



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

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Complex Data

From various contexts

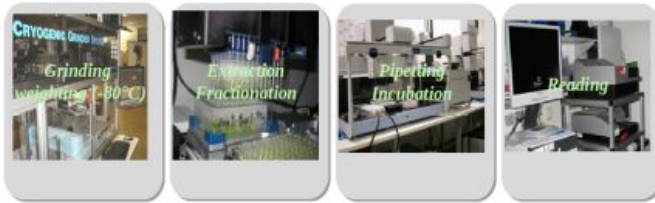
« omics » Platforms

Various data complex types

Genomics

Composition and the structure of biopolymers

Quantification of metabolites and enzyme activities



Field Platforms

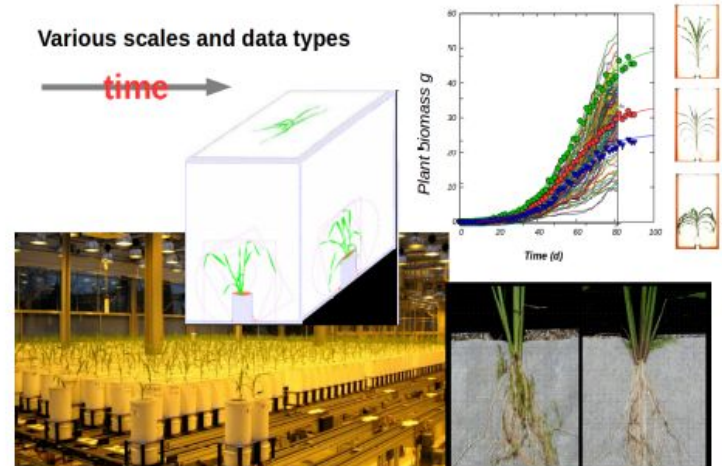
Various scales and data types

- 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***)

