



Virtual Forests  
Bordeaux workshop  
25-05-2023



# IO4 - *Linked Open Data in modelling and simulation platforms*

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# Overview of Intellectual Output 4 (IO4)

1. Publication of Linked Open Data (LOD) for forestry education
  - Cross-Forest: Iberian land cover maps and forest inventories
  - REINFFORCE (latitudinal gradient UK -> Portugal)
2. Adapt the tool Forest Explorer for browsing the LOD resource (step 1)
3. Adapt the simulator SIMANFOR to use the LOD resource (step 1) as input
4. Use in educational scenarios

# T4.1 The Cross-Forest dataset

## ■ Iberian land cover map and forest inventory

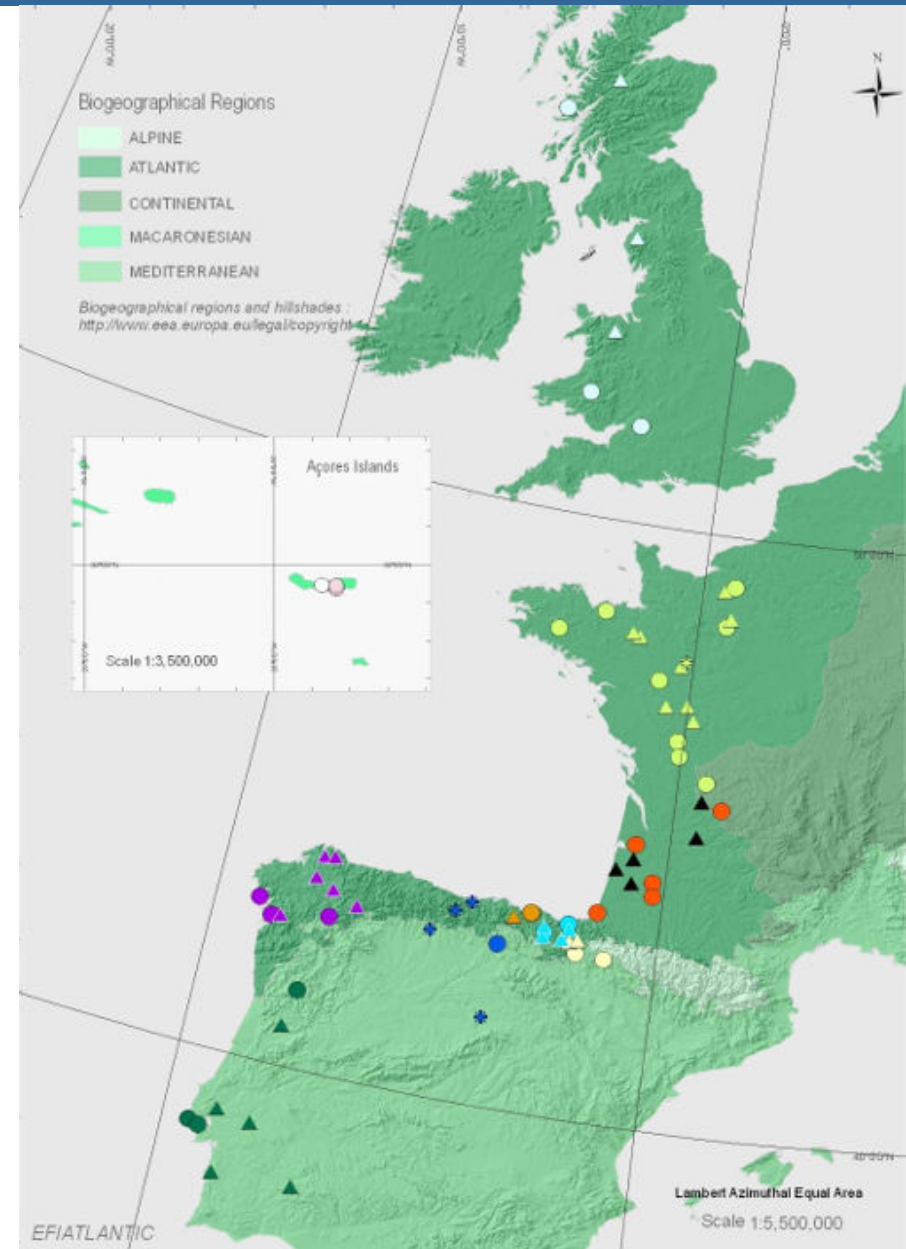
- Previous work in the EU project Cross-Forest
- Dataset summary
  - 92K plots
  - 1,4M trees
  - 922K patches
- The whole dataset has passed a thorough validation process as part of the work in Virtual Forests

