



➤ **Sixtine, PHIS des Systèmes  
d'Information pilotés par des ontologies**

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# Complex Data

## From various contexts

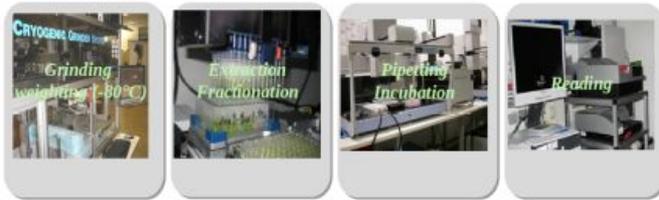
### « omics » Platforms

#### Various data complex types

Genomics

Composition and the structure of biopolymers

Quantification of metabolites and enzyme activities



### Field Platforms

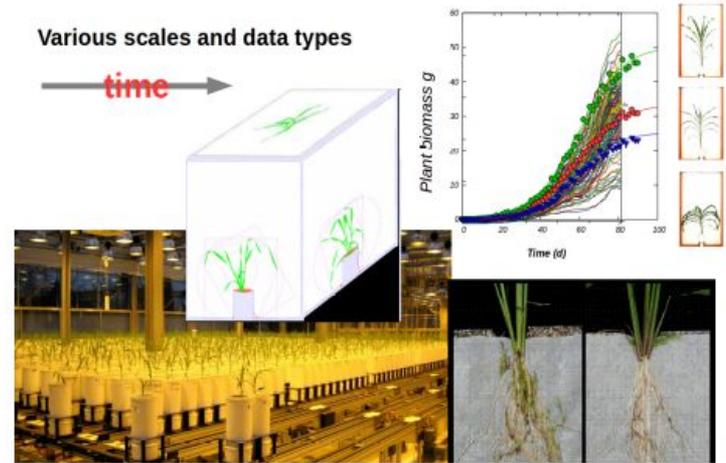
#### Various scales and data types

- Cell, organ, plant, population
- Images, hyperspectral, spectral, sensors, human readings...



### Green house Platforms

#### Various scales and data types



### Farm Platforms

#### Various scales and data types from thousands of farms

- organ, plant, population, site
- Images, sensors, human readings...



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# Structuring Data

**Structuring the data** enables to implement good practices:

- Make **FAIR data**
- **Flexible**
- Ability to allow **understanding (and reproduce) data processing**
- Ability to enforce DMP and Open Science

## → Identification

- Objects: plants, plots, experiments, sensors, events, etc
- Persistent, unambiguous, resolvable, globally unique

## → Naming Convention, Semantics and tagging (based on ontologie set)

- Controlled vocabulary
- Formalized relationships between entities
- Data annotation and enrichment



# Identification



URI of plant :  
<mp3:arch/2014/pl/000000012>

URI of pot :  
<mp3:arch/2001/pt/000001542>

URI of cabin :  
<mp3:arch/2010/ca/cabine2>

URI of camera :  
<mp3:arch/2011/ss/00003312>

URI of image :  
<mp3:arch/2015/im/000000564>



# Approach to Structuring

## → Ontology driven

**Scientific objects** (plant, plant organ, plot, etc.) are:  
Identified by **URI** standardized, unambiguous, shared, etc

**Events** (management, faults, meteo, etc)  
Identified by **URI**

**Variables, Documents, Observations, Software** are associated with  
these Objects and Events  
Identified by **URI**

**Organisation and linking of Objects and Events** → done with a controlled  
**semantic** (reference ontologies, vocabularies, thesaurus, taxonomies) and  
**application Ontologies** (**RDF\***, **OWL\***, **SKOS\***)