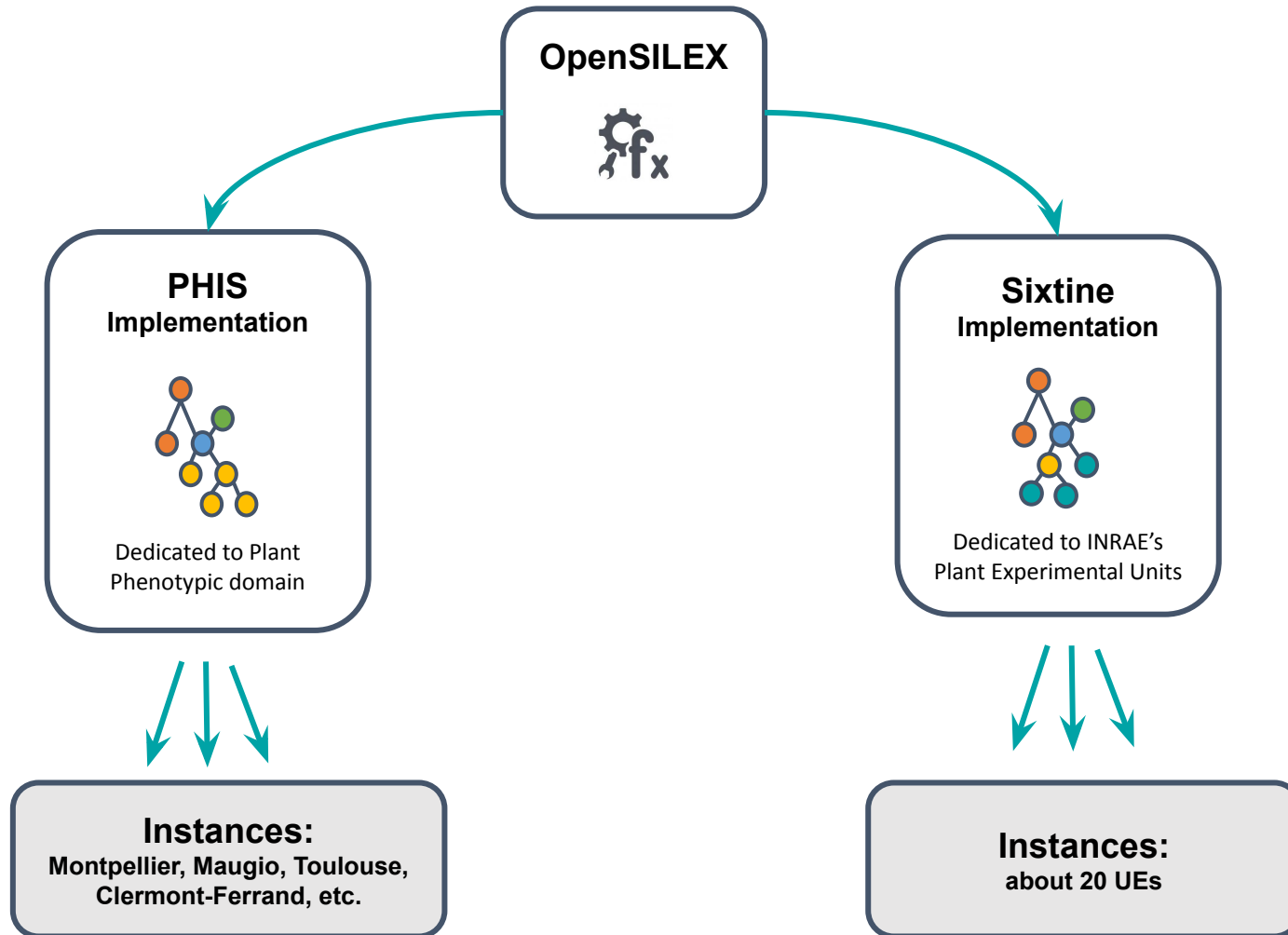
* **Semantic Web Languages (W3C)**



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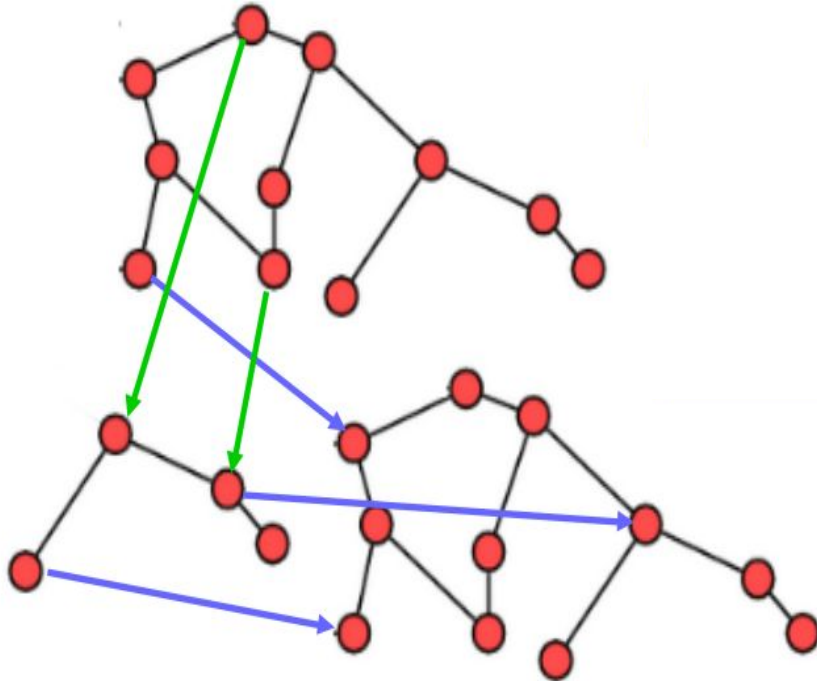
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Sixtine, PHIS and OpenSILEX