## ■ Resources

- Ontologies
  - <https://github.com/Cross-Forest/Ontologies>
  - <https://crossforest.gsic.uva.es/ontologies/>
- SPARQL endpoint (querying)
  - <https://crossforest.gsic.uva.es/sparql/>
- Forest Explorer (T4.2)
  - <https://forestexplorer.gsic.uva.es/>

# T4.1 The REINFFORCE dataset

- REINFFORCE source data
  - <https://reinfforce.iefc.net/en/>
  - 38 climate change arboreta
  - Gradient from Scotland to South Portugal
    - 2,000 trees
    - 32 species
    - 150 plots
  - Note
    - Some parts of the REINFFORCE dataset were not disclosed



# T4.1 Ontologies for REINFFORCE

## ■ Virtual Forests ontology

- REINFFORCE main concepts: Arboretum, Provenance, SurvivalRate, Slope, Country, etc.
- Taxa definitions
  - Hybrid, Variant, Subspecies

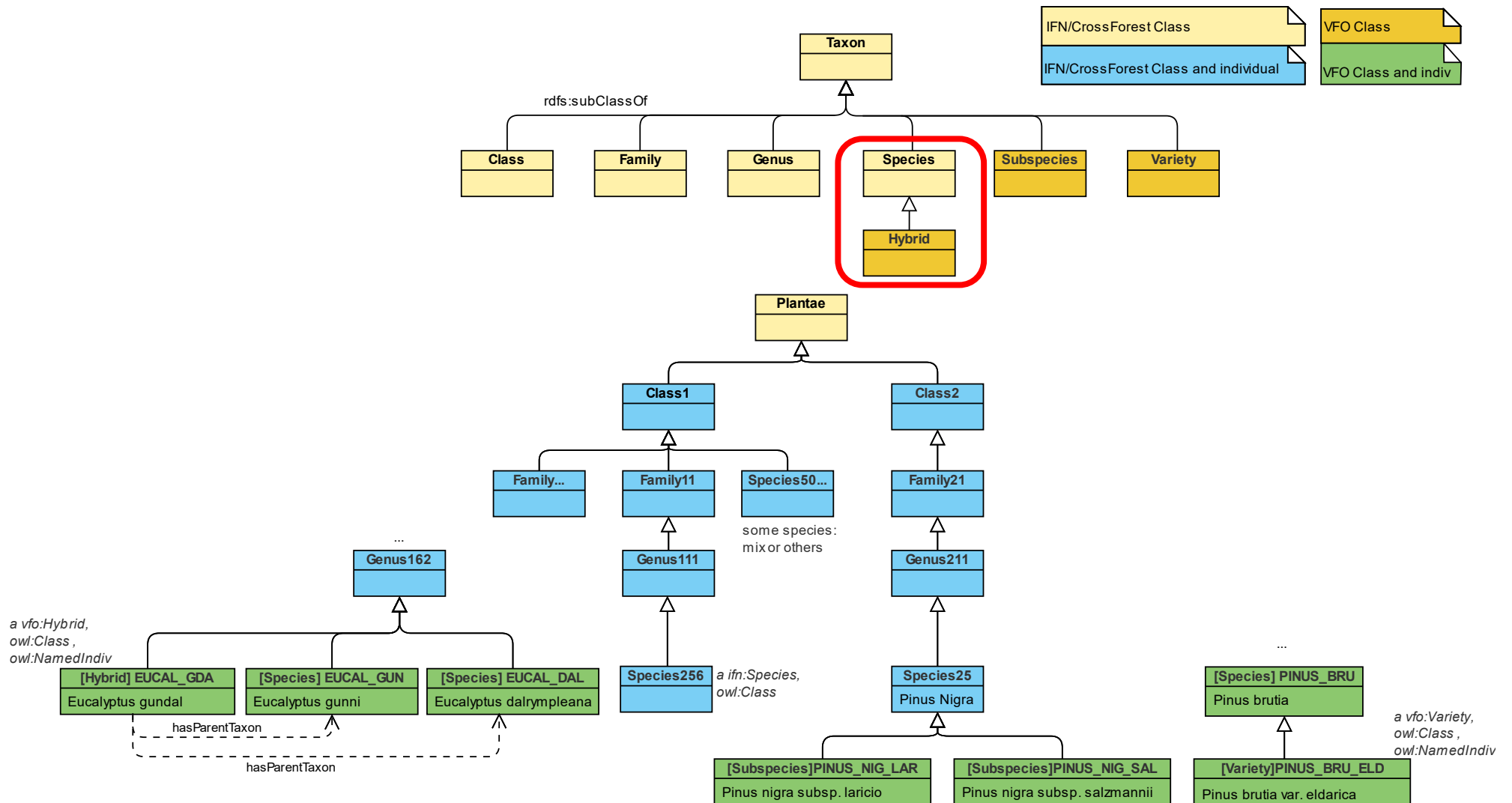
## ■ Species ontology

- Extension of the species ontology designed in Cross-Forest
- New species and genera (not native to Iberian forests)

