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Semantic Web in Libraries 2013
25 - 27 November 2013
Hamburg, Germany

AgriVIVO
A Global Ontology-Driven RDF Store Based on a Distributed Architecture

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*Global Forum on Agricultural Research

^Cornell University

~Food and Agriculture Organization of the UN

Contents

- What we wanted to do
- Why we chose VIVO*
- How we adapted VIVO and built AgriVIVO
  - Ontology
  - Importers
  - Search interface
- Future plans

** VIVO is a research discovery tool based on semantic technologies initially developed at Cornell University and now an incubator project under DuraSpace.org*

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What we wanted to do

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What is “we”

The Global Forum on Agricultural Research (GFAR)

“Agricultural Knowledge for All” program:

a set of activities to improve information and communications management in agricultural research for development (ARD)

Cornell University

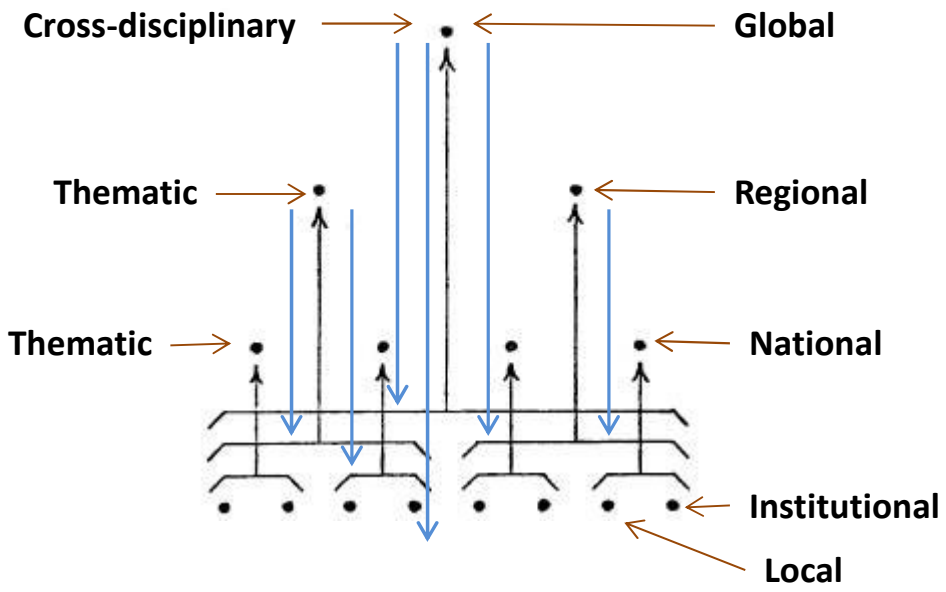
Initiator of VIVO

Food and Agriculture Organization (FAO) of the UN

In particular, the Agricultural Information Management Standards team

The scope of GFAR's data projects

- Data source scope: global, cross-disciplinary (within ARD)
- Use and application: local, regional, global, thematic



• data

↑ providing data

↓ retrieving data for use

What we wanted to achieve

- More effective collaborative research and networking across countries and regions
- Facilitating capacity strengthening and networking of skills

- Fostering collaboration and synergy through greater awareness of ongoing research
- Reducing duplication of research
- Determining strategic trends based on strengths and weaknesses of the network
- Identifying missing expertise

Whom we wanted to support

We wanted to help researchers, research managers, practitioners as well as decision makers to identify / discover:

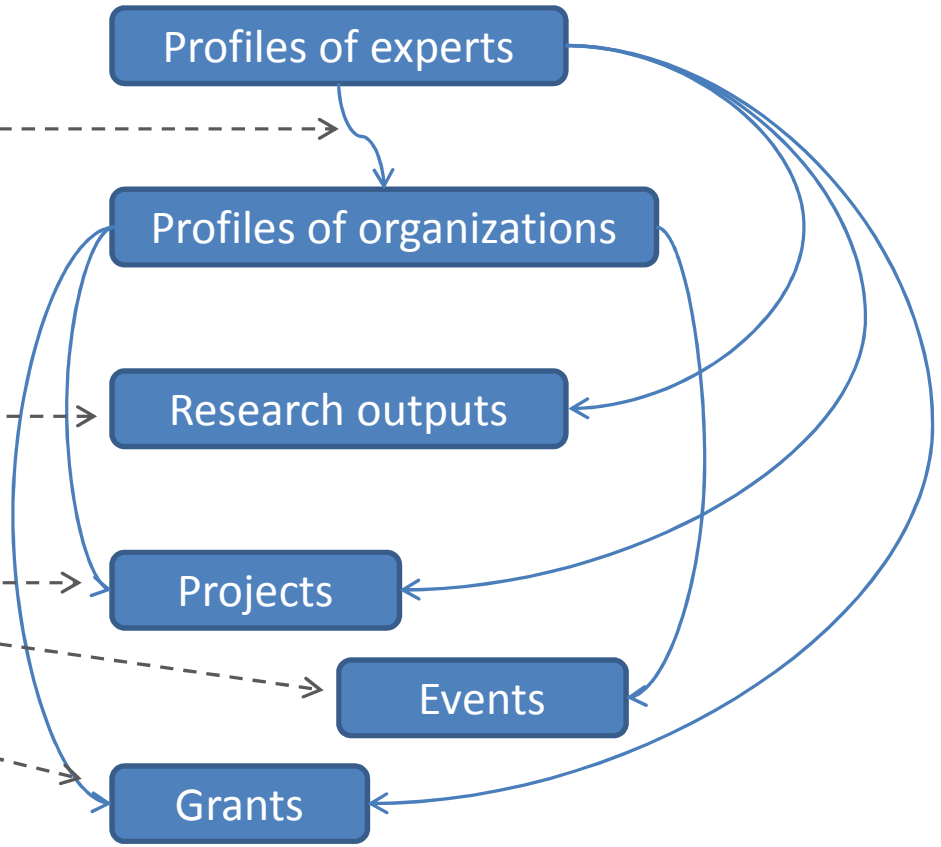
- *their potential best collaborators all over the world for a project*
- *a person with an answer to their question*
- *an organization running a project on a specific area of research*
- *an organization funding projects in a specific area of research*
- *all the publications written by a potential collaborator*
- *numbers or geographic distribution of available competencies or ongoing projects*