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

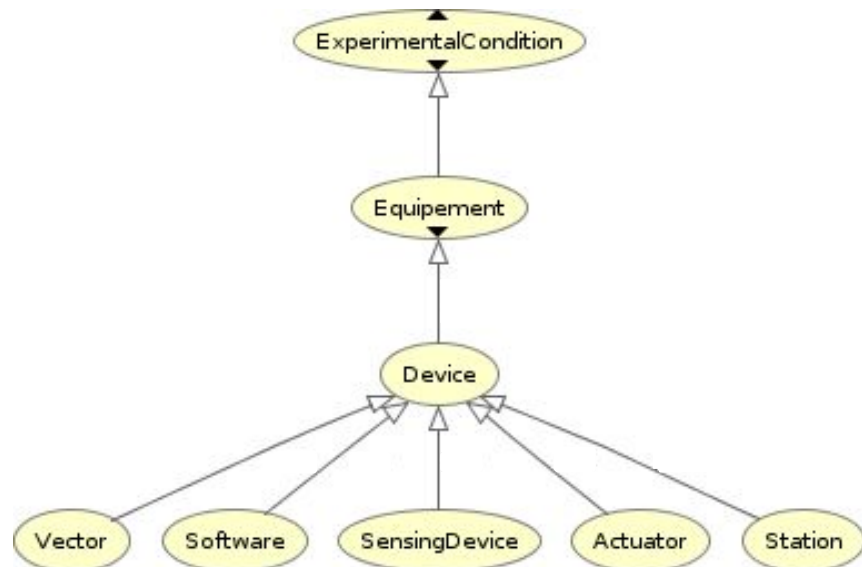
(specific relations of applications)

Core ontology: main concepts of OpenSILEX

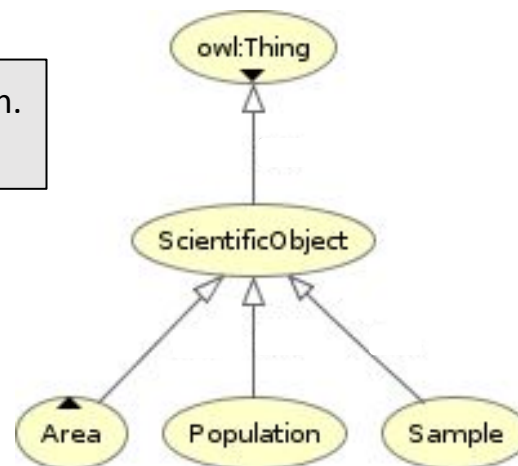
Domain application ontology: specific to a domain or a team