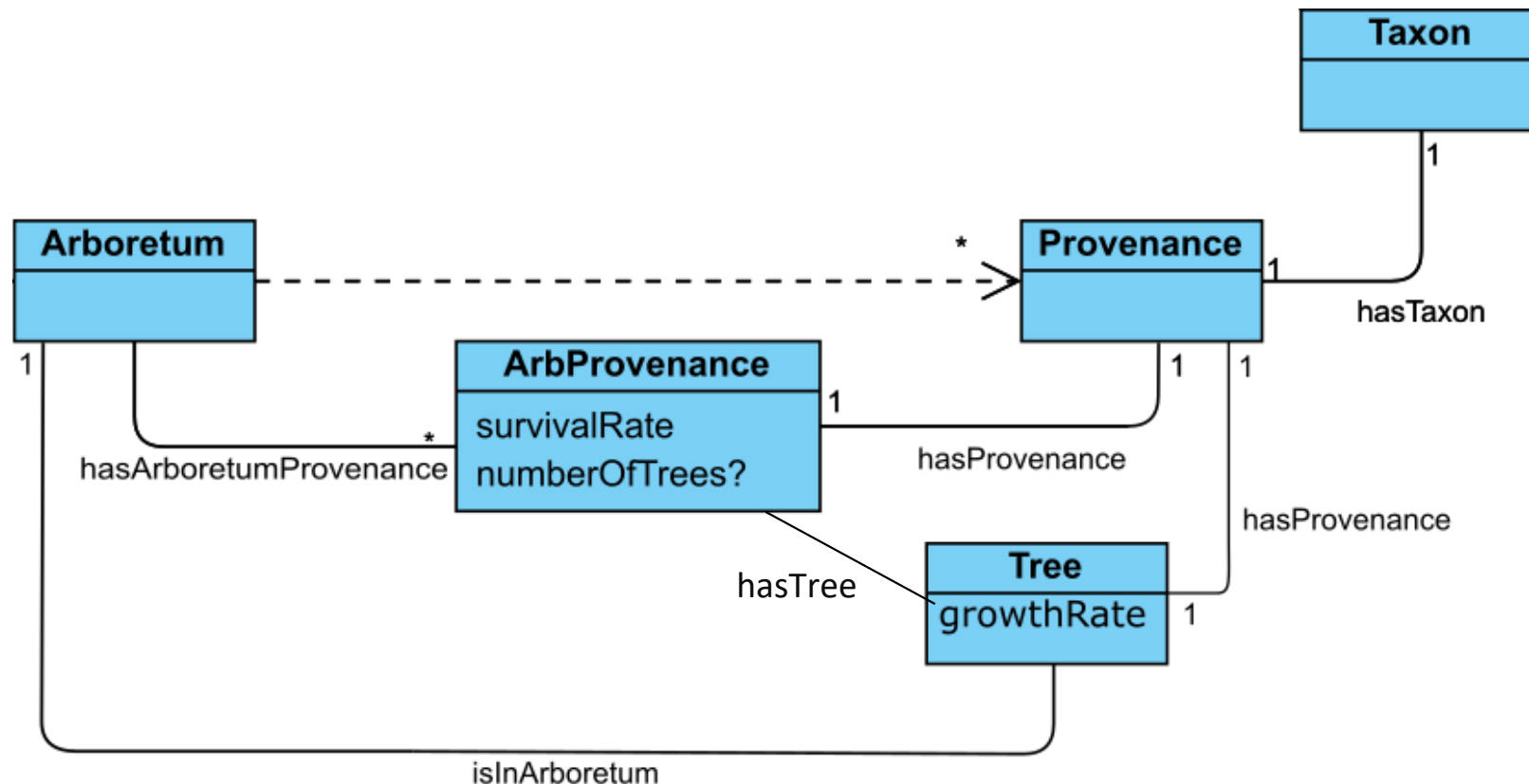
## ■ Measures ontology

- CentimetersPerYear, DegreesCelsius, etc.

