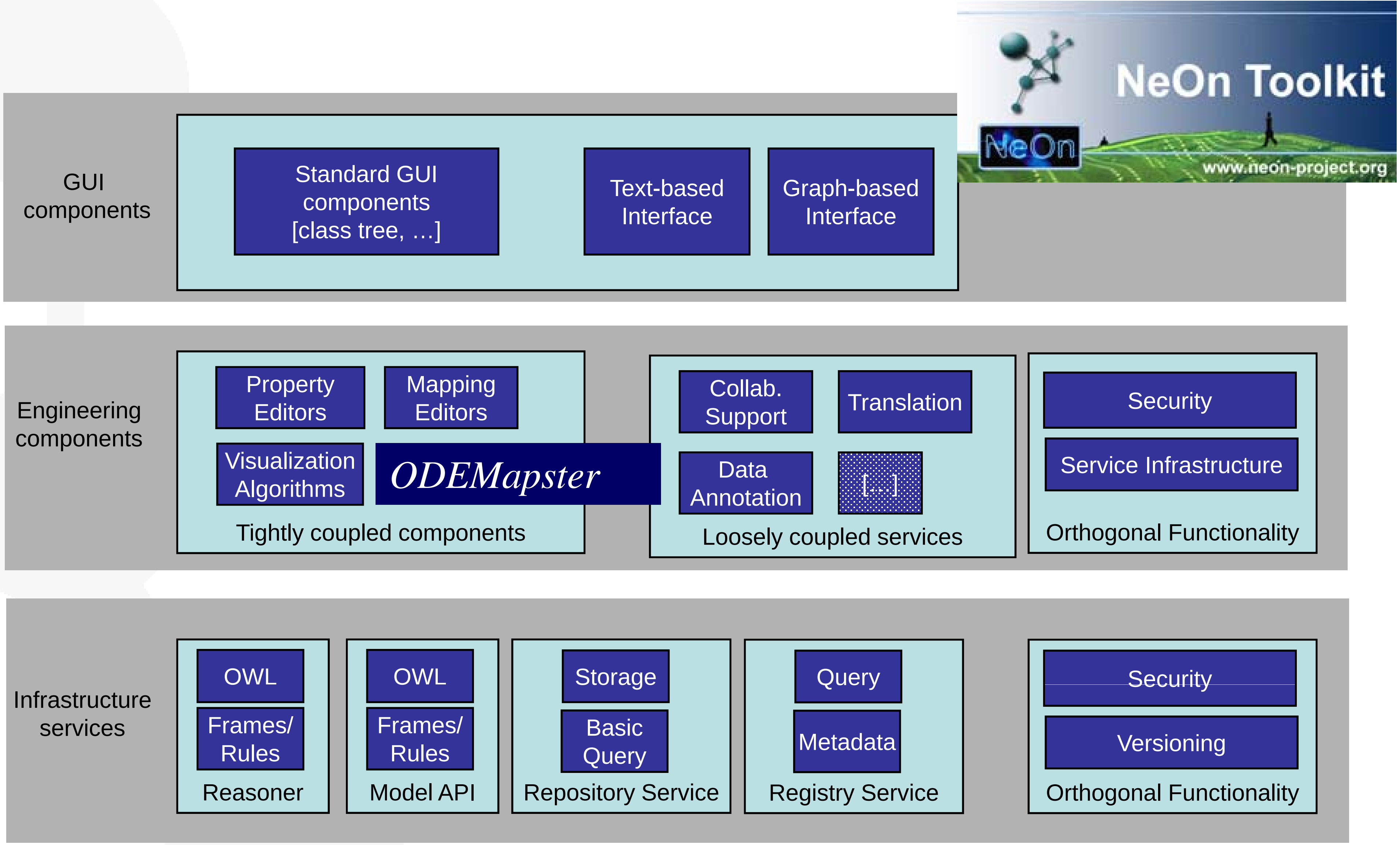
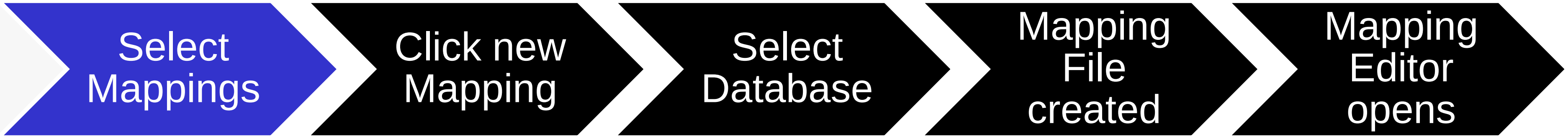
NeOn Toolkit Plug in



Create a DB to Ontology mapping



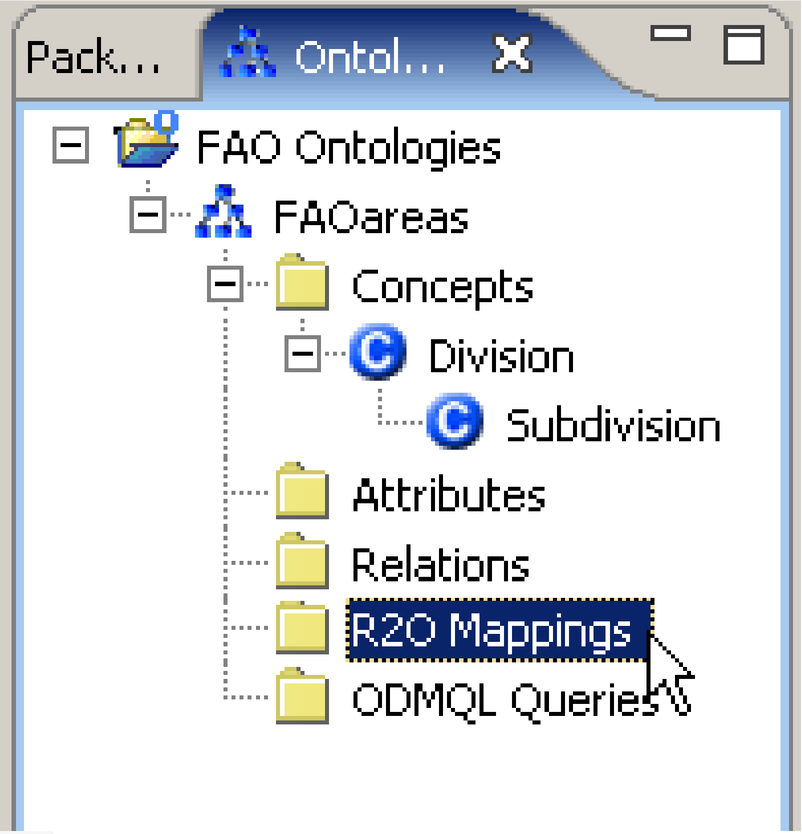
Select Mappings

Click new Mapping

Select Database

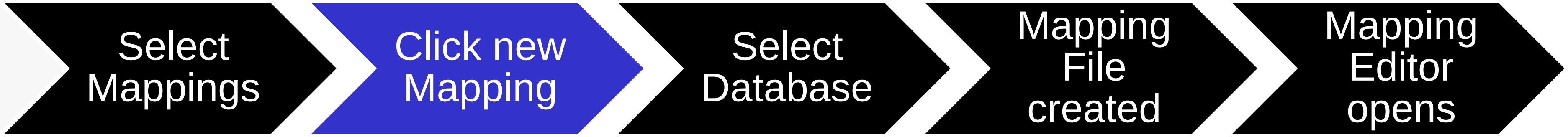
Mapping File created

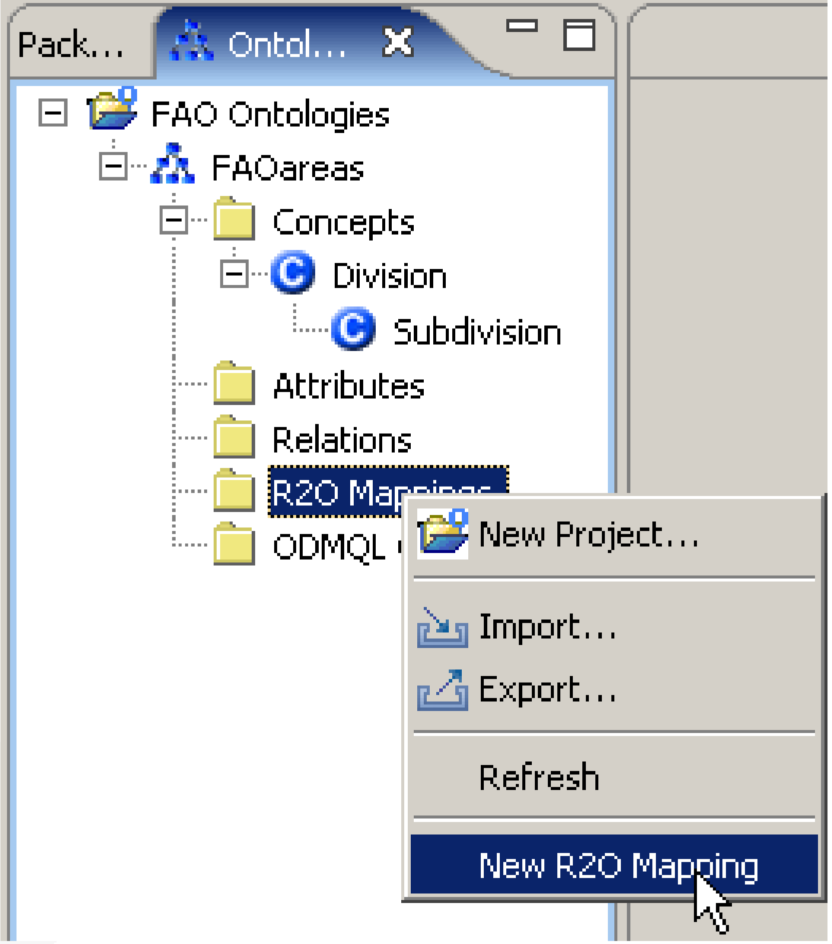
Mapping Editor opens



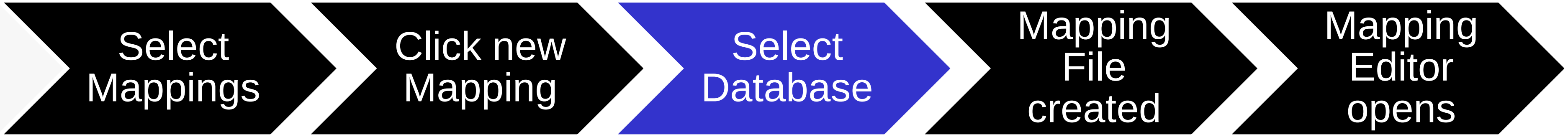
- FAO Ontologies
  - FAOareas
    - Concepts
      - Division
        - Subdivision
    - Attributes
    - Relations
    - R2O Mappings
    - ODMQL Queries