Core ontology OESO

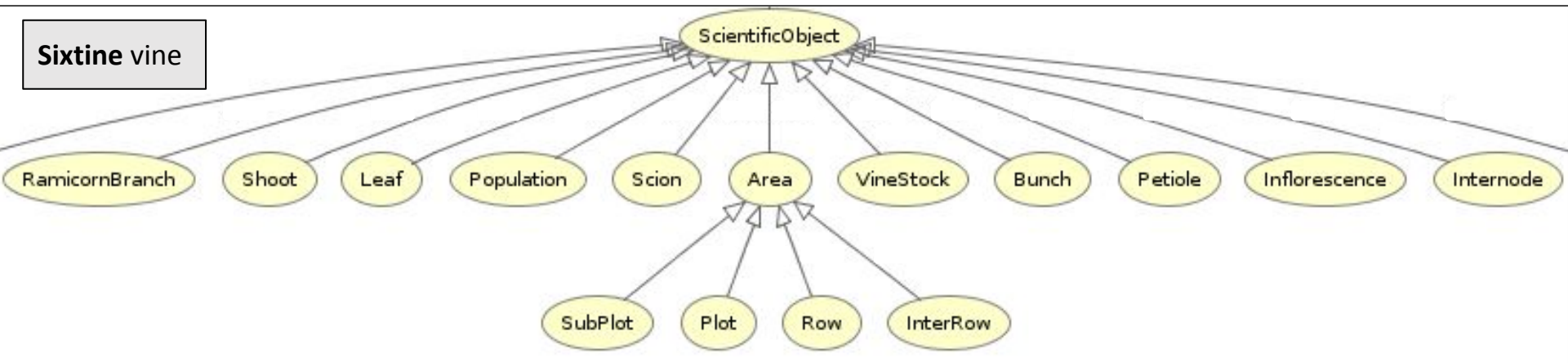
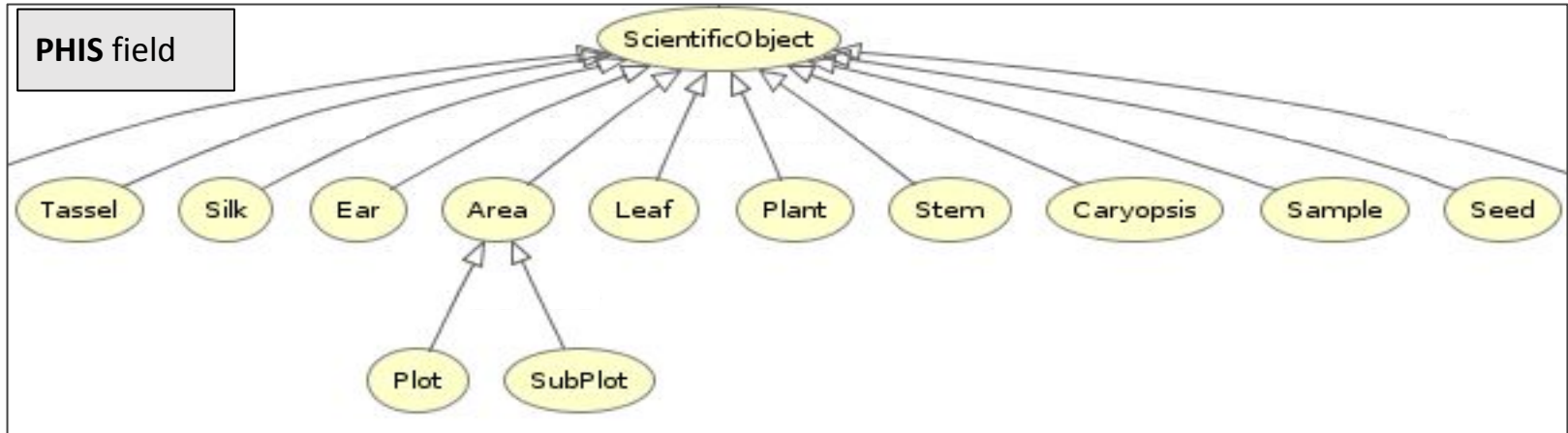
- owl:Thing
- Datafile
- Document
- Experiment
- ExperimentalCondition
- Equipment
- Factor
- Infrastructure
- Project
- Treatment
- foaf:Agent
- Germplasm
- prov:Activity
- prov:Agent
- prov:Entity
- Provenance
- rdf:Bag
- ScientificObject
- Trait
- VariableBase



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



Example: PHIS and Sixtine



Example: PHIS and Sixtine

PHIS field

PHIS X

English ▼ admin admin (Admin) ▼

Scientific Objects
Manage and configure scientific objects

Dashboard / Scientific Objects

+ Add scientific object + CSV Import

Name: Enter name Experiment: Select one experiment Type: Plant x |

Advanced Search

Selected Scientific Objects 0 Actions + Export

Showing 0 to 20 of 1,696 entries

<input type="checkbox"/>	Name	Destruction date	Actions
<input type="checkbox"/>	0001/DH_KE0639/WVP19-19620/WW/ELOPE/3/01_01/ARC...		<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
<input type="checkbox"/>	0001/DZ_PG_47/ZM4362/WD/Veg_1/01_01/ARCH2017-03-30		Plant <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>

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: Scientific Organization (Organization, Projects, Experiments, Devices, Events), Scientific Information (Variables, Germplasm, Documents, Scientific Objects), Data (Provenances, Tabular Data, Data files), Vocabulary (Facilities types, Scientific object types, Device object types, Event types), and Administration (Users, Groups, Profiles, System). Tools and Packages are also listed.

The main content area is titled "Scientific Objects" with the subtitle "Manage and configure scientific objects". It includes a breadcrumb trail: Dashboard / Scientific Objects. Below the title are two buttons: "+ Add scientific object" and "+ CSV Import".