# T4.1 Excerpt of the species ontology

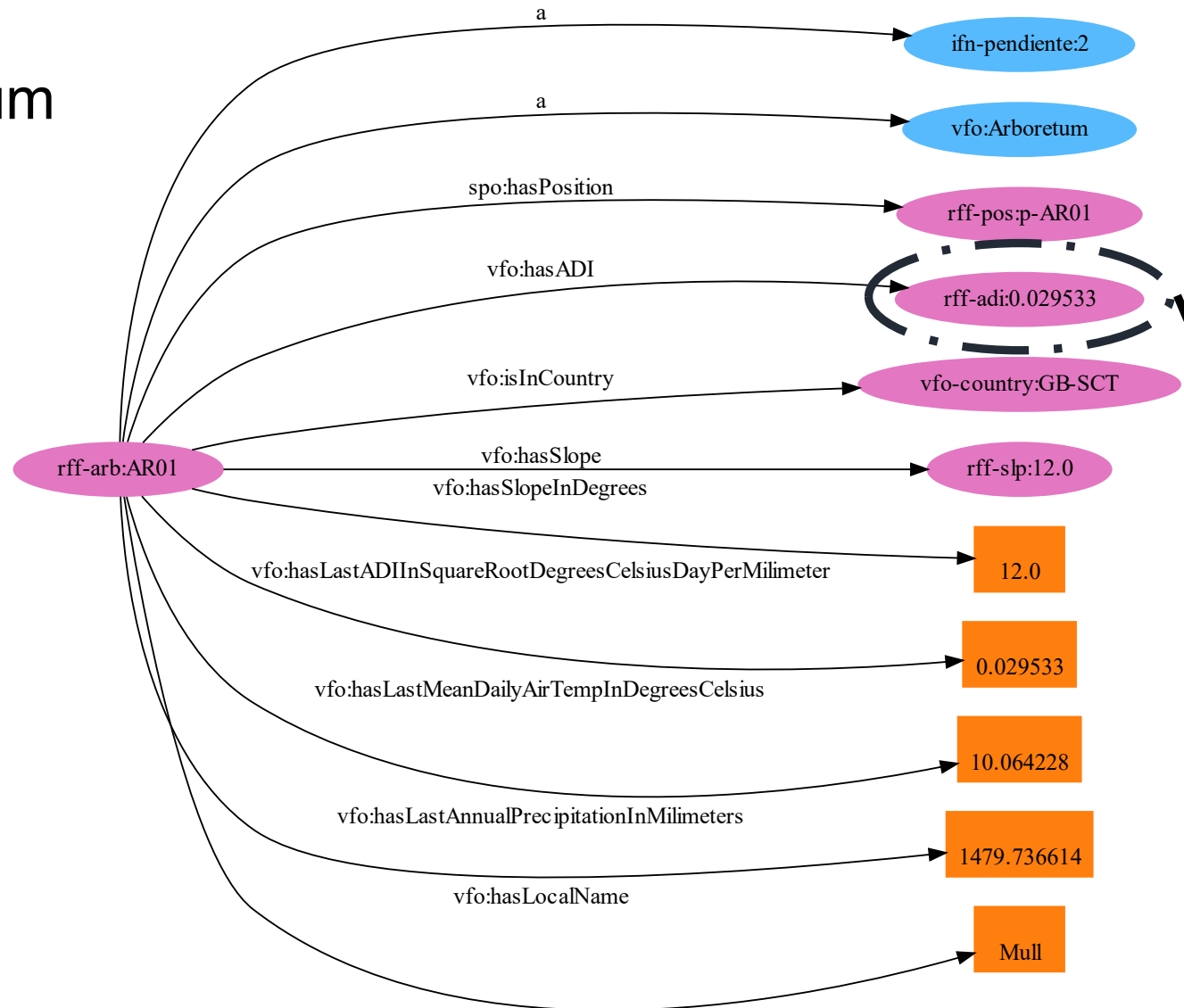


# T4.1 Excerpt of the Virtual Forests ontology



# T4.1 REINFFORCE conversion