How?

*The **connections** between you and your potential collaborators can take many forms. They usually follow the well-understood* ***patterns of affiliation publication participation and funding.***

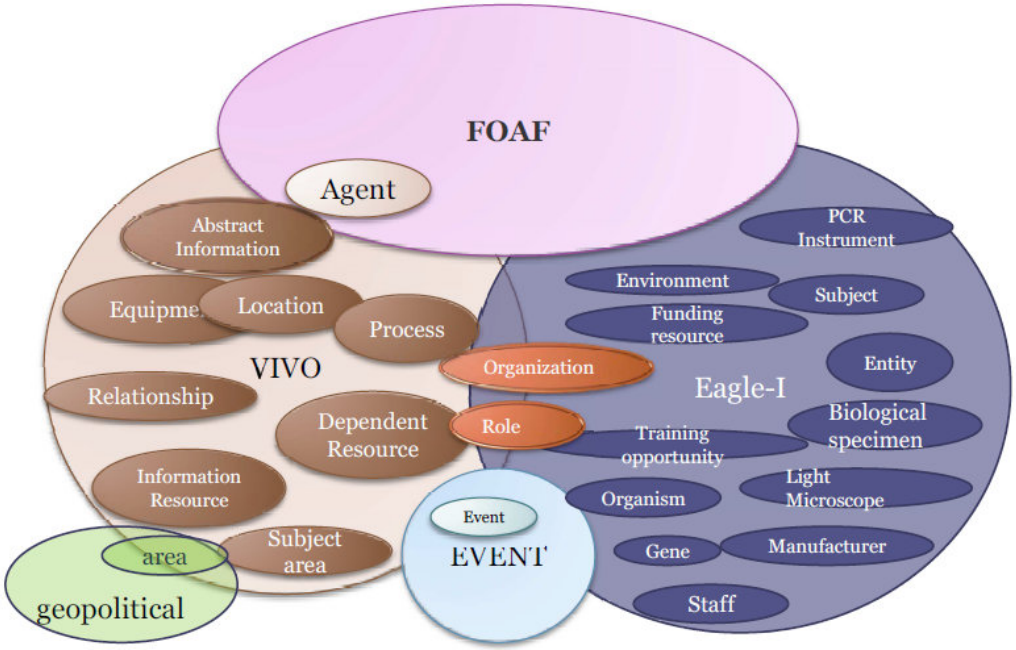
Jon Corson-Rikert, VIVO team

We wanted to give access to:



… worldwide … geographically

CRIS models cover such aspects

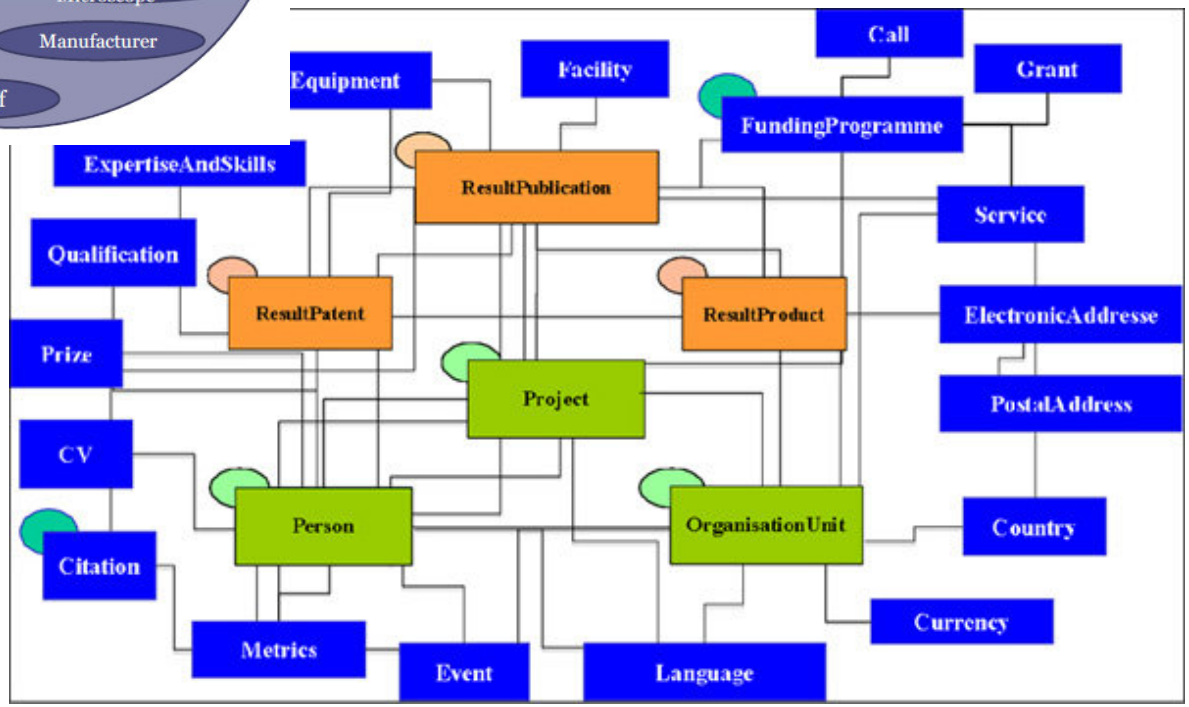


VIVO main classes

VIVO is defined as a "research discovery tool"

CERIF main classes

Model for "Current Research Information Systems" (CRIS)



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What is a CRIS

A Current Research Information System

- Normally, managed at an institutional level
- Normally, managed in research institutions: universities, research centers
- Some data entered manually, some imported from other institutional databases, some aggregated from external sources