Create a DB to Ontology mapping





Create a DB to Ontology mapping



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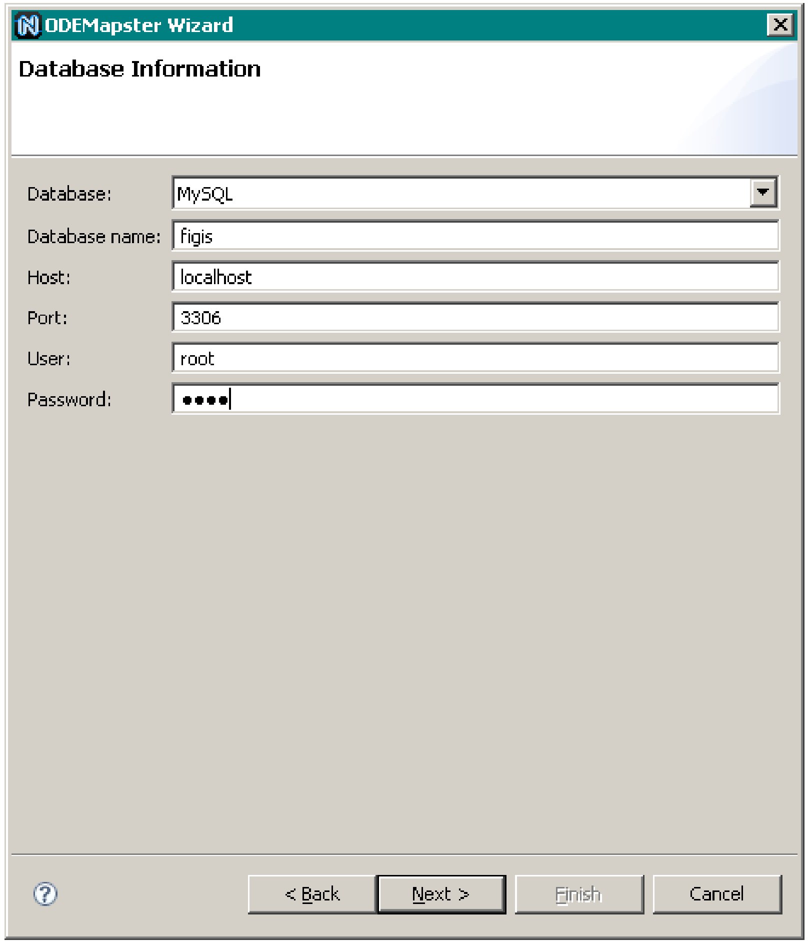


Database Information

Database: MySQL

Database name: figis

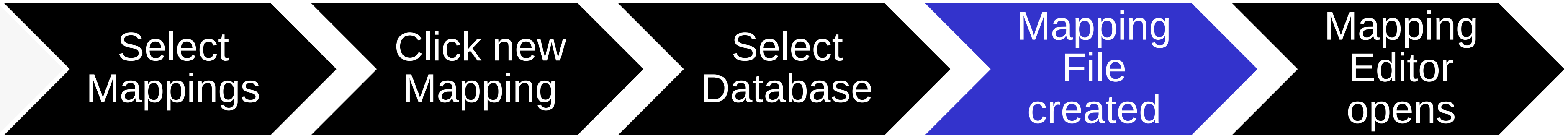
Host: localhost

Port: 3306

User: root

Password: ●●●●

Create a DB to Ontology mapping



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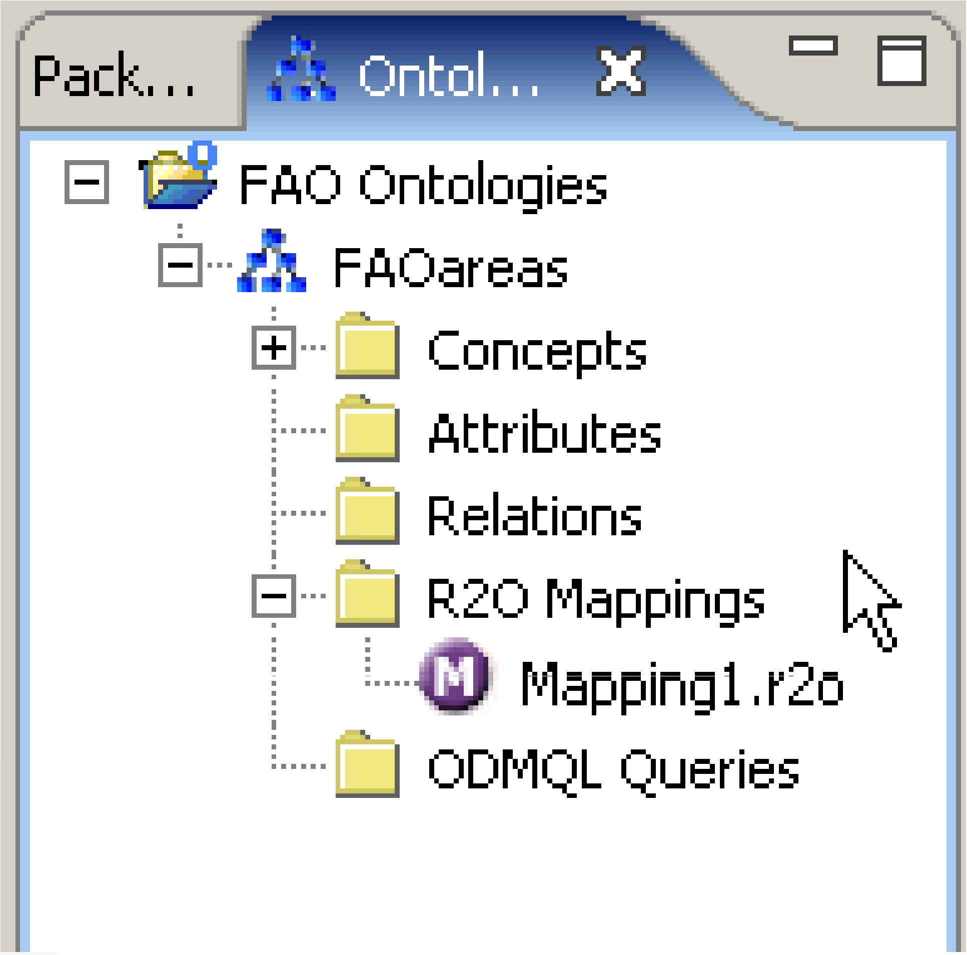
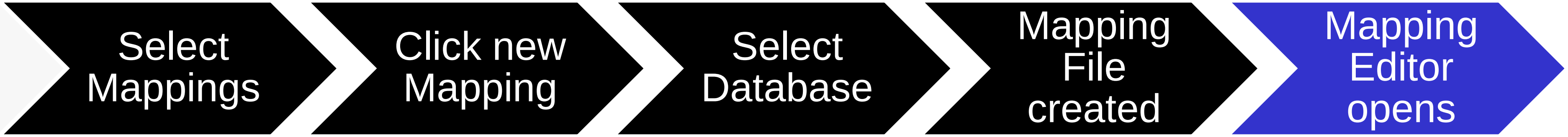


- FAO Ontologies
  - FAOareas
    - Concepts
    - Attributes
    - Relations
    - R2O Mappings
      - Mapping1.r2o
    - ODMQL Queries

Create a DB to Ontology mapping



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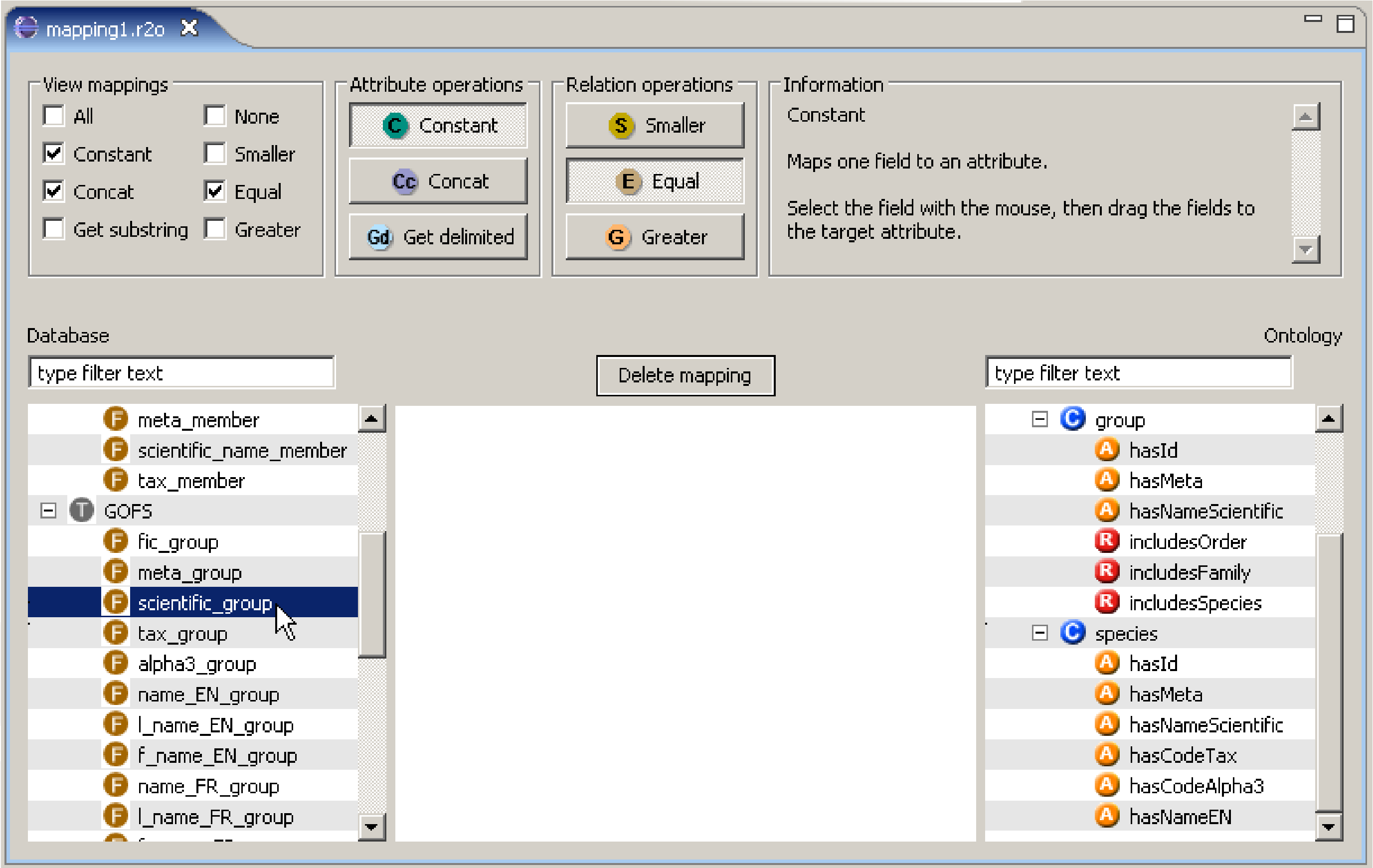


View mappings

□ All □ None

☑ Constant □ Smaller

☑ Concat ☑ Equal

□ Get substring □ Greater

Attribute operations

Relation operations

Information

Constant

Maps one field to an attribute.

Select the field with the mouse, then drag the fields to the target attribute.