to LOD (1/3)

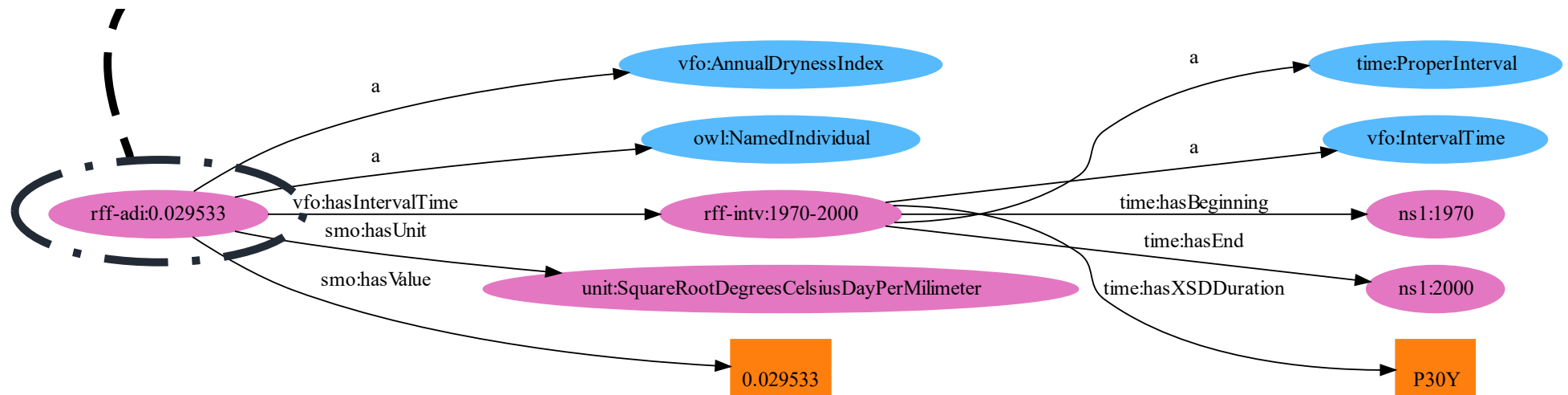
Mull arboretum





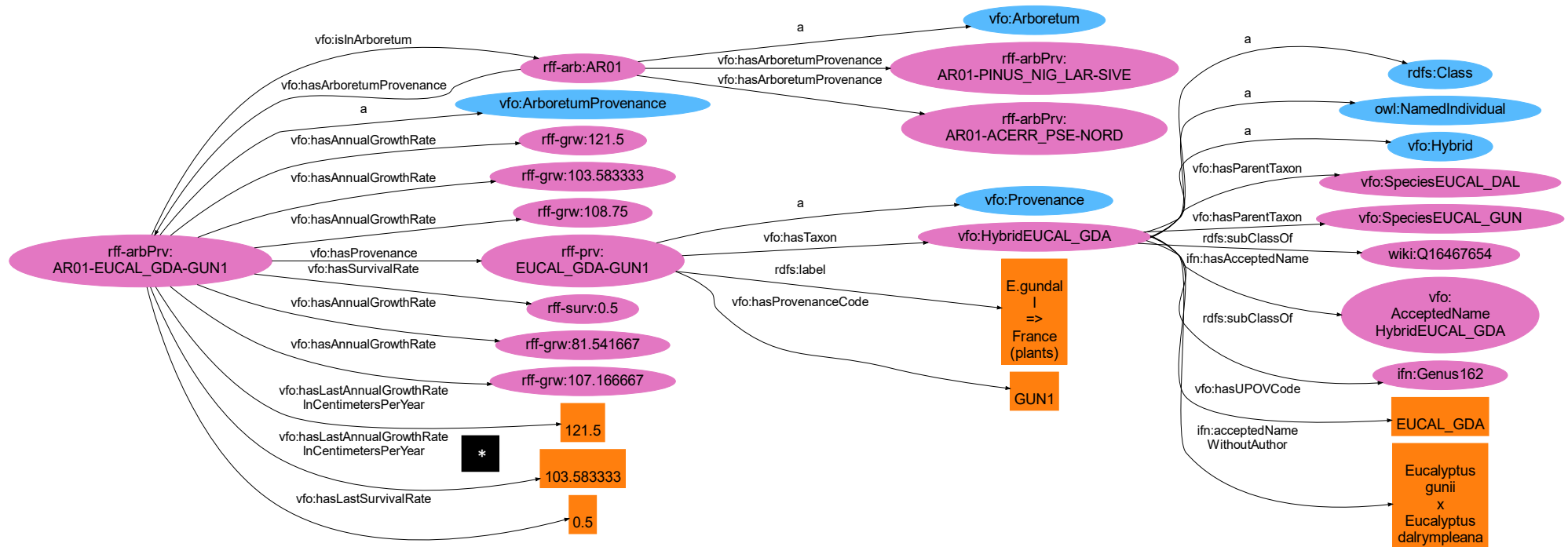
# T4.1 REINFFORCE conversion to LOD (2/3)