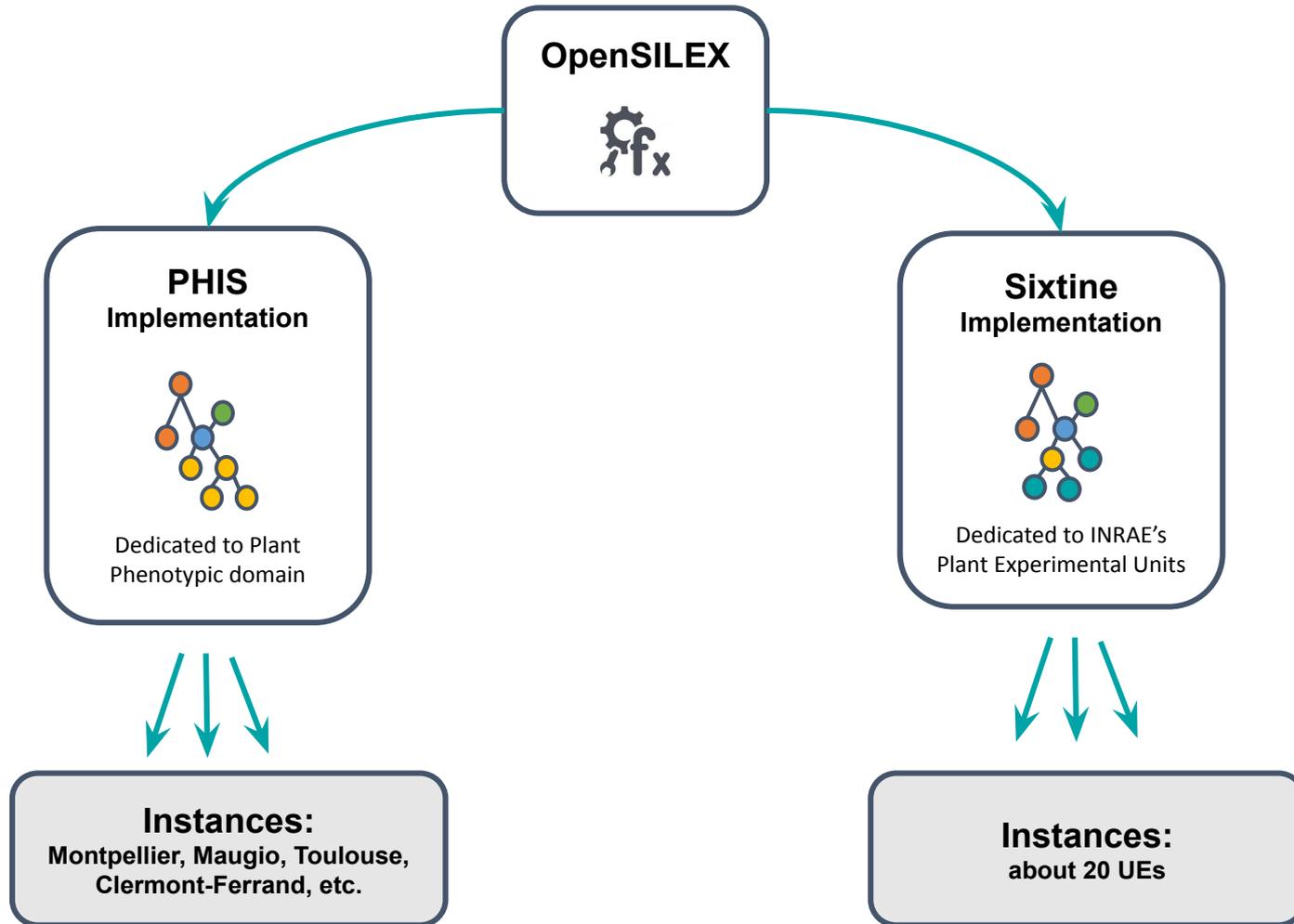
\* **Semantic Web Languages (W3C)**



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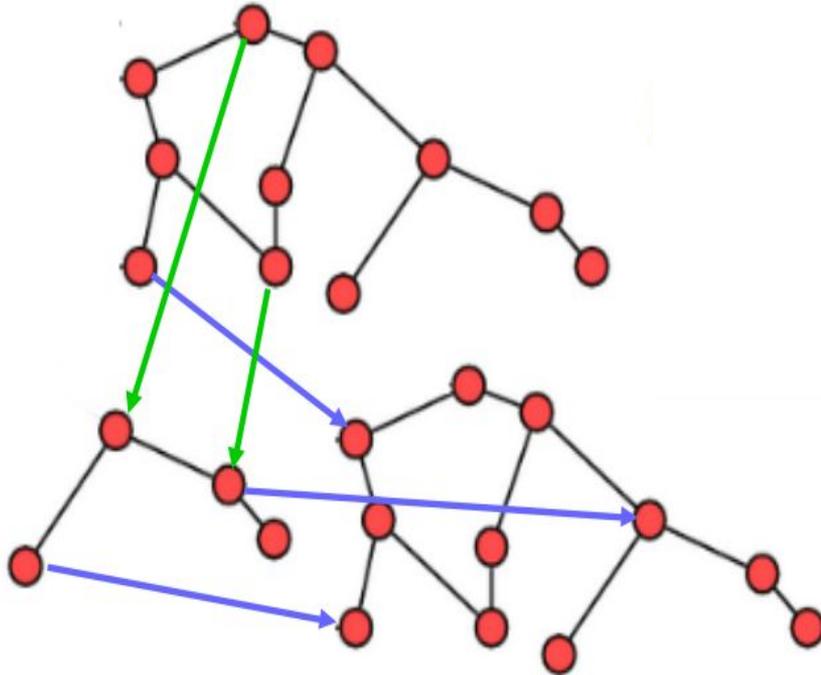
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# Sixtine, PHIS and OpenSILEX



# Ontology driven Information System

Driven by a set of ontologies



## Reference ontologies

(composition and specialisation relationships)