Database

type filter text

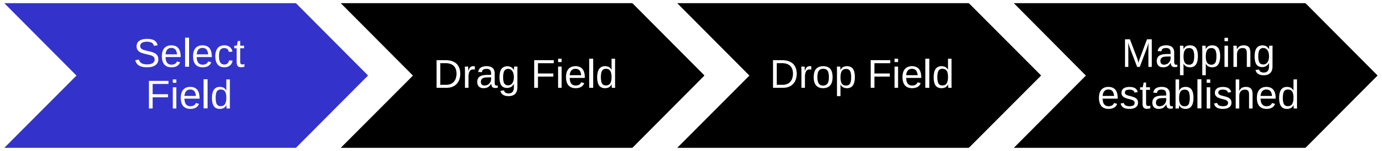
Ontology

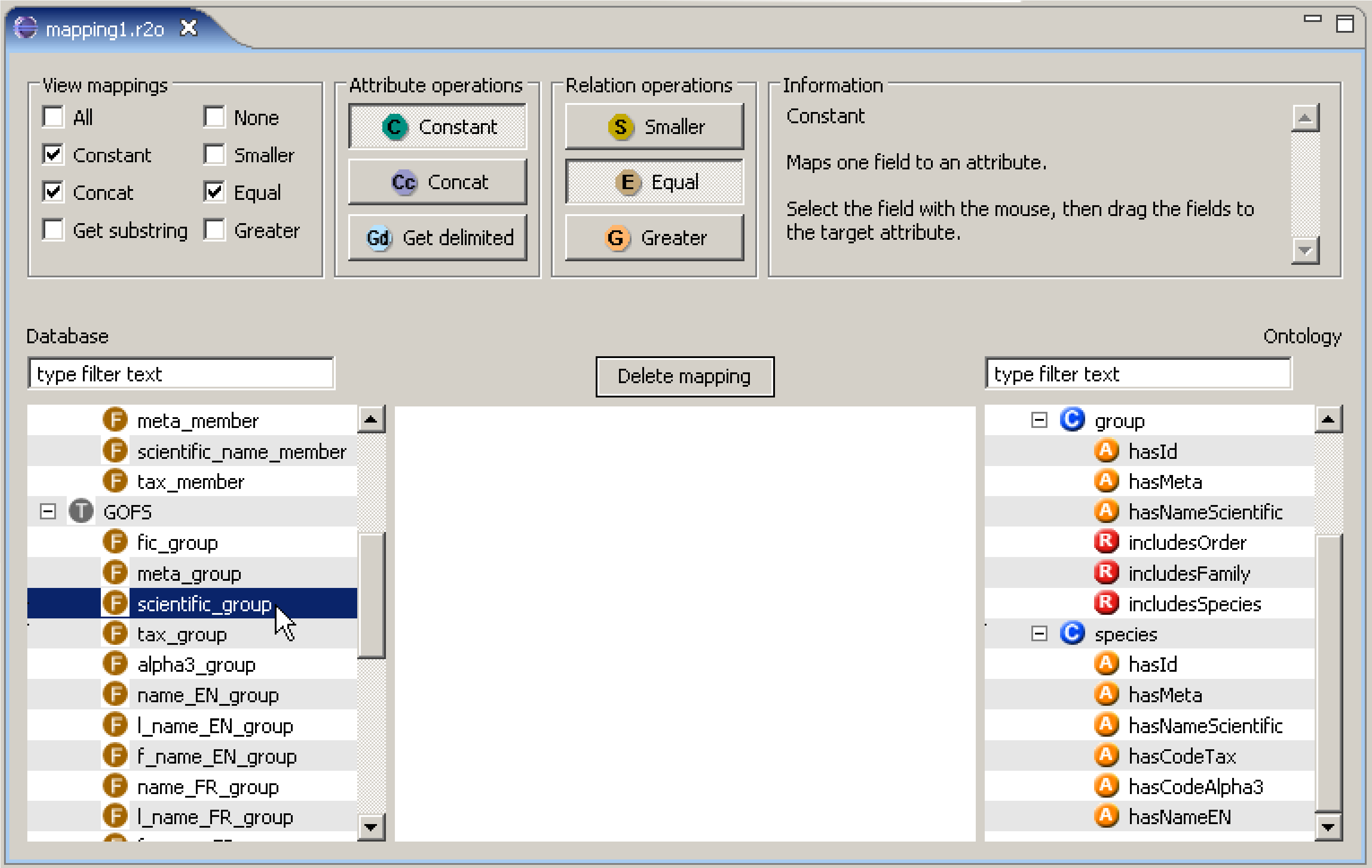
type filter text

- meta_member
- scientific_name_member
- tax_member
- GOFS
  - fic_group
  - meta_group
  - scientific_group
  - tax_group
  - alpha3_group
  - name_EN_group
  - l_name_EN_group
  - f_name_EN_group
  - name_FR_group
  - l_name_FR_group

- group
  - hasId
  - hasMeta
  - hasNameScientific
  - includesOrder
  - includesFamily
  - includesSpecies
- species
  - hasId
  - hasMeta
  - hasNameScientific
  - hasCodeTax
  - hasCodeAlpha3
  - hasNameEN

Create attribute mapping – Constant Operation





View mappings: □ All □ None ☑ Constant □ Smaller ☑ Concat ☑ Equal □ Get substring □ Greater

Information

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Database

type filter text

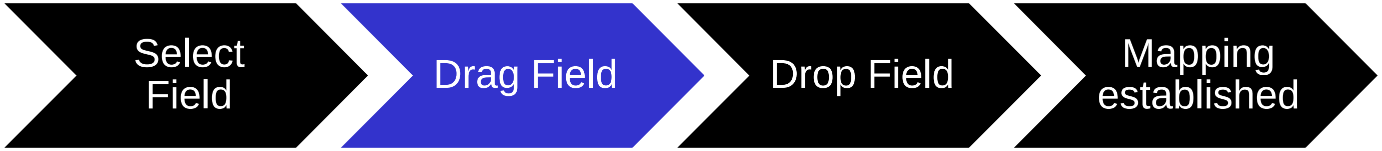
- meta_member
- scientific_name_member
- tax_member
- GOFS
  - fic_group
  - meta_group
  - scientific_group
  - tax_group
  - alpha3_group
  - name_EN_group
  - l_name_EN_group
  - f_name_EN_group
  - name_FR_group
  - l_name_FR_group

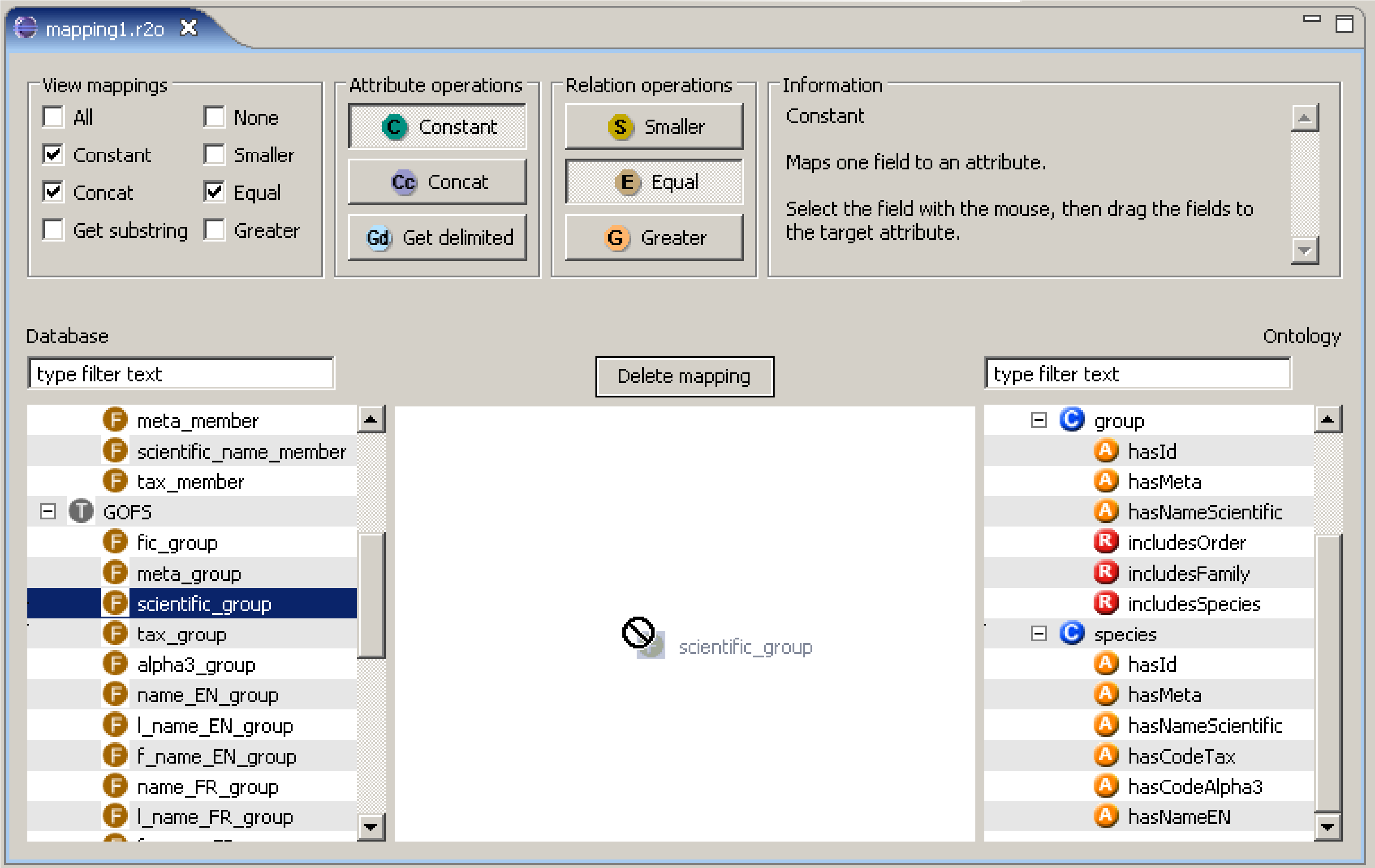
Ontology

type filter text

- group
  - hasId
  - hasMeta
  - hasNameScientific
  - includesOrder
  - includesFamily
  - includesSpecies
- species
  - hasId
  - hasMeta
  - hasNameScientific
  - hasCodeTax
  - hasCodeAlpha3
  - hasNameEN

Create attribute mapping – Constant Operation





View mappings: ☐ All ☐ None ☑ Constant ☐ Smaller ☑ Concat ☑ Equal ☐ Get substring ☐ Greater