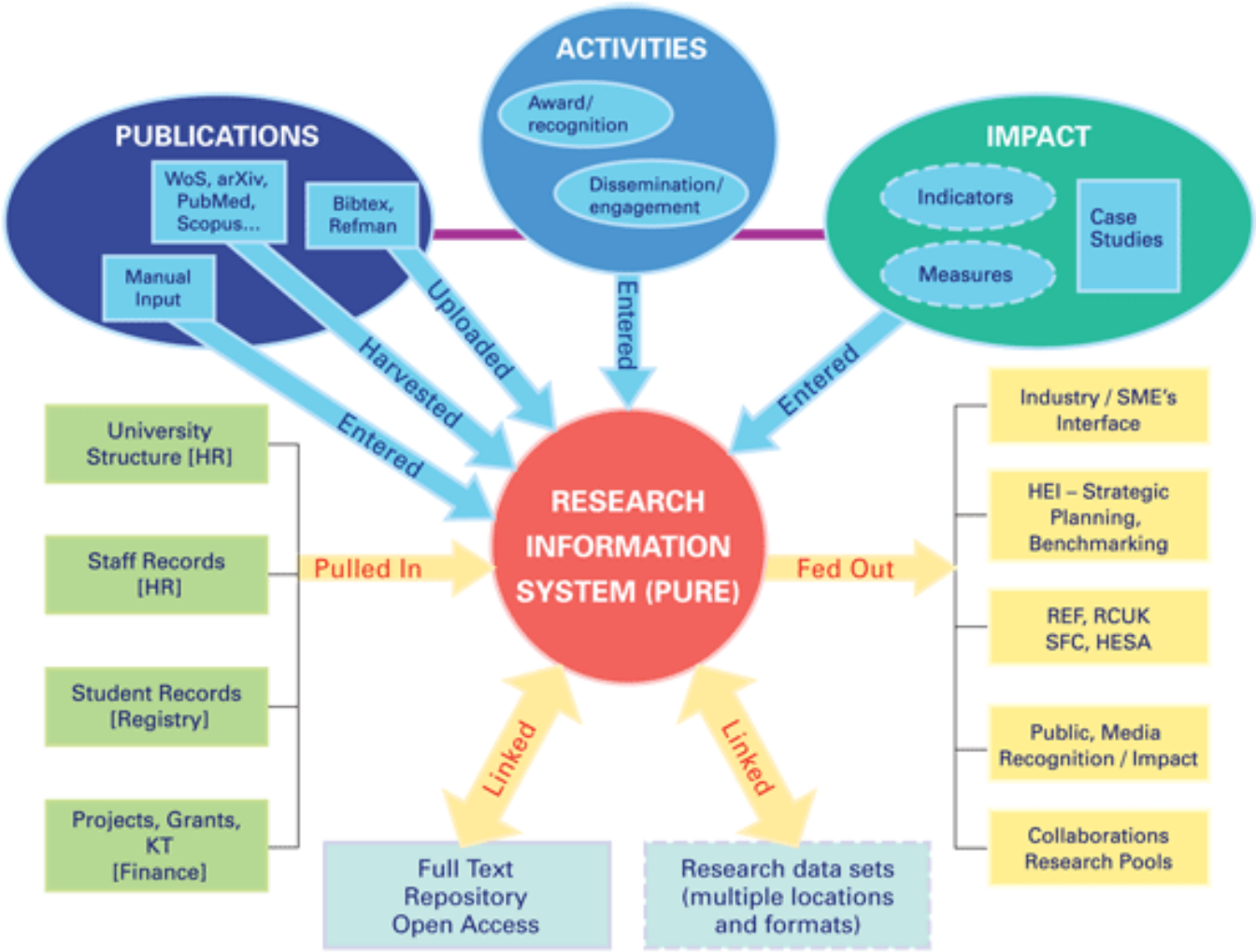

Image from: http://libraryconnect.elsevier.com/articles/technology-content/2013-03/research-information-meets-research-data-management

How? Some CRIS tools

- Pure (Atira > SciVal)
  http://info.scival.com/pure
- Converis (Avedas)
  http://www.converis5.com/
- Symplectic Elements (Symplectic)
  http://www.symplectic.co.uk/product-tour/
- VIVO (now a DuraSpace Incubator)
  https://wiki.duraspace.org/display/VIVO/

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Why we chose VIVO

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Our special requirements

- Data already collected in institutional, national or thematic databases / platforms
- Principle: data have to be entered once, as close to source as possible, and reused

→ No data entry in the global system

→ Aggregation from relevant data sources

→ **Distributed architecture**

- Global, cross-institutional, expertise-based

→ The model needs to be less tied with institutional structures (university, research institute)

→ **Need to adjust the CRIS model** to our needs

- **Semantic technologies, Linked Data!**
- **Open source**

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What is VIVO

- VIVO is an open-source semantic publishing platform for making **data about research activities** visible and accessible.
  - *based on semantic technologies initially developed at Cornell University and now an incubator project under DuraSpace.org*
- Organization of data is based on a **bundle of ontologies** and data are stored in a **triple store**.
- When installed and populated with researcher interests, activities, and accomplishments, it enables the **discovery of research** across disciplines at that institution and beyond.