**Standard ontologies:** time, OA, DC, FOAF, etc.

**Upper ontologies:** Dolce and BFO

## Application ontologies

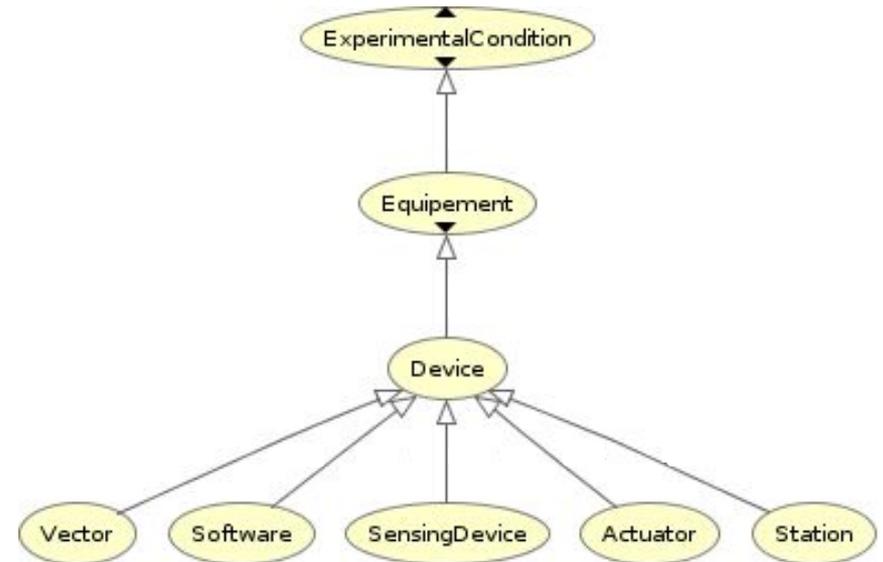
(specific relations of applications)

**Core ontology:** main concepts of OpenSILEX

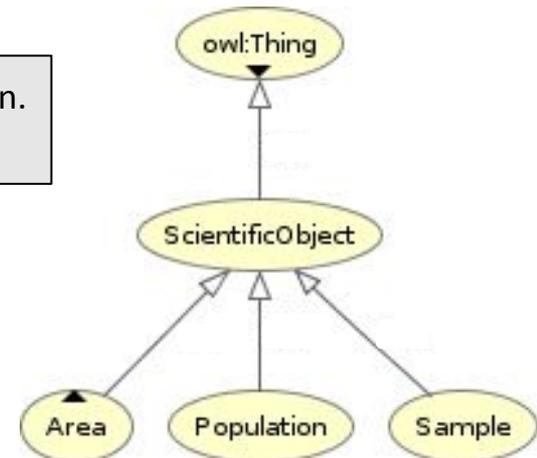
**Domain application ontology:** specific to a domain or a team