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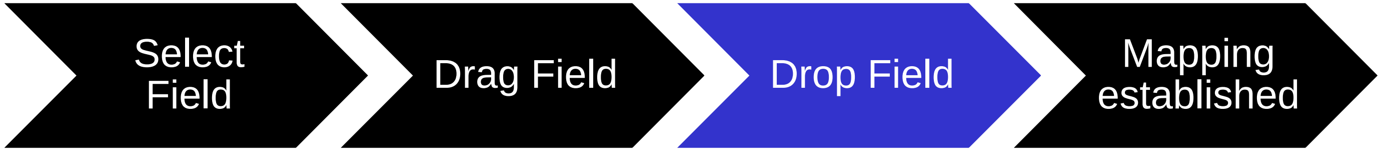
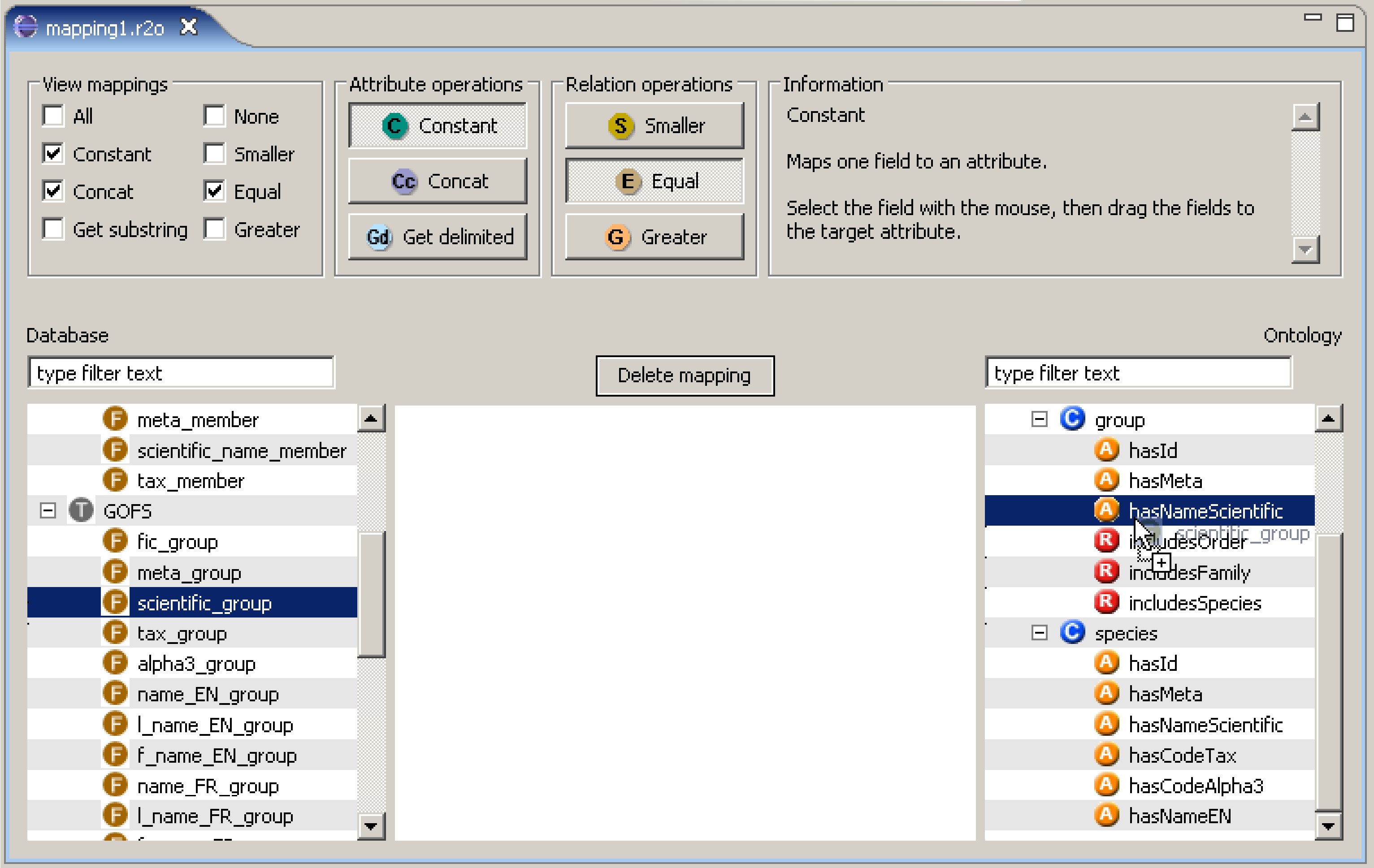
Create attribute mapping – Constant Operation





View mappings

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☑ Constant	□ Smaller
☑ Concat	☑ Equal
□ Get substring	□ Greater

Information

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Maps one field to an attribute.

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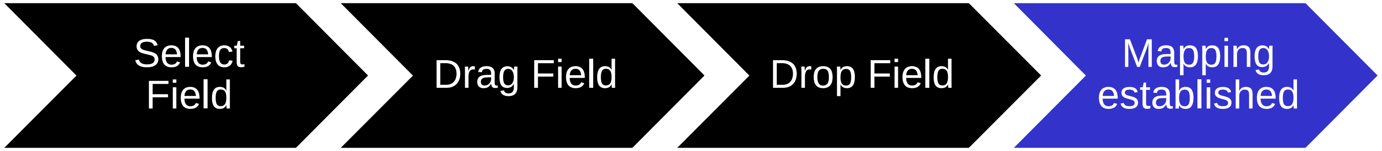
Database:

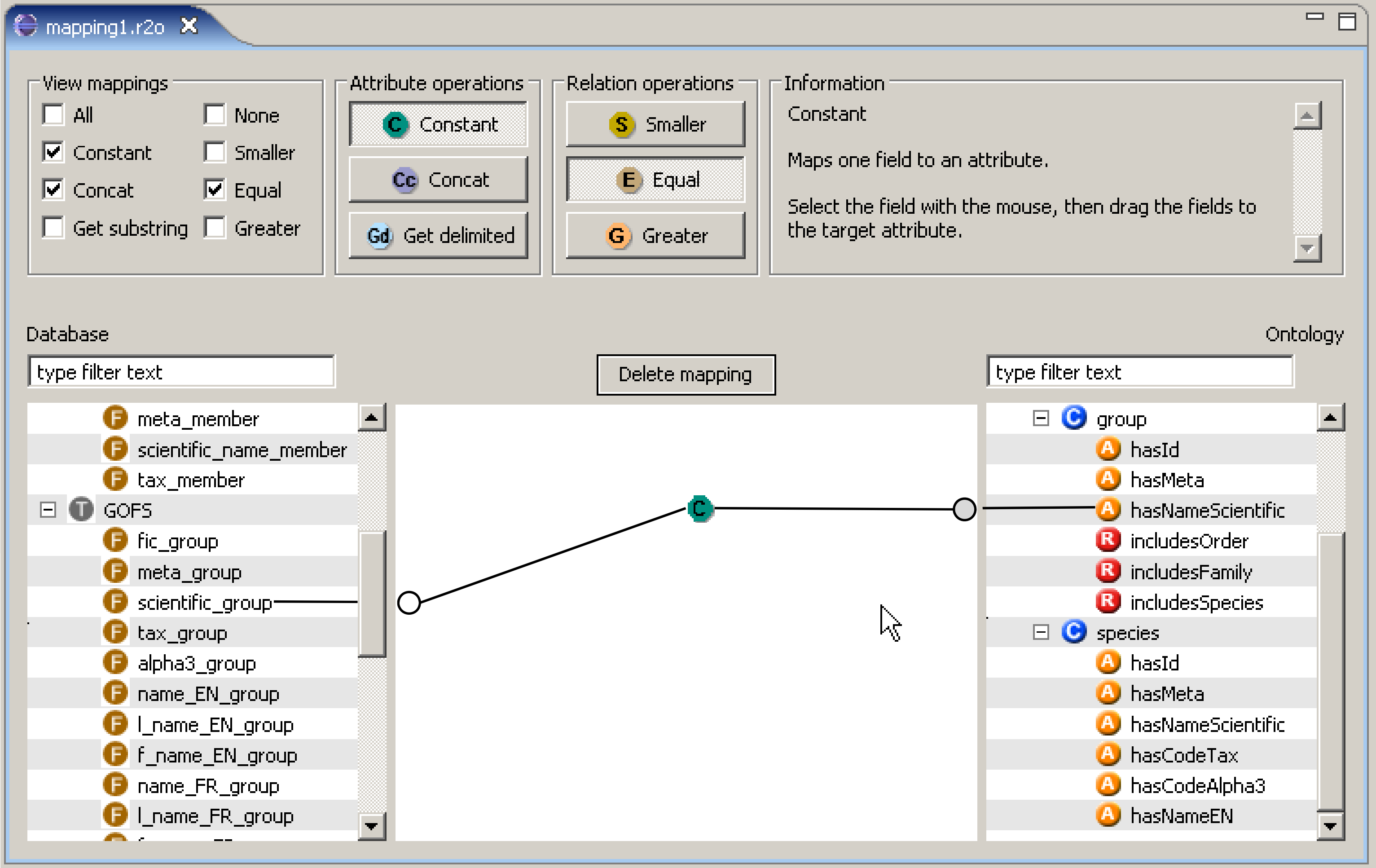
- F meta_member
- F scientific_name_member
- F tax_member
- T GOFS
  - F fic_group
  - F meta_group
  - F scientific_group
  - F tax_group
  - F alpha3_group
  - F name_EN_group
  - F l_name_EN_group
  - F f_name_EN_group
  - F name_FR_group
  - F l_name_FR_group

Ontology:

- C group
  - A hasId
  - A hasMeta
  - A hasNameScientific
  - R includesOrder
  - R includesFamily
  - R includesSpecies
- C species
  - A hasId
  - A hasMeta
  - A hasNameScientific
  - A hasCodeTax
  - A hasCodeAlpha3
  - A hasNameEN

Create attribute mapping – Constant Operation





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Database

type filter text

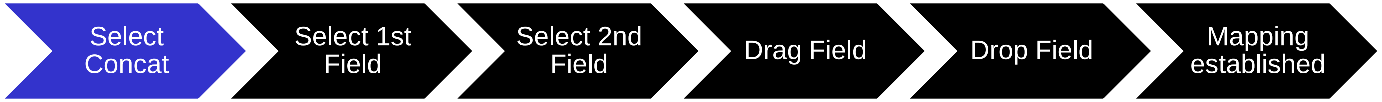
- F meta_member
- F scientific_name_member
- F tax_member
- ⊟ T GOFS
  - F fic_group
  - F meta_group
  - F scientific_group
  - F tax_group
  - F alpha3_group
  - F name_EN_group
  - F l_name_EN_group
  - F f_name_EN_group
  - F name_FR_group
  - F l_name_FR_group