VIVO | connect share discover

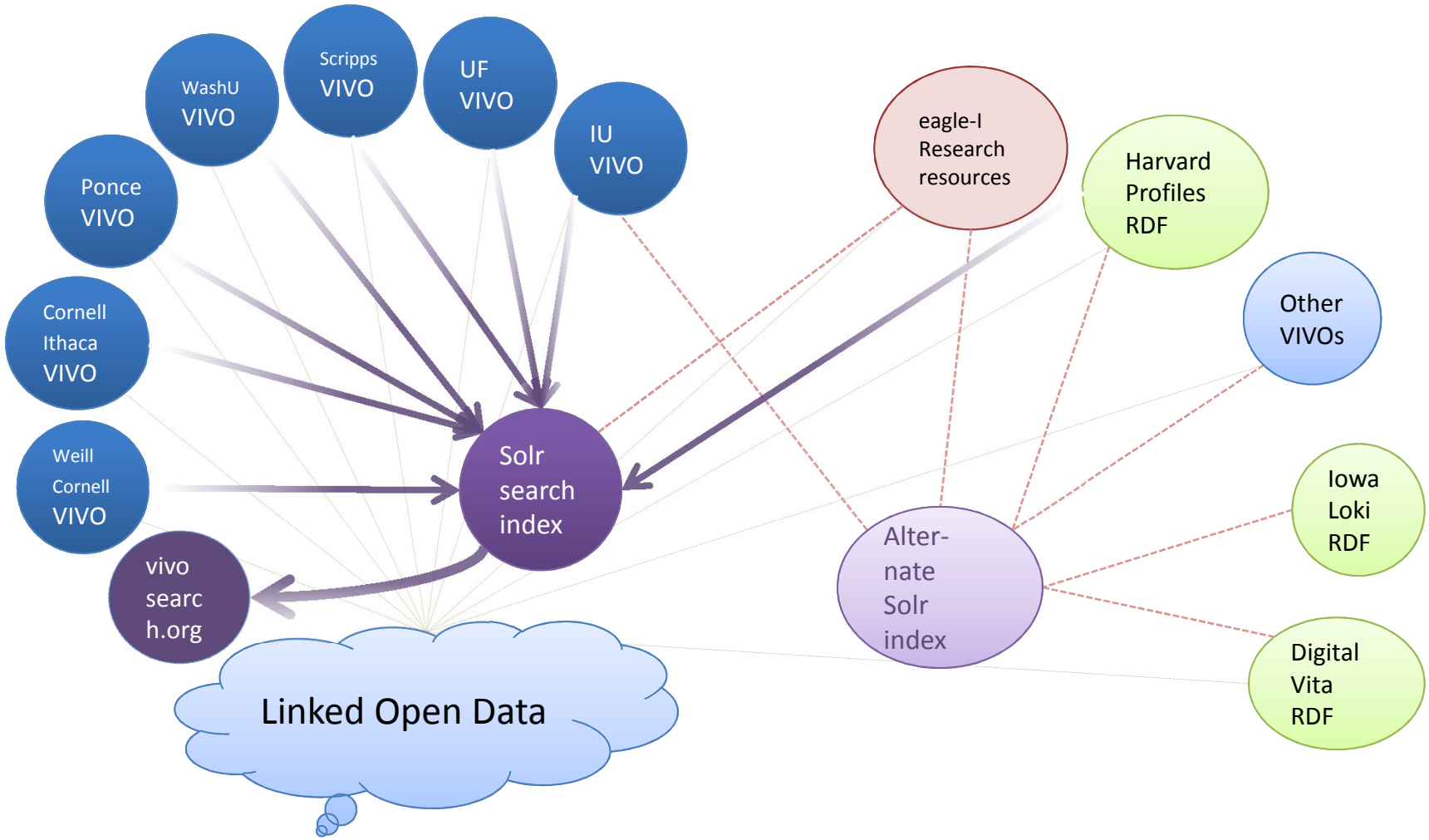
Why VIVO 1: Distributed aspects

- Besides its CRIS model, VIVO can enable the discovery of researchers across institutions

- See VIVOweb (http://www.vivoweb.org/):
  - Participants in the network include institutions with
    - local installations of VIVO
    - other profiling applications
  - *The information accessible through VIVO's search and browse capability will reside and be controlled locally*

- See **VIVOSearch** (http://beta.vivosearch.org/):
  - A demonstration of multi-institutional search over several VIVO installations

Why VIVO 1: Distributed aspects



Distributed architecture: how

- **Aggregated Solr index**
  - If data providers are able to produce custom indexes based on similar metadata models
- **Harvesters**
  - Allow to parse different types of sources, map their elements to VIVO metadata and ingest them

- In our project, foreseen data providers manage data with very basic tools and provide them in very basic formats

→ **We chose the harvesters approach**

Why VIVO 2: Adaptable model

VIVO has an extensible ontology

- You can extend the ontology without modifying the tool
  - Tradeoffs of generality vs. optimal interface*

- The VIVO model can be **customized to fit agricultural research** e.g. by
- extending it to **include non-academic actors that are relevant to the agricultural domain** (revising the Organization and Person sub-classes)
- integrating properties for **annotation with external concepts** from Agrovoc**

• From the VIVOweb presentation by McIntosh, Cramer, Corson-Rikert: "VIVO Researcher Networking Update", 2011
** Widely used agricultural thesaurus: http://aims.fao.org/standards/agrovoc/about

Why VIVO 3: standards

- Uses and links to standard vocabularies
- Uses RDF
- Exposes Linked Data
- Is being mapped to other standards (CERIF)
- Has been connected to SPARQL endpoints and Linked Data APIs
- Is open source
- Is widely used and supported

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How we adapted VIVO and built AgriVIVO

What is AgriVIVO

- AgriVIVO is an RDF-based and ontology-driven **global aggregated database harvesting from distributed directories** of experts, organizations and events in the field of agriculture.
- AgriVIVO is also a **search portal** giving access to the AgriVIVO database
- AgriVIVO will broaden its scope to cover the relationships between people, institutions, projects, publications and datasets