# Core ontology OESO

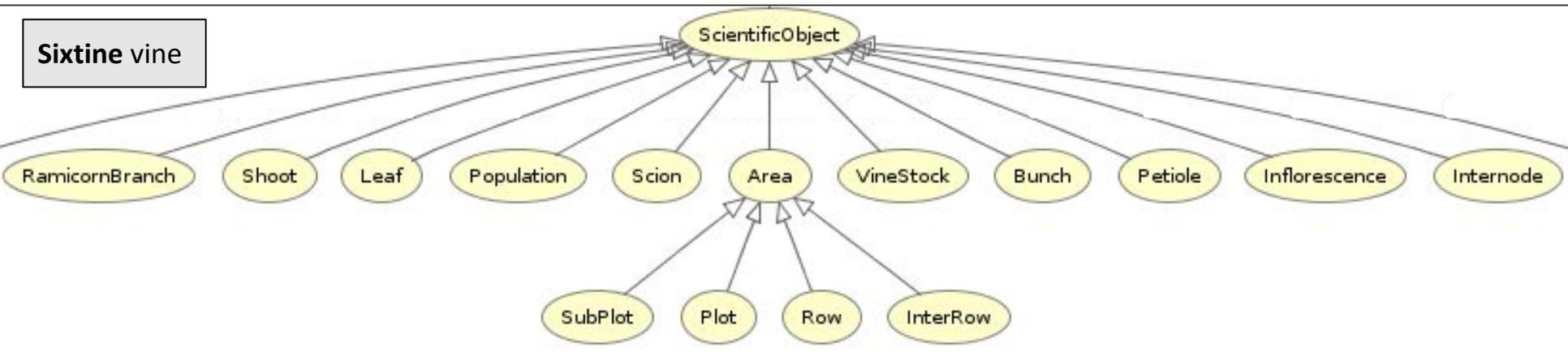
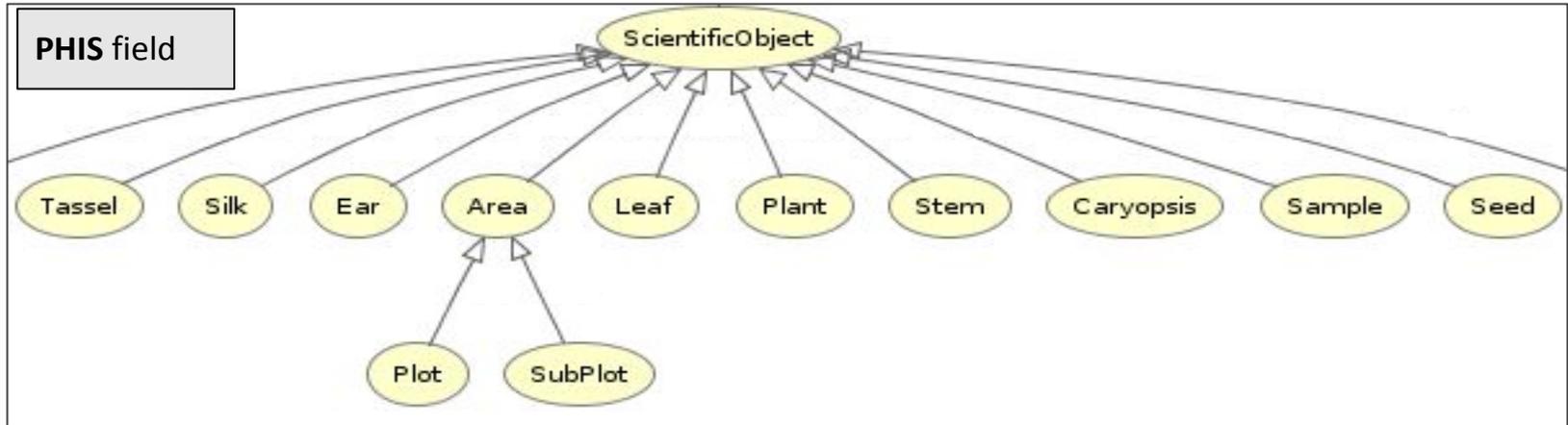
- owl:Thing
- Datafile
- Document
- Experiment
- ExperimentalCondition
- Equipment
- Factor
- Infrastructure
- Project
- Treatment
- foaf:Agent
- Germplasm
- prov:Activity
- prov:Agent
- prov:Entity
- Provenance
- rdf:Bag
- ScientificObject
- Trait
- VariableBase