Ontology

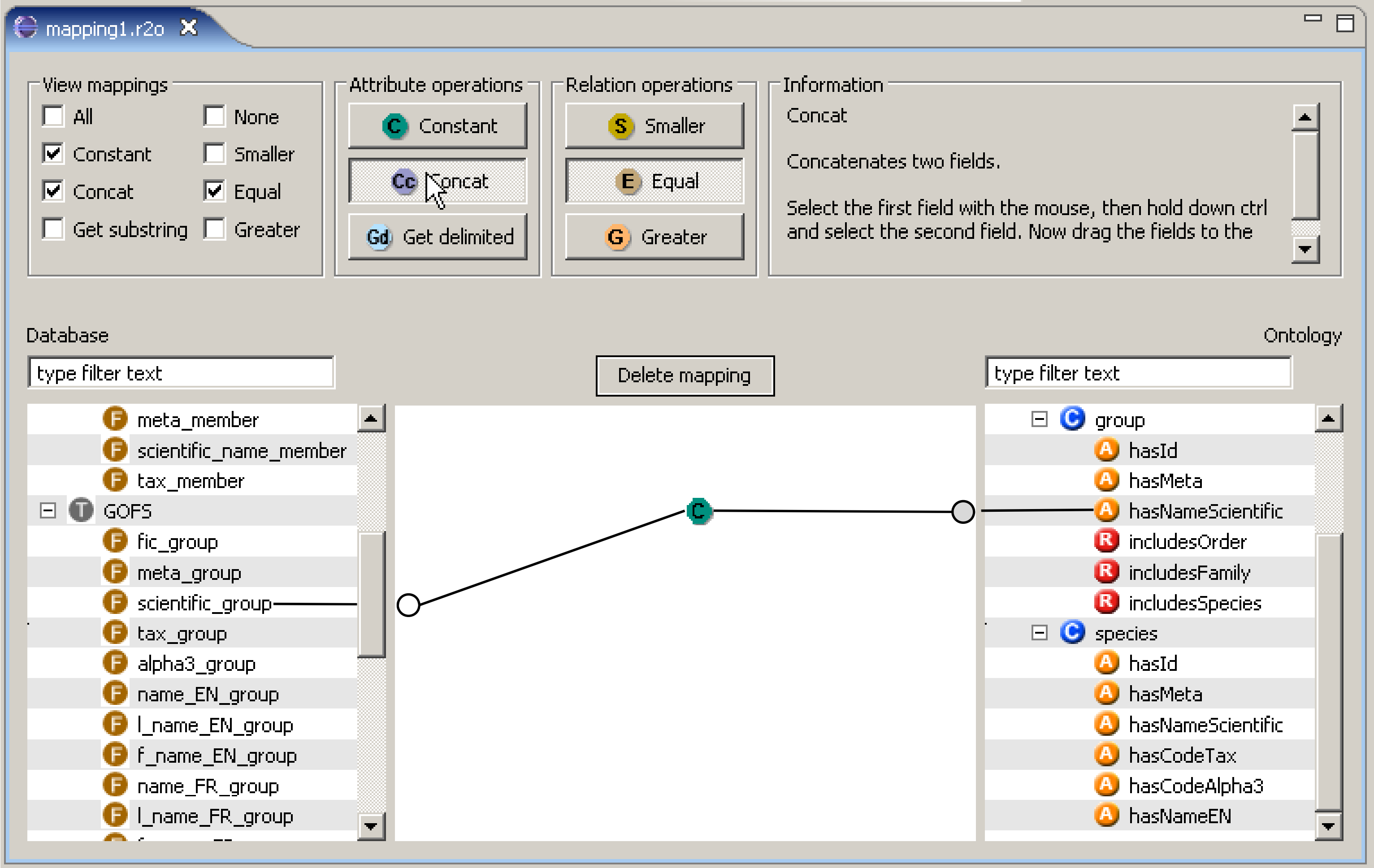
type filter text

- ⊟ C group
  - A hasId
  - A hasMeta
  - A hasNameScientific
  - R includesOrder
  - R includesFamily
  - R includesSpecies
- ⊟ C species
  - A hasId
  - A hasMeta
  - A hasNameScientific
  - A hasCodeTax
  - A hasCodeAlpha3
  - A hasNameEN

Create attribute mapping - Concat operation



Select Concat → Select 1st Field → Select 2nd Field → Drag Field → Drop Field → Mapping established



View mappings

- ☐ All
- ☐ None
- ☑ Constant
- ☐ Smaller
- ☑ Concat
- ☑ Equal
- ☐ Get substring
- ☐ Greater

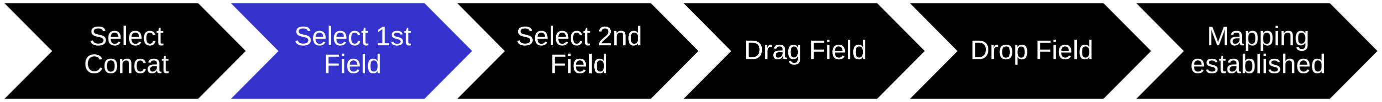
Information

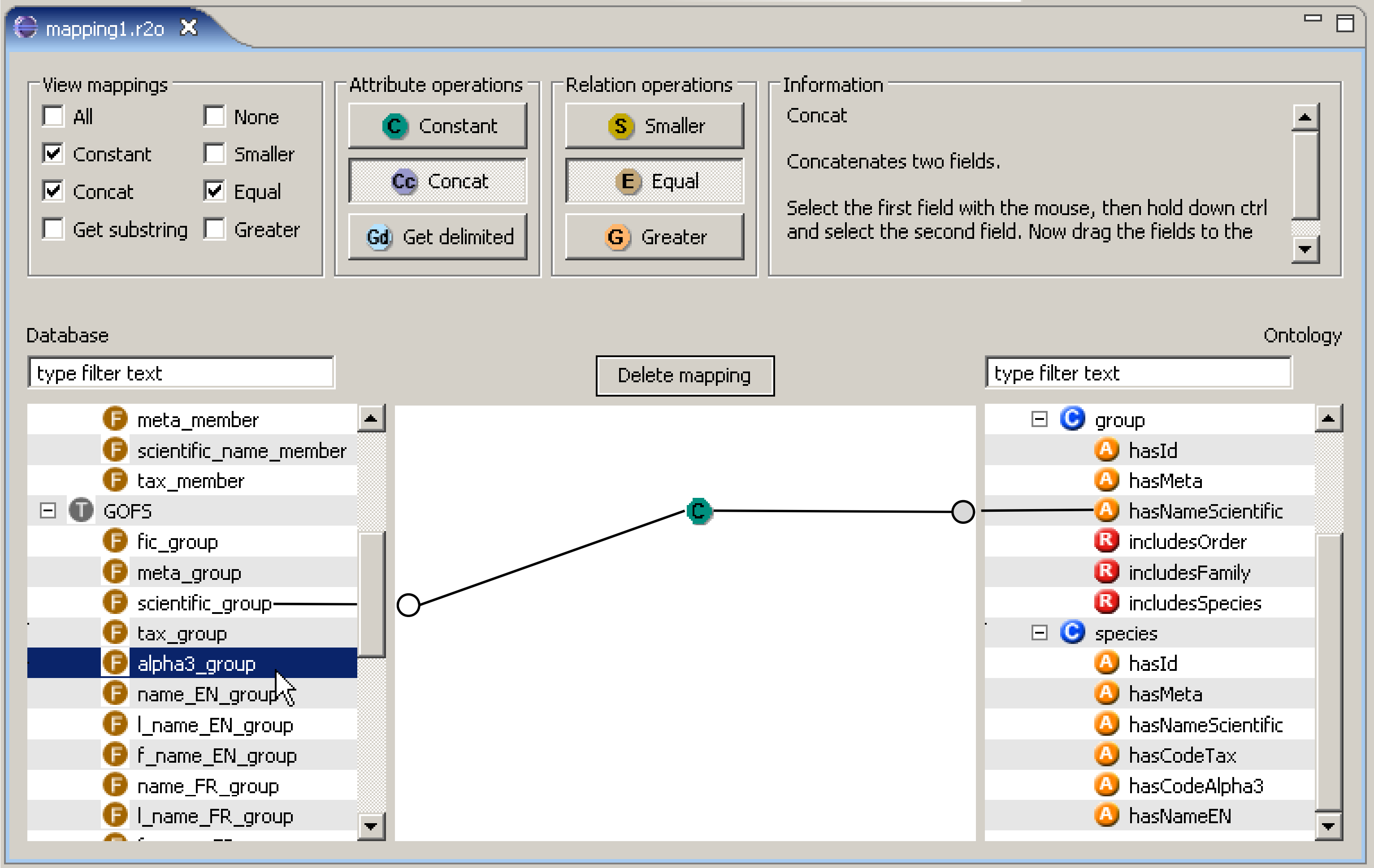
Concat

Concatenates two fields.

Select the first field with the mouse, then hold down ctrl and select the second field. Now drag the fields to the

Create attribute mapping - Concat operation





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Database:

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- tax_member
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  - meta_group
  - scientific_group
  - tax_group
  - alpha3_group
  - name_EN_group
  - l_name_EN_group
  - f_name_EN_group
  - name_FR_group
  - l_name_FR_group

Ontology:

- group
  - hasId
  - hasMeta
  - hasNameScientific
  - includesOrder
  - includesFamily
  - includesSpecies
- species
  - hasId
  - hasMeta
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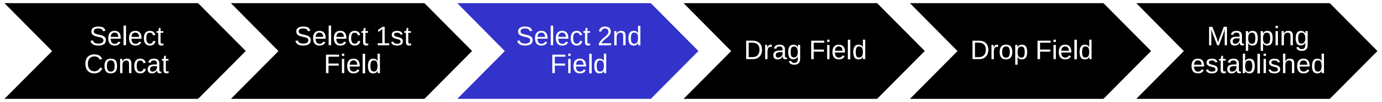
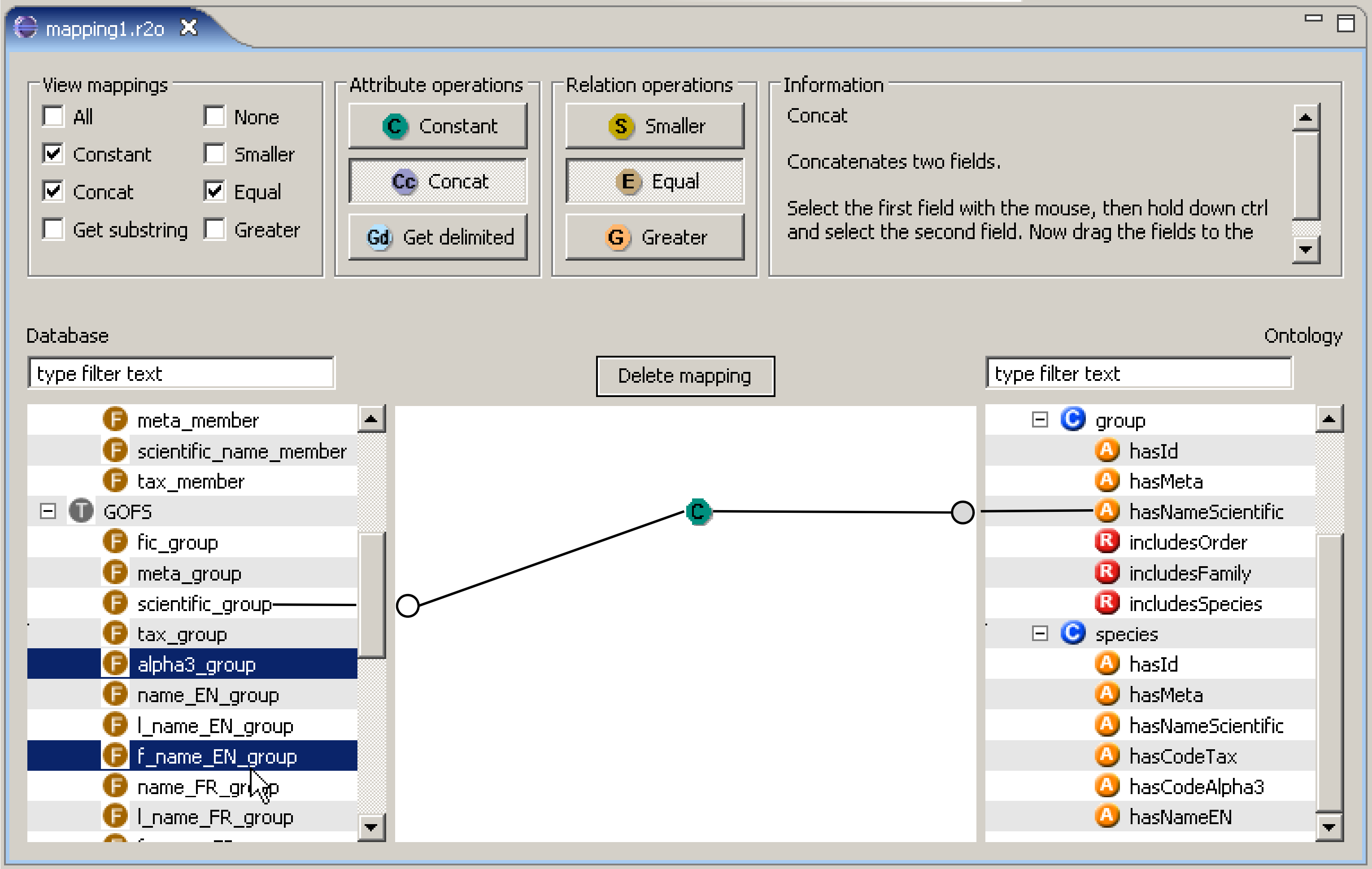
Create attribute mapping - Concat operation