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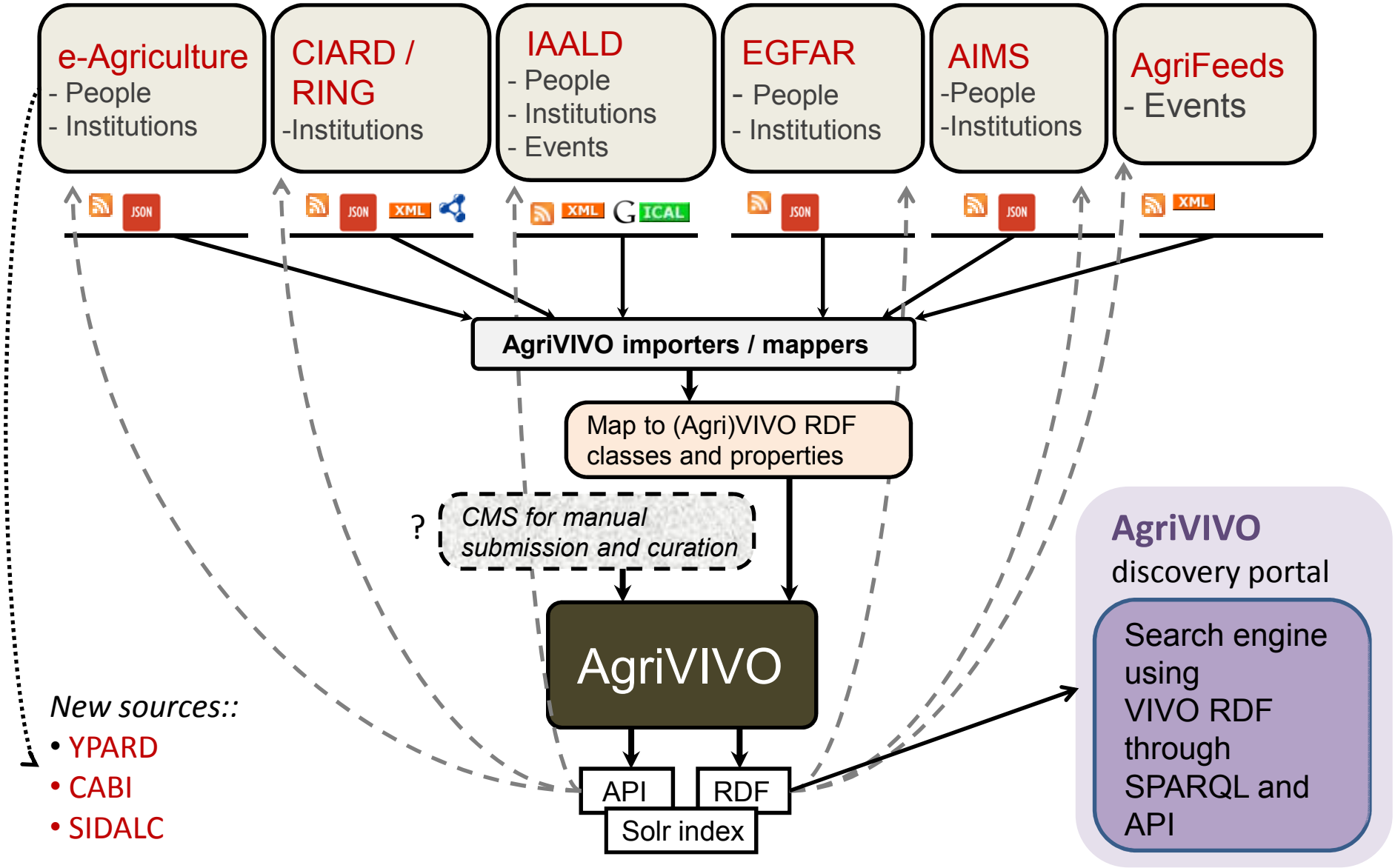
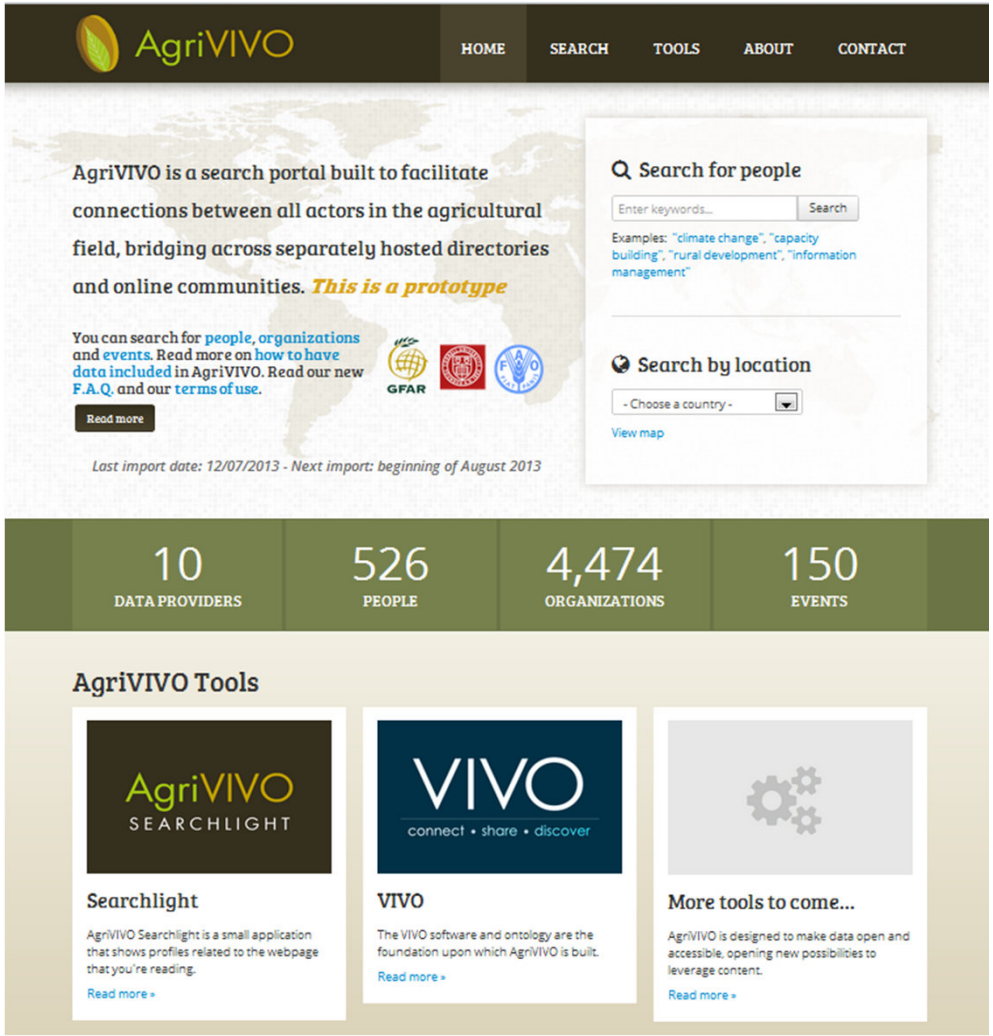
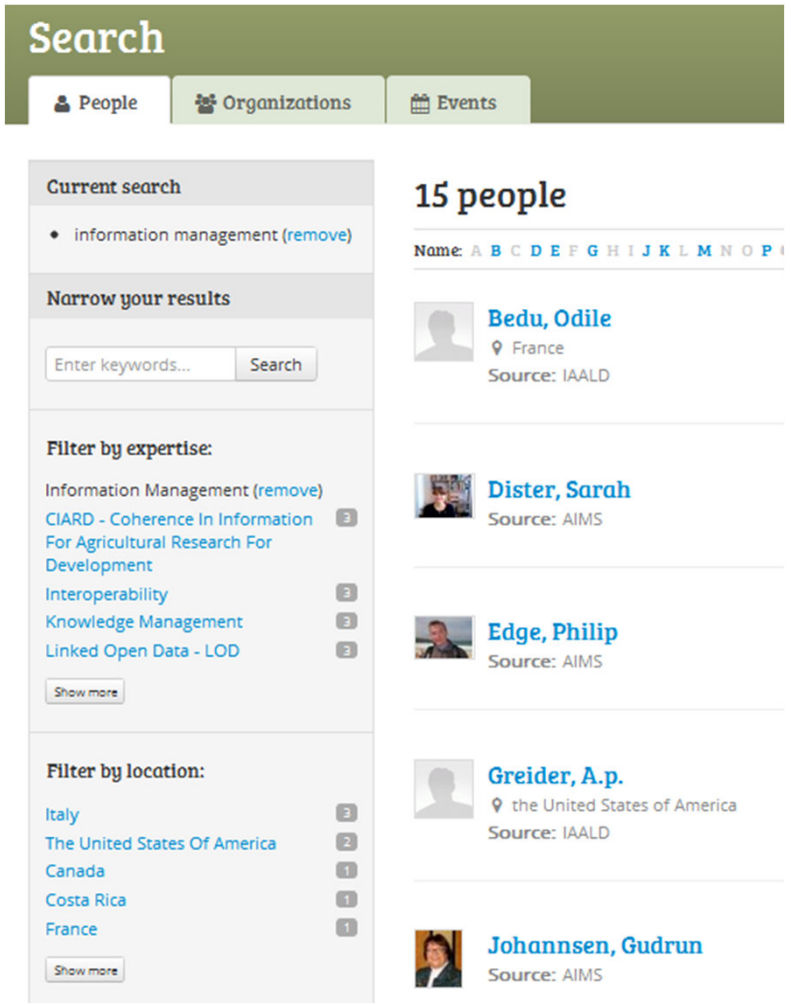
AgriVIVO data flow