Main Concepts use by the application.  
Some Concept can be extend



# Example: PHIS and Sixtine



# Example: PHIS and Sixtine

PHIS field

The screenshot displays the PHIS web interface for managing scientific objects. The top navigation bar includes the PHIS logo and a user profile for 'admin admin (Admin)'. The left sidebar provides access to various system components. The main area is titled 'Scientific Objects' and offers options to add new objects or import data from a CSV file. A form for creating or editing an object is visible, with fields for Name, Experiment, and Type. The Type dropdown menu is currently open, highlighting 'Plant'. Below the form is an 'Advanced Search' section. At the bottom, a table lists 'Selected Scientific Objects' with columns for Name, Destruction date, and Actions. The table shows two entries, each with a unique ID and a 'Plant' type.



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# Example: PHIS and Sixtine

Sixtine vine

The screenshot displays the Sixtine web application interface. At the top, there is a navigation bar with the Sixtine logo, language selection (English), and a Logout button. A left sidebar contains a navigation menu with categories like Scientific Organization, Scientific Information, Data, Vocabulary, and Administration. The main content area is titled 'Scientific Objects' and includes buttons for 'Add scientific object' and 'CSV Import'. Below this, there are input fields for 'Name' and 'Experiment', and a 'Type' dropdown menu. The 'Type' dropdown is open, showing a list of options: SubPlot (checked), Bunch, Inflorescence, InterRow, Internode, Leaf, Petiole, Plot, RamicornBranch, Rootstock, Row, and Scion. Below the dropdown, there is an 'Advanced Search' section with a 'Reset' button and a 'Search' button. At the bottom, there is a table titled 'Selected Scientific Objects' with 0 entries, and a table showing 2 entries: '56S-1' and '56S-2', both of type 'SubPlot'. Each entry has a checkbox and an 'Actions' menu with icons for view, edit, and delete.

Scientific Objects  
Manage and configure scientific objects

Dashboard / Scientific Objects

+ Add scientific object + CSV Import

Name: Enter name Experiment: Select one experiment Type: SubPlot x

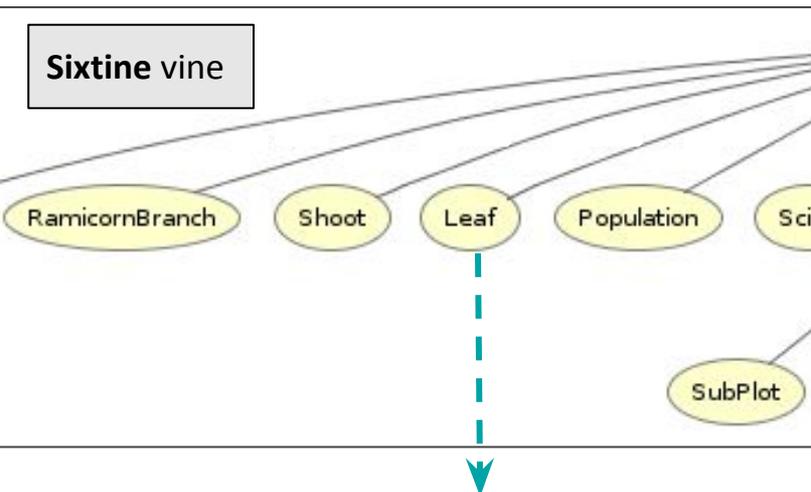
Advanced Search

Selected Scientific Objects 0 Actions + Export all

Showing 0 to 20 of 32 entries

<input type="checkbox"/>	Name	Type	Creation date
<input type="checkbox"/>	56S-1	SubPlot	
<input type="checkbox"/>	56S-2	SubPlot	