Select Concat → Select 1st Field → **Select 2nd Field** → Drag Field → Drop Field → Mapping established



View mappings

☐ All ☐ None
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☐ Get substring ☐ Greater

Attribute operations

Relation operations

Information

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Database

Ontology

Database:
- meta_member
- scientific_name_member
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- GOFS
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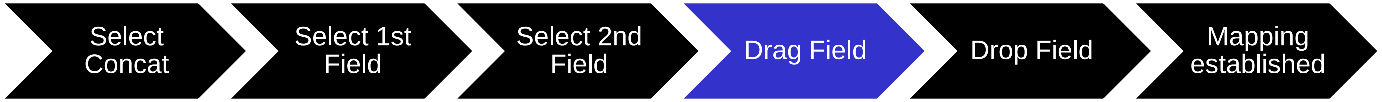
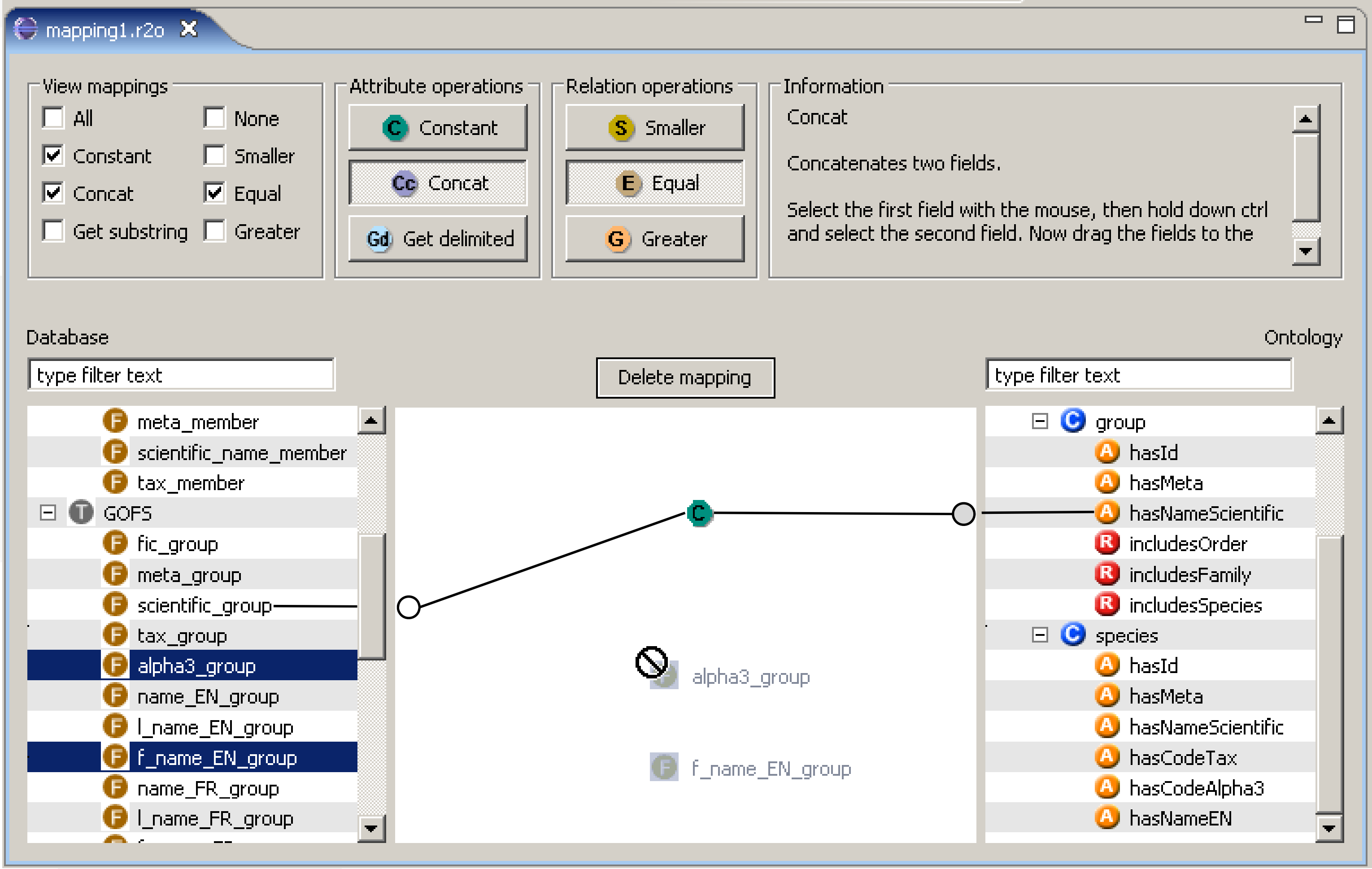
Create attribute mapping - Concat operation





View mappings:

☐ All ☐ None
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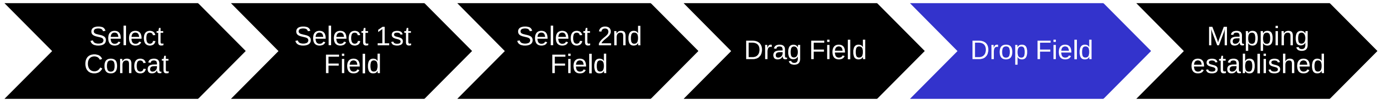
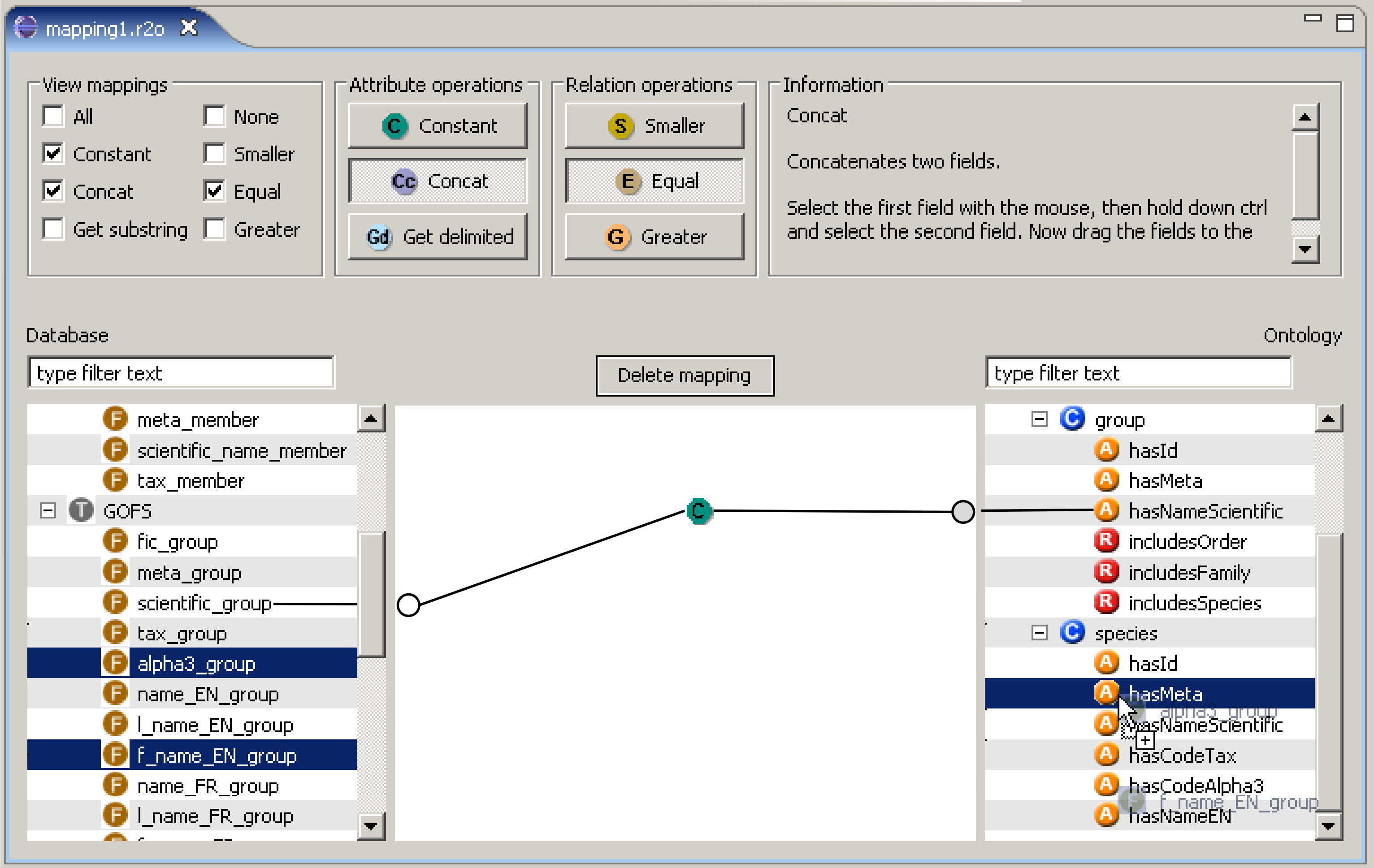


Select Concat → Select 1st Field → Select 2nd Field → Drag Field → Drop Field → Mapping established