The search portal





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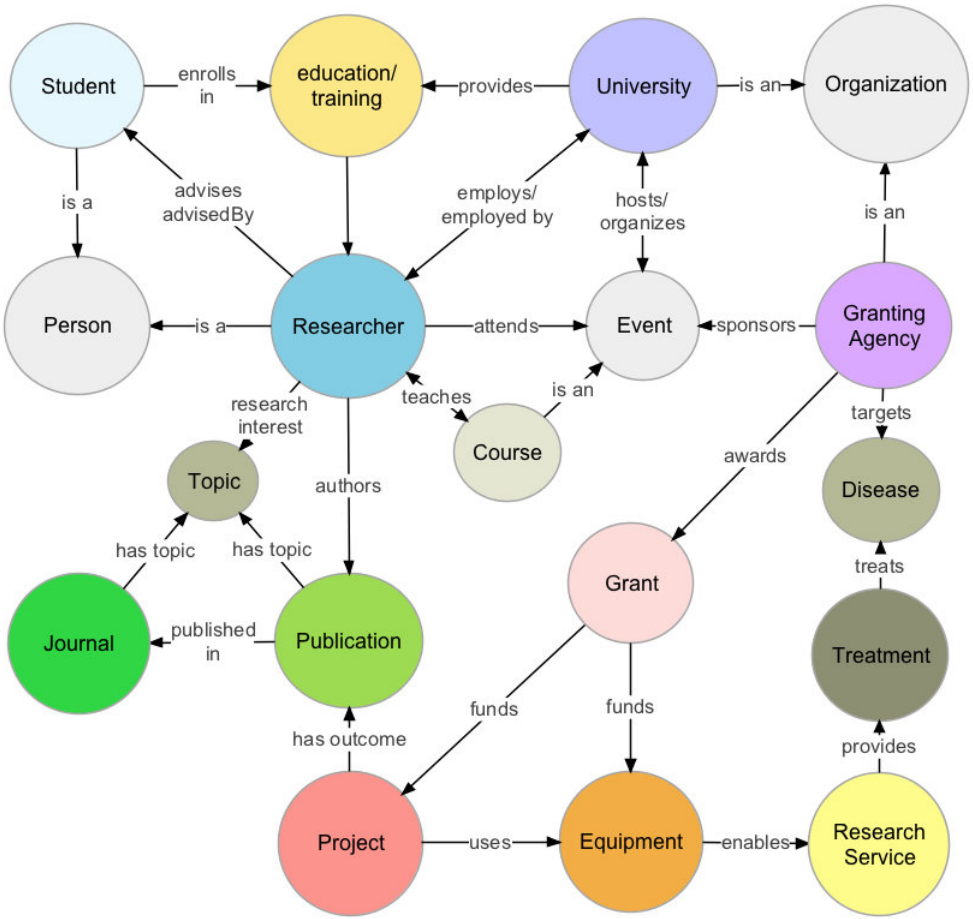
How we adapted VIVO and built AgriVIVO