## Mull climatic data

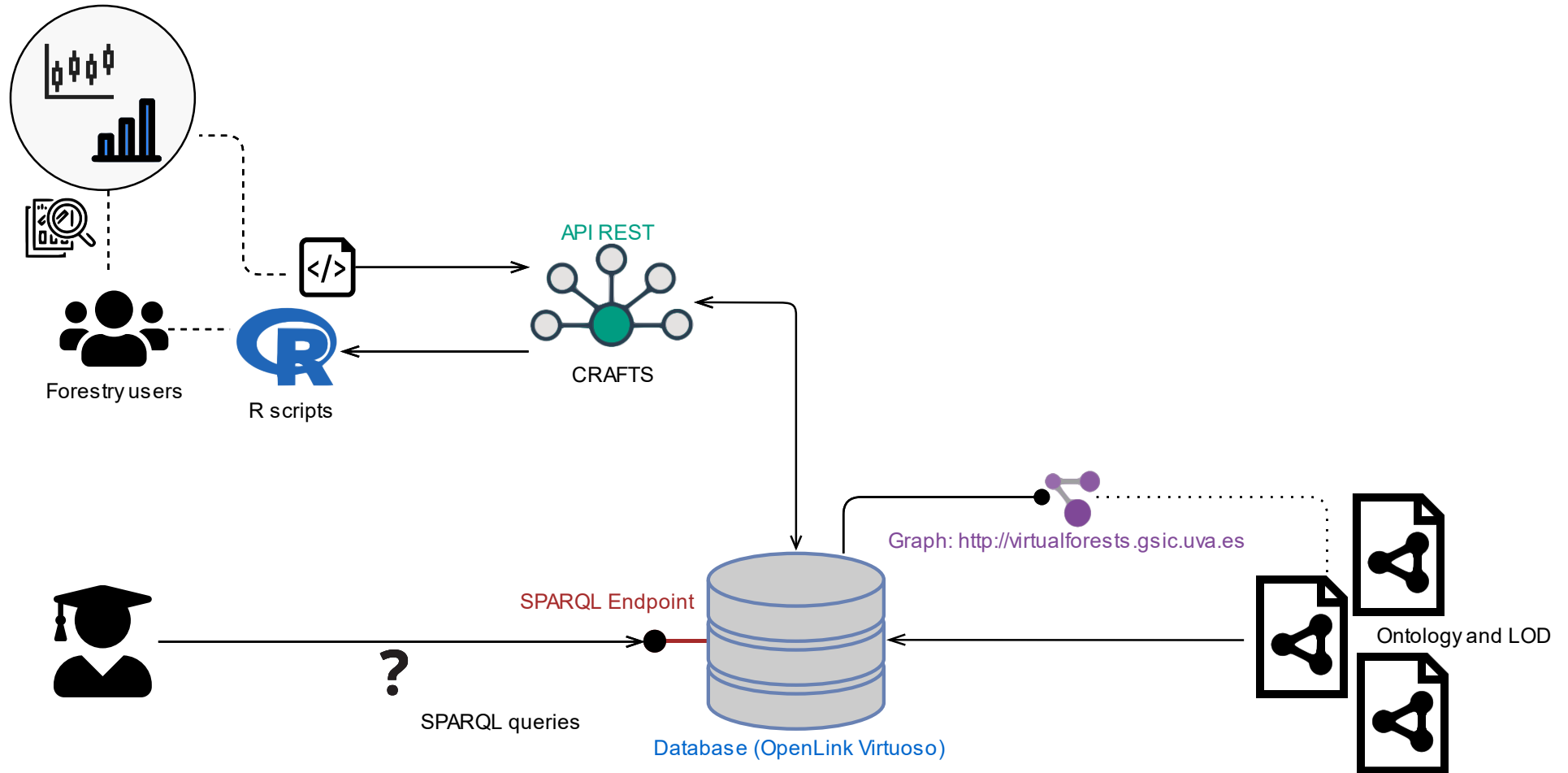


# T4.1 REINFFORCE conversion to LOD (3/3)

*Eucalyptus gundal* provenance data in Mull arboretum



# T4.1 Accessing REINFFORCE LOD



## T4.1 Querying the SPARQL endpoint (1/2)

- Get the arboreta with less than 12°C mean annual temperature

```
PREFIX vfo: <http://virtualforests.gsic.uva.es/>
SELECT ?arboretum ?name ?t_avg
WHERE {
    ?arboretum a vfo:Arboretum;
        vfo:hasLocalName ?name ;
        vfo:hasLastMeanAnnualTempInDegreesCelsius ?t_avg .
    FILTER(?t_avg <= 12)
}
ORDER BY ?t_avg
```

## T4.1 Querying the SPARQL endpoint (2/2)

- Get the arboreta with a survival rate of more than 90% for provenance "*Castanea Sativa* - MEDITERRANEE 741, France"

```
PREFIX vfo: <http://virtualforests.gsic.uva.es/>
PREFIX prov: <http://reinfforce.iefc.net/data/provenance/>
PREFIX smo: <http://crossforest.eu/measures/ontology/>
SELECT ?arboretum ?name ?surv_rate
WHERE {
    ?arboretum a vfo:Arboretum;
        vfo:hasLocalName ?name ;
        vfo:hasArboretumProvenance ?arbprinfo .
    ?arbprinfo vfo:hasProvenance prov:CASTA_SAT-MEDI ;
        vfo:hasSurvivalRate/smo:hasValue ?surv_rate .
    FILTER(?surv_rate >= 0.9)
}
ORDER BY DESC(?surv_rate)
```

## T4.1 Using the CRAFTS API (1/2)

- Get all the species in REINFFORCE

<https://crafts.gsic.uva.es/apis/virfor/query?id=taxa&type=https://datos.iepnb.es/def/sector-publico/medio-ambiente/ifn/Species>