# Caracterise: use of restriction



**Class: Leaf**

SubClassOf:  
isPartOf some ScientificObject,  
hasGermplasm some Germplasm,  
**orientation some xsd:string,**  
hasCreationDate max 1 xsd:dateTime,  
hasDestructionDate max 1 xsd:dateTime

**Add scientific object**

Object URI ?

autogenerated URI

Name \*  
F256-AF

Type \*  
Leaf

Description

Orientation

Creation date  
MM/DD/YYYY

Destruction date  
MM/DD/YYYY

Facility  
Please select a facility

Germplasm  
Select a germplasm

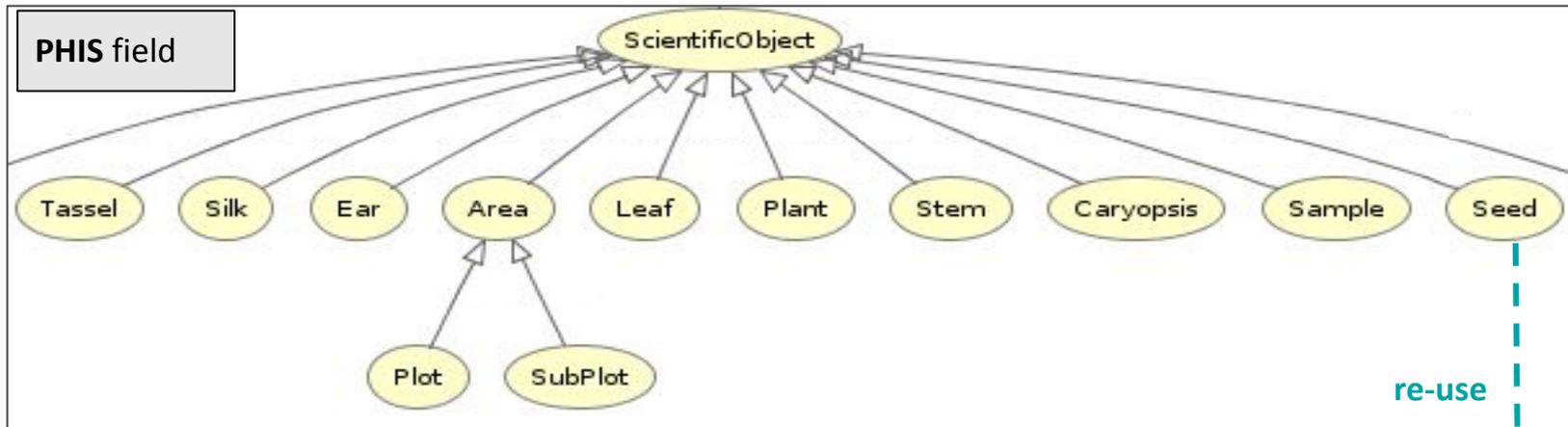
Parent



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# Relationship with others ontologies