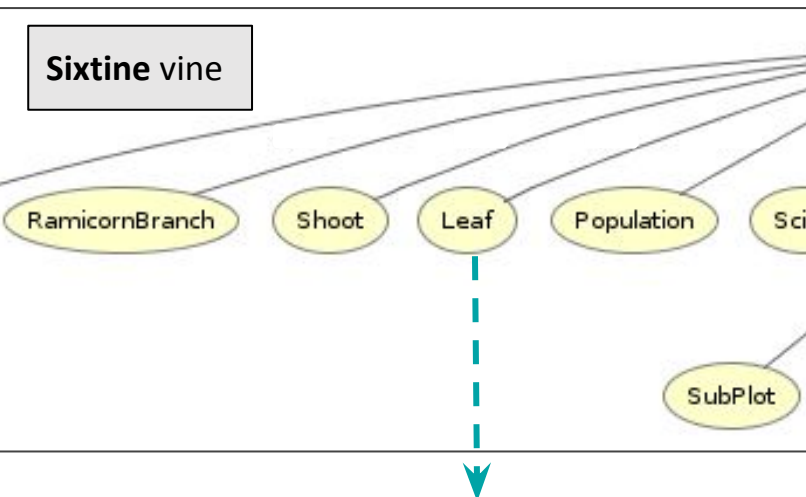
The "Advanced Search" section features three input fields: "Name" (with a placeholder "Enter name"), "Experiment" (with a dropdown "Select one experiment"), and "Type" (with a dropdown menu open). The "Type" dropdown menu lists various scientific object types: SubPlot (checked), Bunch, Inflorescence, InterRow, Internode, Leaf, Petiole, Plot, RamicornBranch, Rootstock, Row, and Scion.

Below the search fields, there is a "Selected Scientific Objects" section showing 0 objects. A table displays the results, with columns for Name, Type, and Creation date. The table shows two entries:

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

Each row in the table has an "Actions" column with icons for view, edit, and delete. A "Reset" button and a "Search" button are also visible.

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

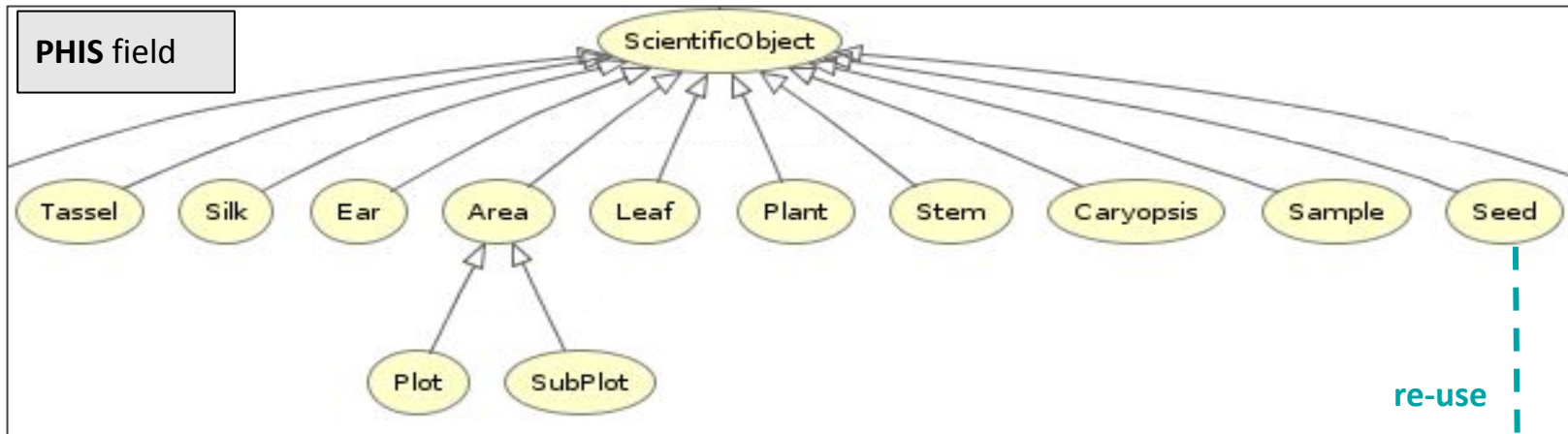
Parent



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Relationship with others ontologies