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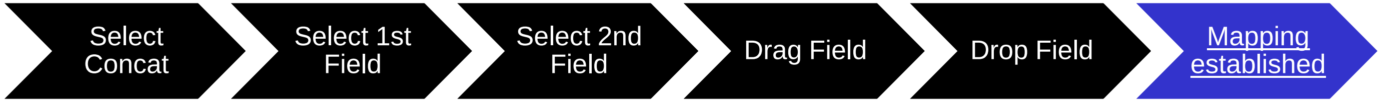
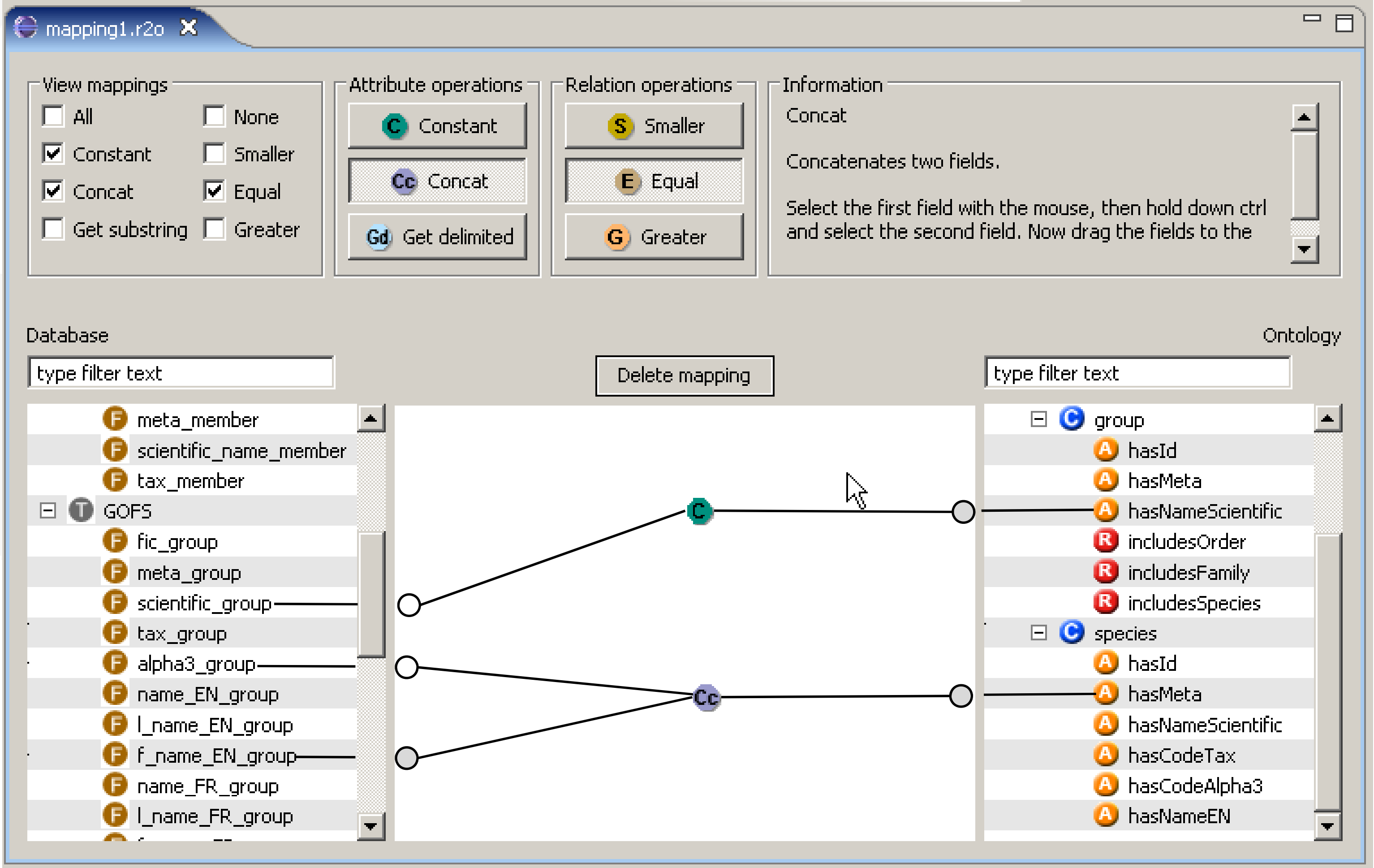

Select Concat
Select 1st Field
Select 2nd Field
Drag Field
Drop Field
Mapping established


mapping1.r2o

View mappings

☐ All ☐ None
☑ Constant ☐ Smaller
☑ Concat ☑ Equal
☐ Get substring ☐ Greater

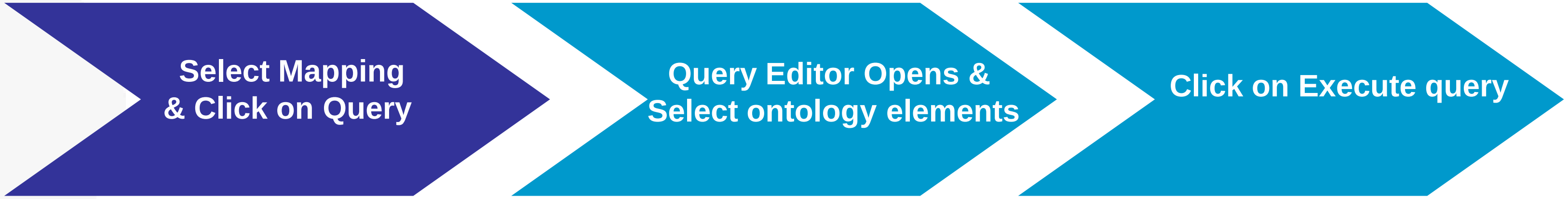
Information

Concat

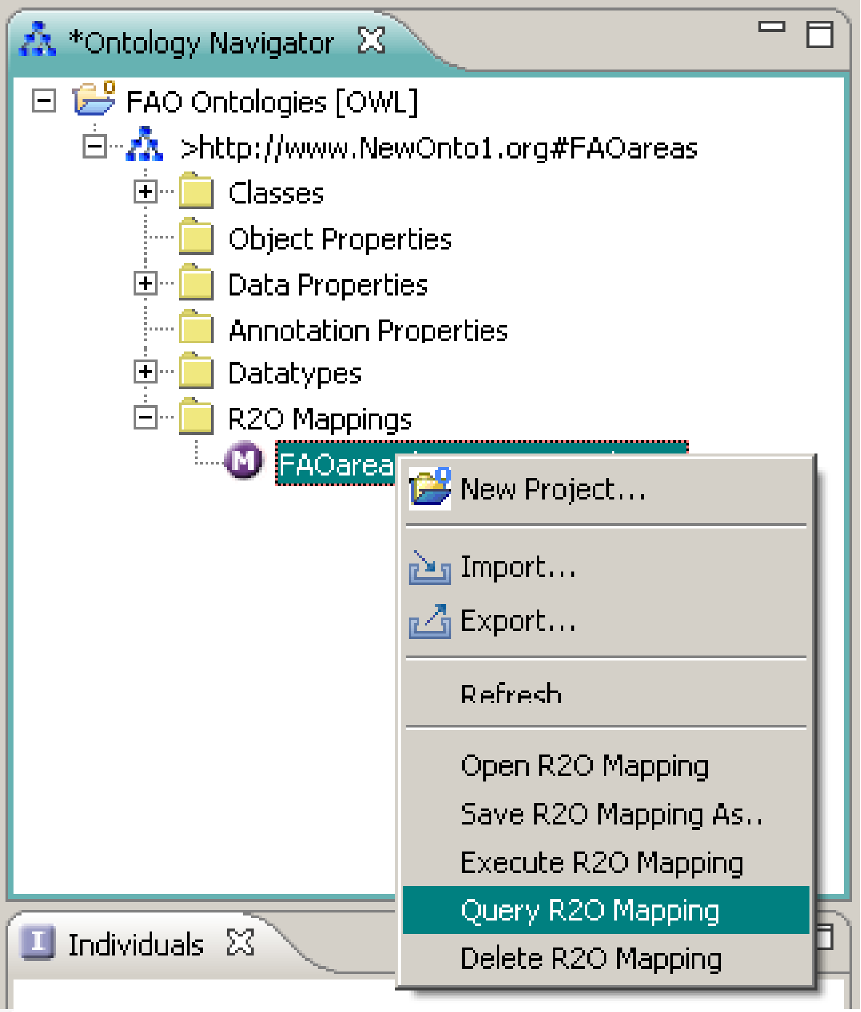
Concatenates two fields.

Select the first field with the mouse, then hold down ctrl and select the second field. Now drag the fields to the

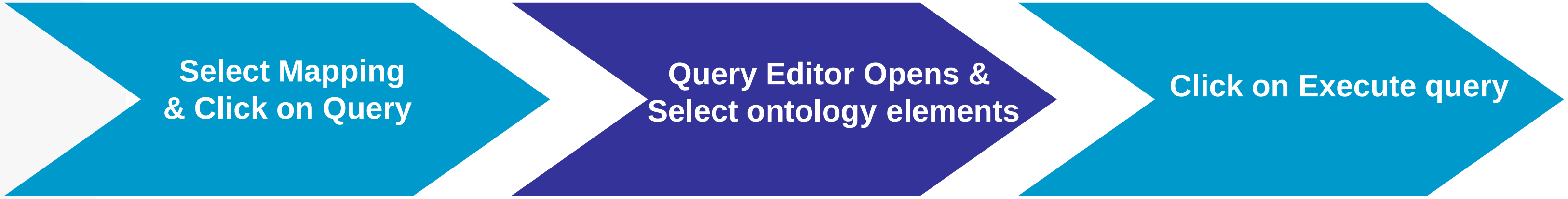
Query the ontology instances



Select Mapping & Click on Query
Query Editor Opens & Select ontology elements
Click on Execute query



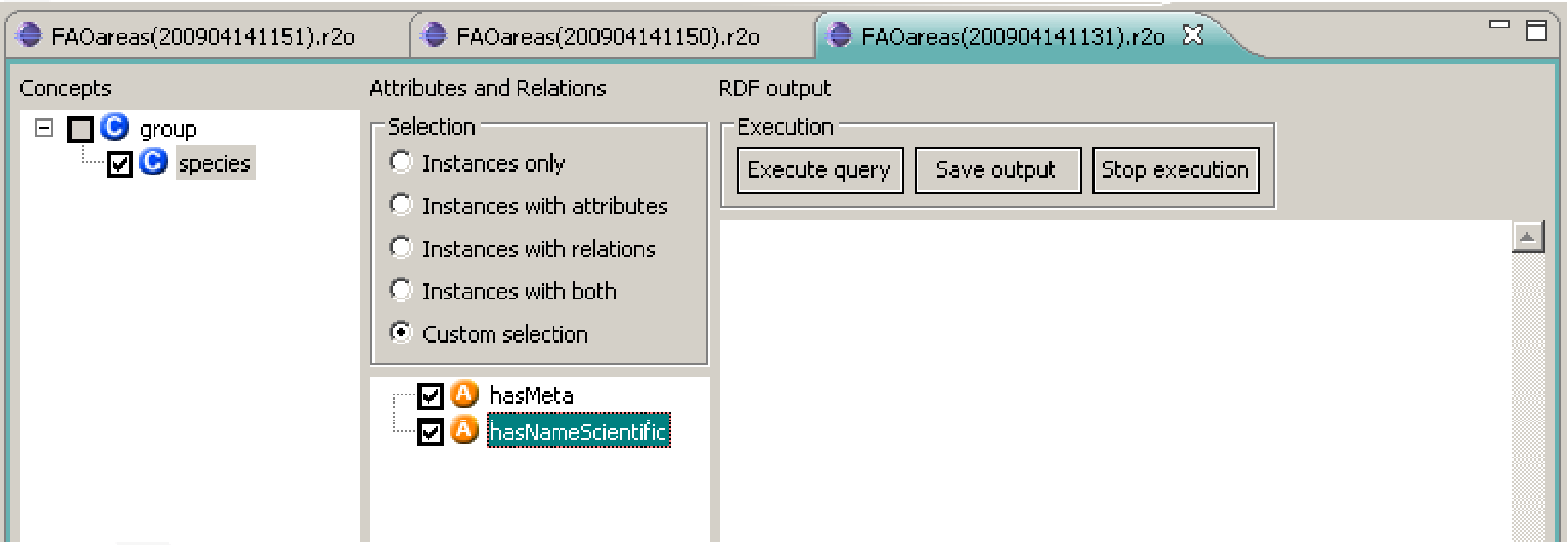
Query the ontology instances



Select Mapping & Click on Query

Query Editor Opens & Select ontology elements

Click on Execute query



FAOareas(200904141151).r2o | FAOareas(200904141150).r2o | FAOareas(200904141131).r2o