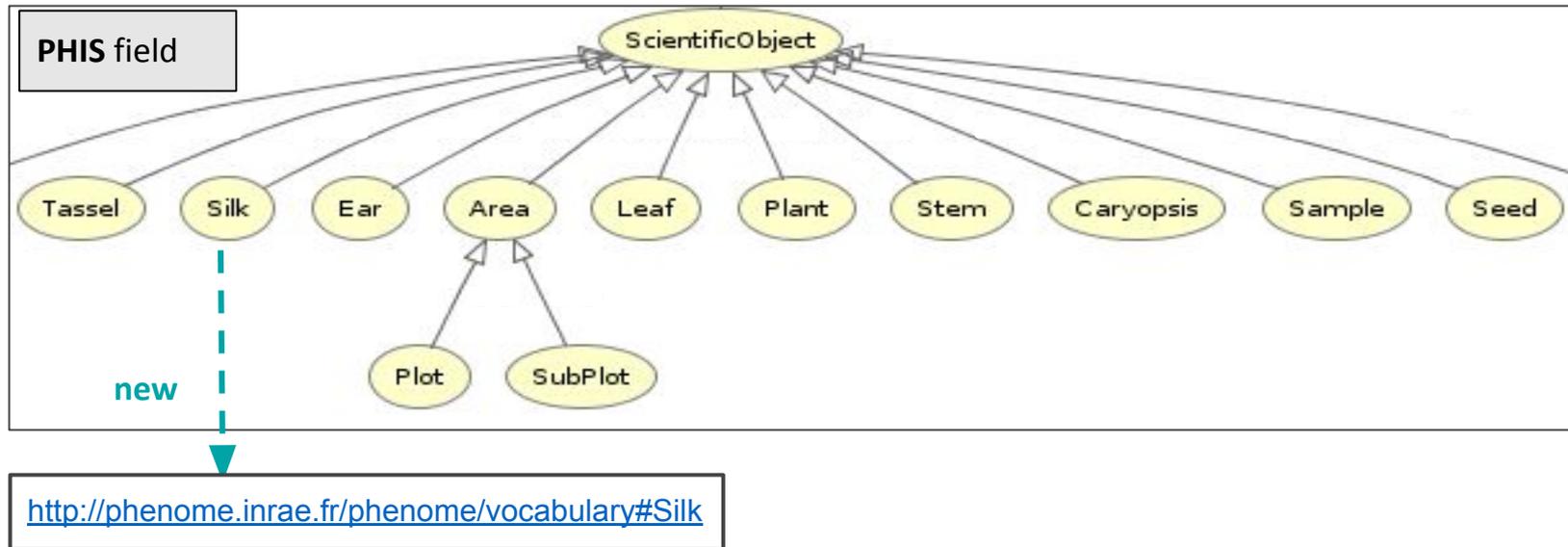
[http://purl.obolibrary.org/obo/PO\\_0009010](http://purl.obolibrary.org/obo/PO_0009010)

**en**  
A multi-tissue plant structure (PO:0025496) that develops from a plant ovule (PO:0020003) and has as parts a plant embryo (PO:0009009) enclosed in a seed coat (PO:0009088). A seed generally....

**fr**  
Structure végétale multitissulaire (PO:0025496) qui se développe à partir d'un ovule végétal (PO:0020003) et a comme partie un embryon végétal (PO:0009009) enfermé dans un tégument (PO:0009088). Une graine se développe....



# Relationship with others ontologies



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# Relationship with others ontologies

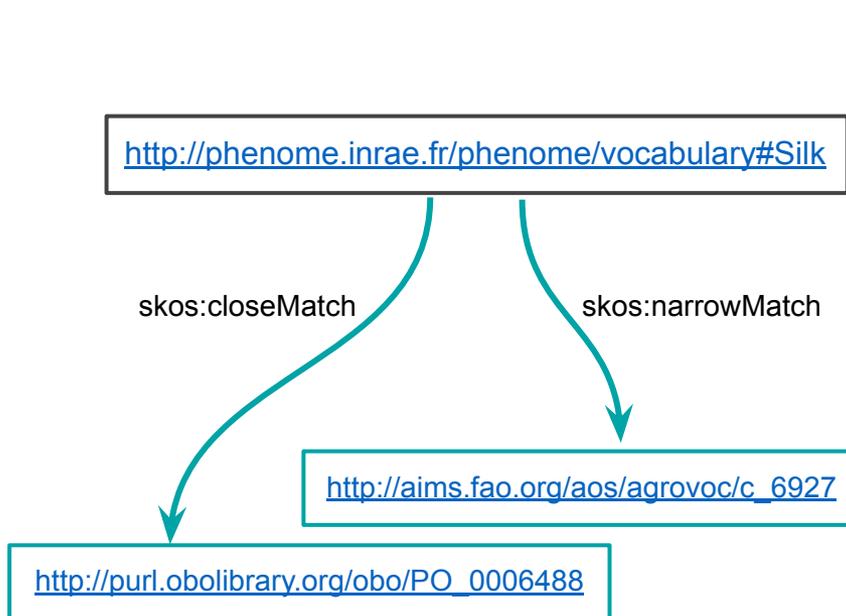
## SKOS

Semantic relations provide ways to declare **relationship** between concepts

### Mapping properties:

broaderMatch, narrowMatch, relatedMatch, closeMatch; exactMatch, etc.