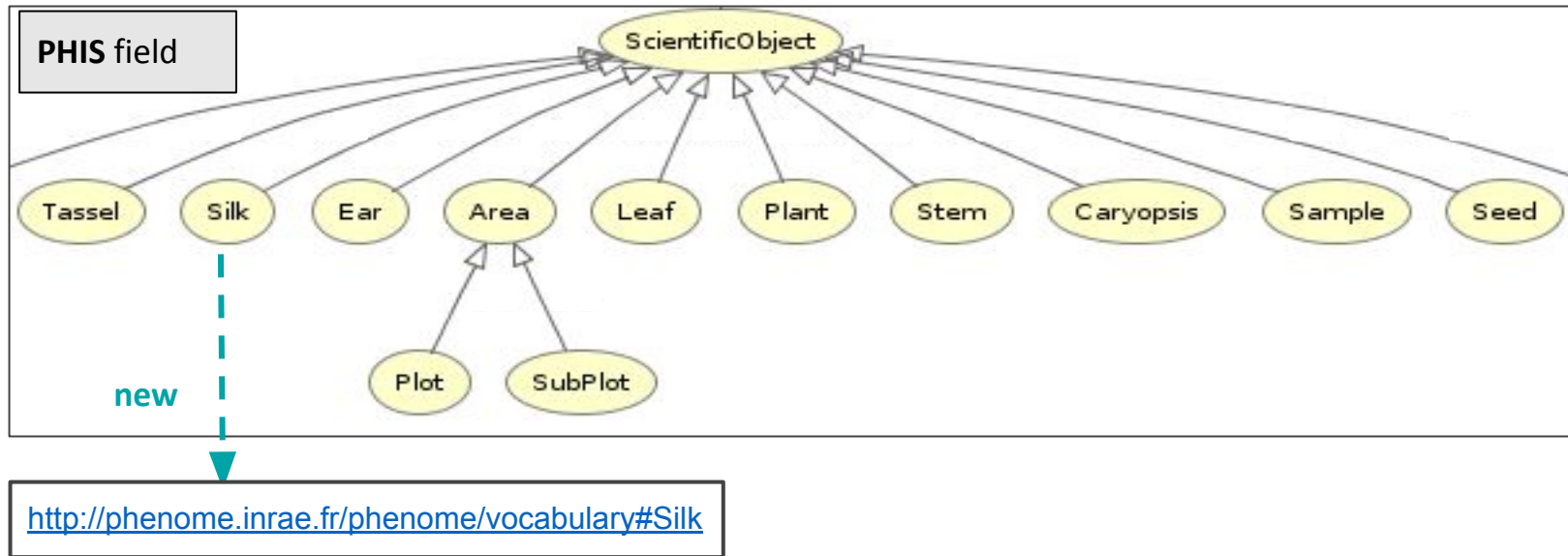
http://purl.obolibrary.org/obo/PO_0009010