- Get information about taxon *Castanea Sativa*

[https://crafts.gsic.uva.es/apis/virfor/resource?id=Taxon&iri=http://virtualforests.gsic.uva.es/SpeciesCASTA\\_SAT](https://crafts.gsic.uva.es/apis/virfor/resource?id=Taxon&iri=http://virtualforests.gsic.uva.es/SpeciesCASTA_SAT)

- Get all the provenances with taxon *Castanea Sativa*

[https://crafts.gsic.uva.es/apis/virfor/query?id=provenances&taxon=http://virtualforests.gsic.uva.es/SpeciesCASTA\\_SAT](https://crafts.gsic.uva.es/apis/virfor/query?id=provenances&taxon=http://virtualforests.gsic.uva.es/SpeciesCASTA_SAT)

## T4.1 Using the CRAFTS API (2/2)

- Get all the arboreta in REINFFORCE

<https://crafts.gsic.uva.es/apis/virfor/query?id=arboreta>

- Get the information about arboretum AR01

<https://crafts.gsic.uva.es/apis/virfor/resource?id=Arboretum&iri=http://reinfforce.iefc.net/data/arboretum/AR01>

- Get the information about provenance  
“*Castanea Sativa* - MEDITERRANEE 741,  
France” in arboretum AR01

[https://crafts.gsic.uva.es/apis/virfor/resource?id=ArbProvInfo&iri=http://reinfforce.iefc.net/data/arbProvenance/AR01-CASTA\\_SAT-MEDI](https://crafts.gsic.uva.es/apis/virfor/resource?id=ArbProvInfo&iri=http://reinfforce.iefc.net/data/arbProvenance/AR01-CASTA_SAT-MEDI)

# T4.1 Resources

## ■ GitHub repository

- <https://github.com/gsic-emic/VirtualForests>
- Ontologies
- RDF data
- Scripts and auxiliary programs => R script

## ■ SPARQL endpoint (querying)

- URL: <https://crossforest.gsic.uva.es/pruebas/sparql/>
- Graph: <http://virtualforests.gsic.uva.es/>