**OpenSILEX**: main concepts, Variables, Factor, etc.



The screenshot shows the "Interoperability References" interface. The main heading is "Interoperability References" with a close button (X). Below it, the text says "Add references to `test:set/variables#variable.air_temperature_thermocouple_degree-celsius`".

On the left, under "Reference ontologies", there is a list of ontologies:

- AGROPORTAL
- AGROVOC
- BioPortal
- Crop Ontology
- Plant Ontology
- Planteome
- Units of measurement ontology (UO)
- Units of Measure (OM)
- QUDT Ontologies (QUDT)
- XML/XSD Datatype Schemas

On the right, there are two input fields:

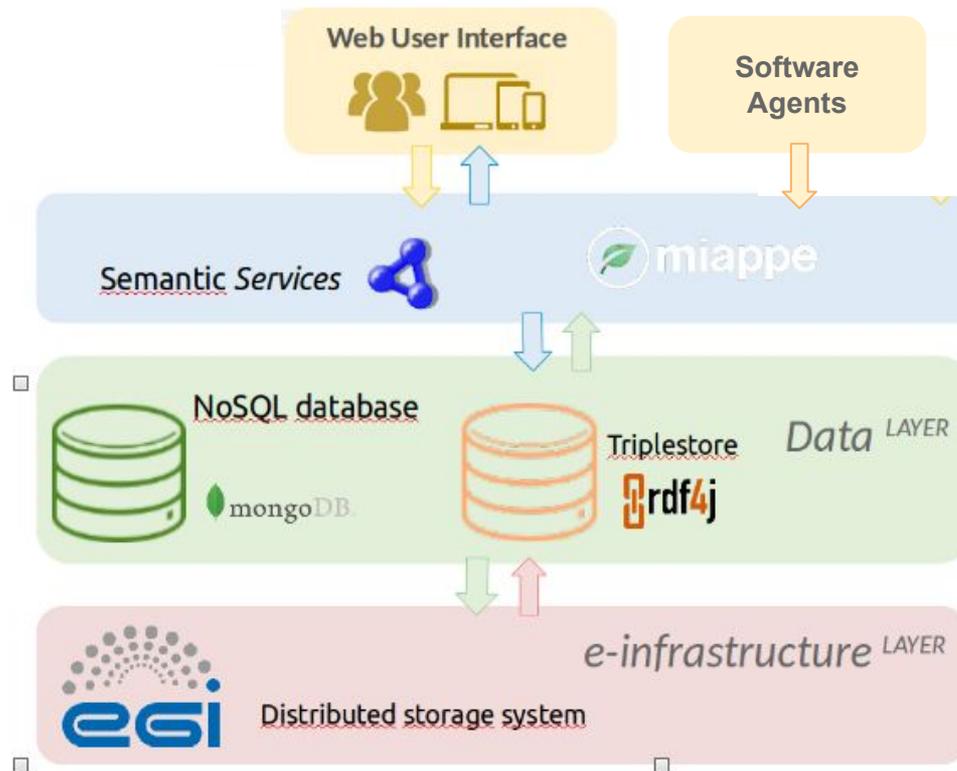
- "Relations" with a dropdown menu showing "Exact match".
- "Reference URI" with a text input field containing `http://aims.fao.org/aos/agrovoc/c_8332`.

Below these fields is a green "Add references" button.

At the bottom of the interface, it says "No reference available".

# Main Technologies

- JSON
  - MongoDB
  - Web Services
  - Semantic Web
- 
- Vue.JS
  - Docker
  - Apache Tomcat
  - EGI Services
- 
- Languages JAVA, JavaScript



# Questions ?



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