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

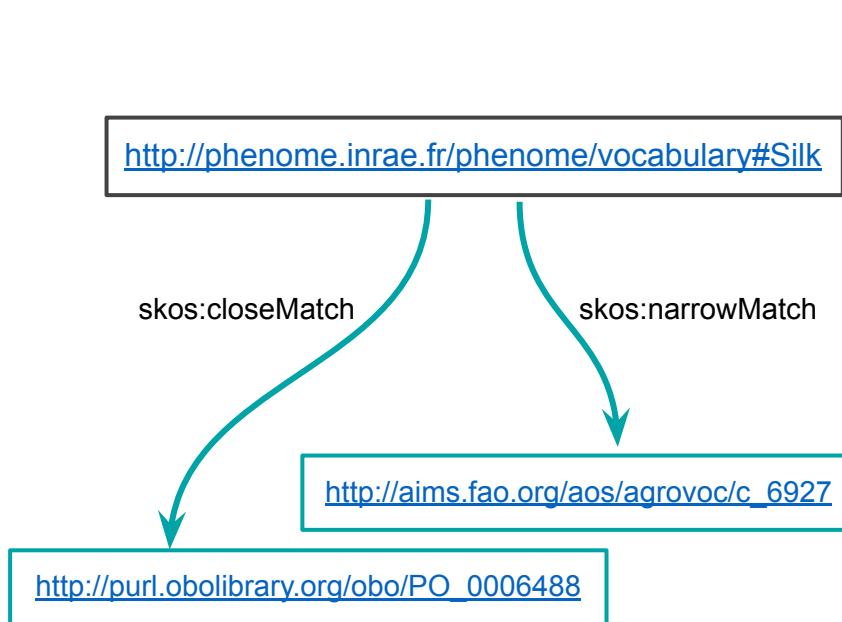
SKOS

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

Mapping properties:

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

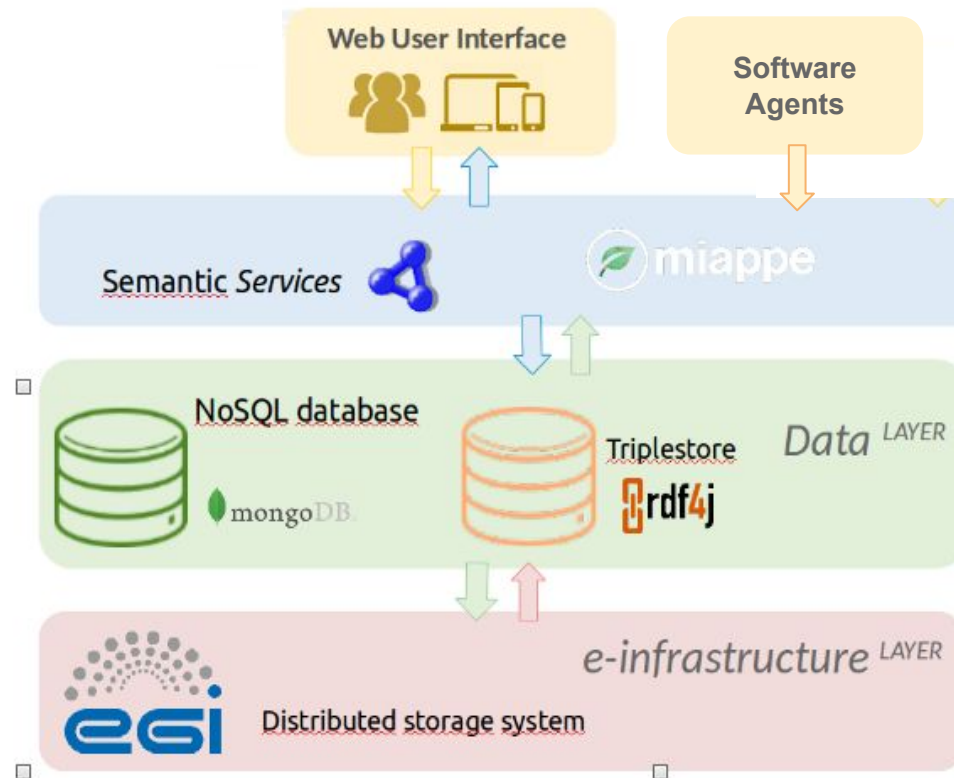
OpenSILEX: main concepts, Variables, Factor, etc.



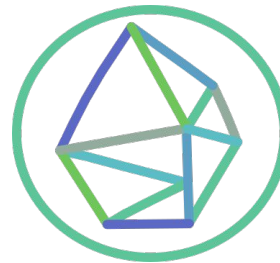
The screenshot shows the 'Interoperability References' interface. The title bar reads 'Interoperability References'. Below the title bar, it says 'Add references to `test:set/variables#variable.air_temperature_thermocouple_degree-celsius`'. There is a section for 'Reference ontologies' with a list of options: AGROPORTAL, AGROVOC, BioPortal, Crop Ontology, Plant Ontology, Planteome, Units of measurement ontology (UO), Units of Measure (OM), QUDT Ontologies (QUDT), and XML/XSD Datatype Schemas. To the right, there is a 'Relations' dropdown menu set to 'Exact match' and a 'Reference URI' 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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