Concepts

- ☐ group
  - ☑ species

Attributes and Relations

Selection

○ Instances only

○ Instances with attributes

○ Instances with relations

○ Instances with both

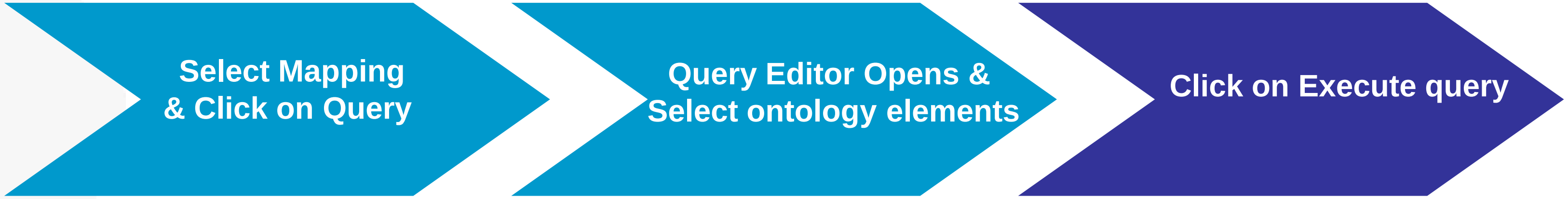
● Custom selection

- ☑ hasMeta
- ☑ hasNameScientific

RDF output

Execution

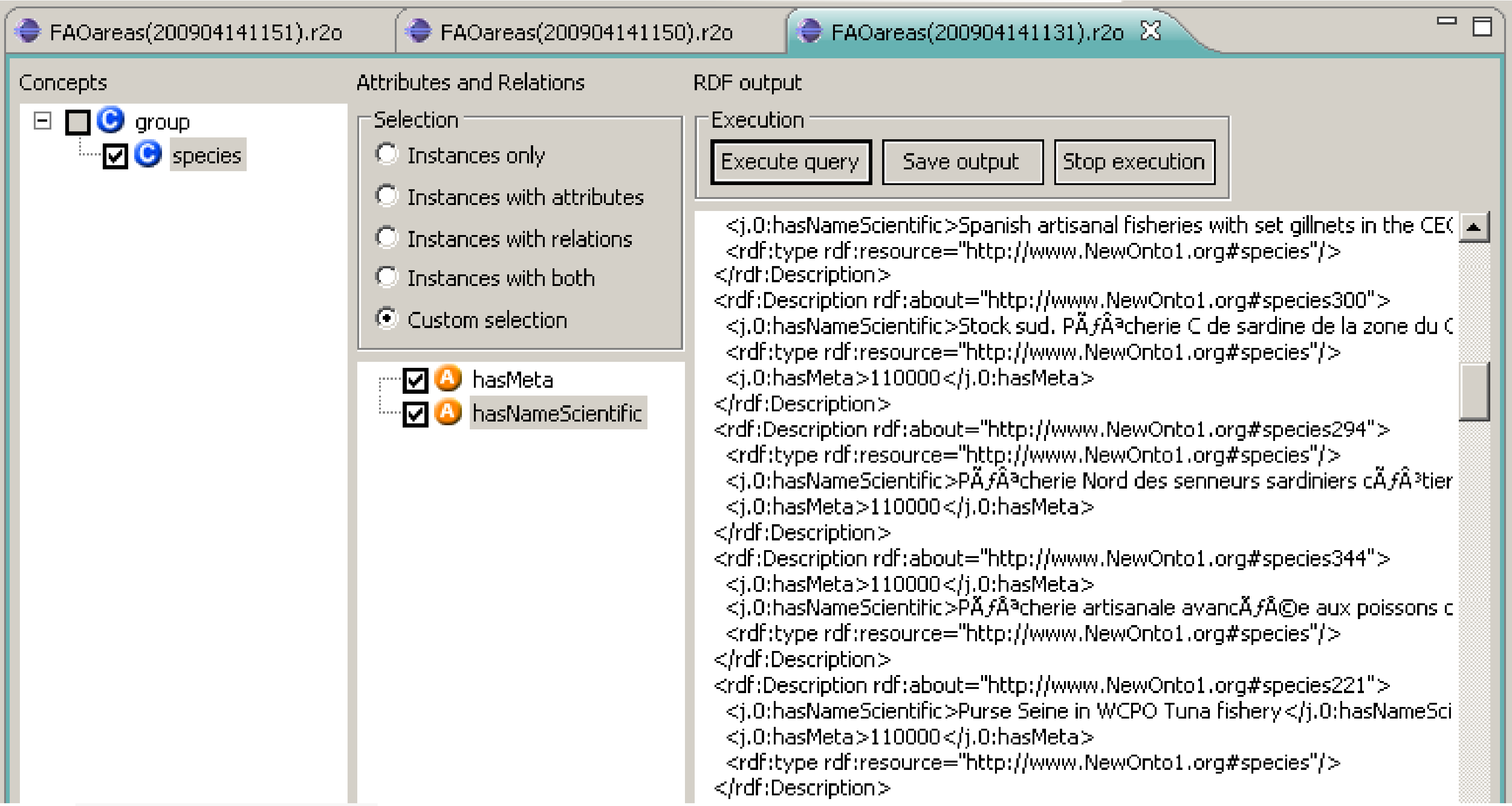
Query the ontology instances



Select Mapping & Click on Query

Query Editor Opens & Select ontology elements

Click on Execute query



```
  <j.0:hasNameScientific>Spanish artisanal fisheries with set gillnets in the CE(
  <rdf:type rdf:resource="http://www.NewOnto1.org#species"/>
</rdf:Description>
<rdf:Description rdf:about="http://www.NewOnto1.org#species300">
  <j.0:hasNameScientific>Stock sud. PÃƒÂªcherie C de sardine de la zone du (
  <rdf:type rdf:resource="http://www.NewOnto1.org#species"/>
  <j.0:hasMeta>110000</j.0:hasMeta>
</rdf:Description>
<rdf:Description rdf:about="http://www.NewOnto1.org#species294">
  <rdf:type rdf:resource="http://www.NewOnto1.org#species"/>
  <j.0:hasNameScientific>PÃƒÂªcherie Nord des senneurs sardiniers cÃƒÂ³tier
  <j.0:hasMeta>110000</j.0:hasMeta>
</rdf:Description>
<rdf:Description rdf:about="http://www.NewOnto1.org#species344">
  <j.0:hasMeta>110000</j.0:hasMeta>
  <j.0:hasNameScientific>PÃƒÂªcherie artisanale avancÃƒÂ©e aux poissons c
  <rdf:type rdf:resource="http://www.NewOnto1.org#species"/>
</rdf:Description>
<rdf:Description rdf:about="http://www.NewOnto1.org#species221">
  <j.0:hasNameScientific>Purse Seine in WCPO Tuna fishery</j.0:hasNameSci
  <j.0:hasMeta>110000</j.0:hasMeta>
  <rdf:type rdf:resource="http://www.NewOnto1.org#species"/>
</rdf:Description>
```

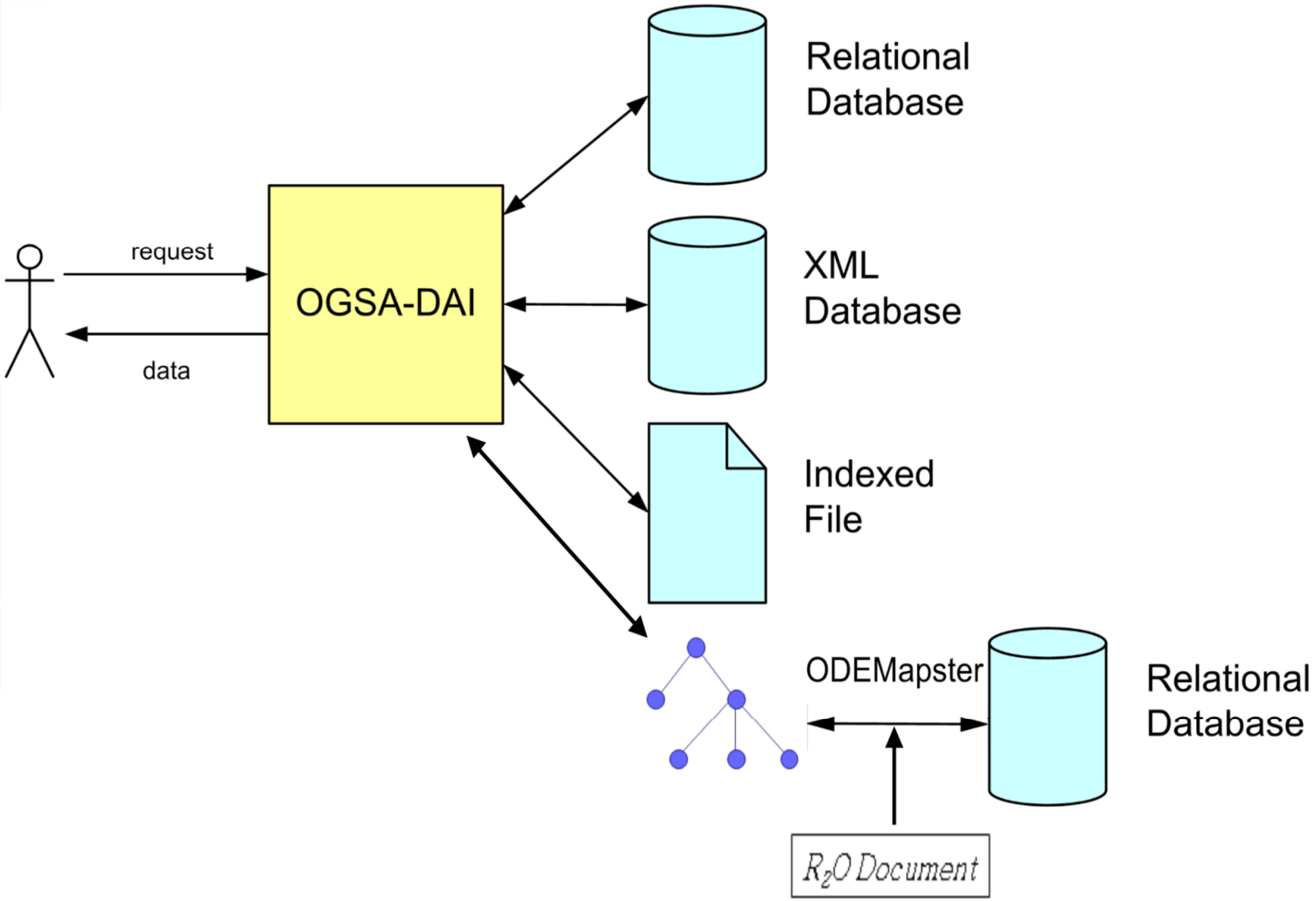
ToC

- Introduction
- R_2O
- ODEMapster
- NeOn Toolkit plug in
- Service Based Access to provide linked data

Web Service Access

- Current approach needs high amount of time
  - Batch mode may be running for a long time
  - Even on demand mode depending on the database length
- WS-DAI Web services specification allows to make synchronous and asynchronous calls
- OGSA-DAI
  - Framework that allows to access, integrate, transform and deliver distributed and heterogeneous sources of data
  - Implements part of the WS-DAI specification
  - Resources, activities and workflows
- Output: stream of RDF data

New Resource (ODEMapster Engine)



R_2O and ODEMapster

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Date: 24/04/2009