## ■ CRAFTS API

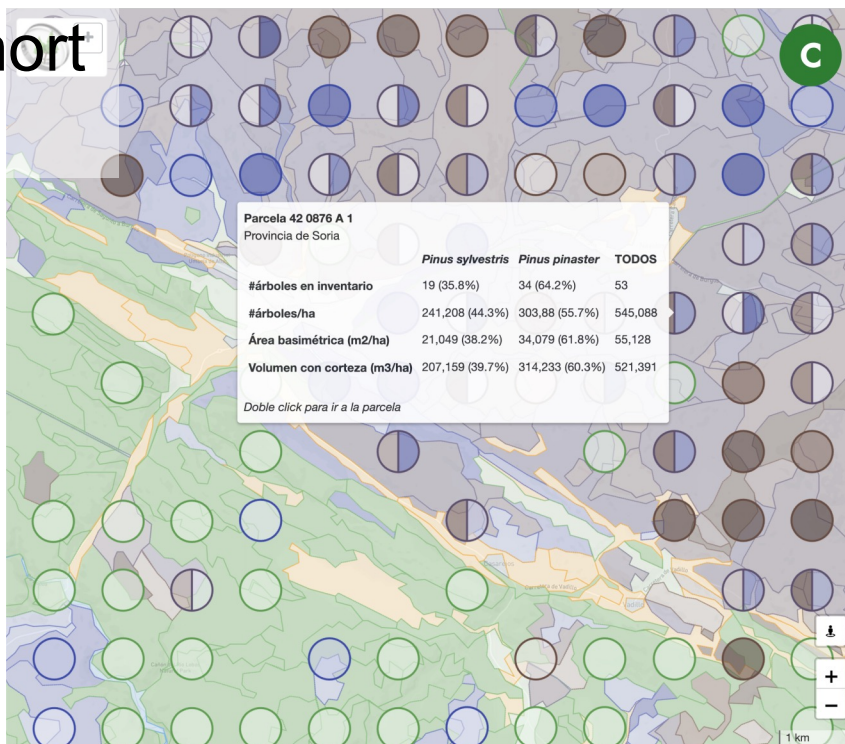
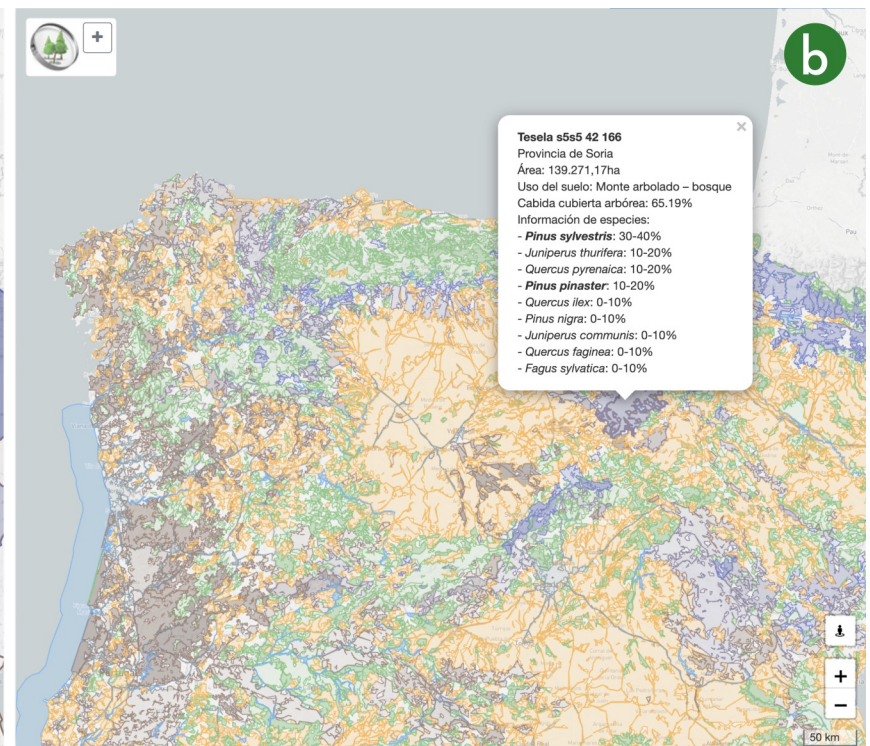
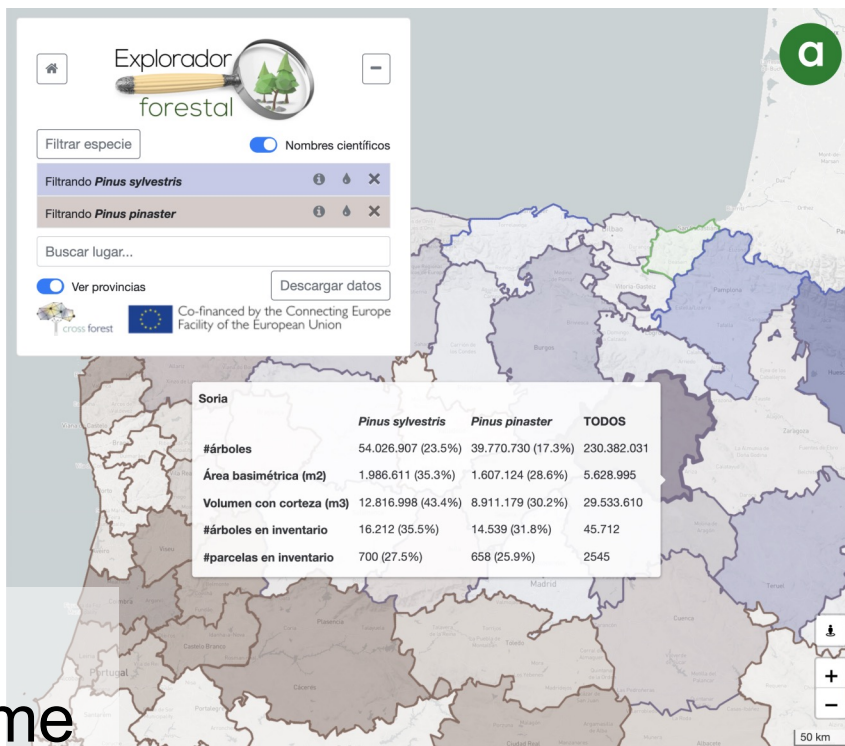
- <https://crafts.gsic.uva.es/apis/virfor>
- Guide for using the API (upon demand)



## T4.2 Adaptation of Forest Explorer

- Completed refactoring of Forest Explorer to simplify consumption of Linked Open Data
  - Forest Explorer can now browse forestry data from Portugal
- Resources
  - <https://forestexplorer.gsic.uva.es/>
  - Multiple papers, for example:
    - Vega-Gorgojo, G., Giménez-García, J.M., Ordóñez, C., Bravo, F. *"Pioneering Easy-to-Use Forestry Data with Forest Explorer"*, Semantic Web. 13(2):147-162, 2022

Do we  
have time  
for a short  
demo?



## T4.3 LOD extractor for SIMANFOR

- Published a CRAFTS API for accessing the Cross-Forest dataset
- Resources
  - <https://crafts.gsic.uva.es/apis/simanfor>
  - Guide for using this API (upon demand)



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