1. Extension of the ontology

VIVO basic entities and relations



The whole ontology – just an overview

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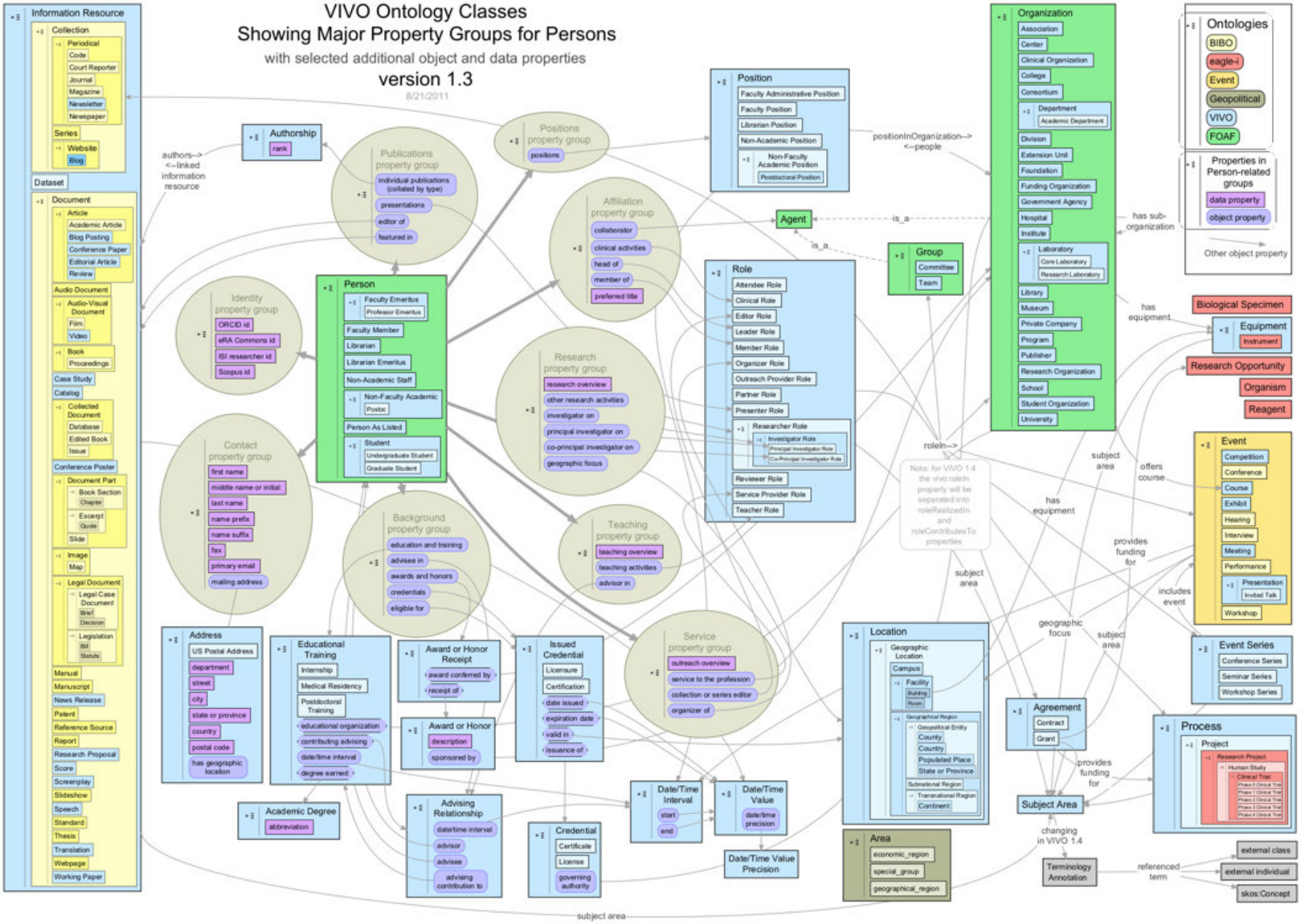
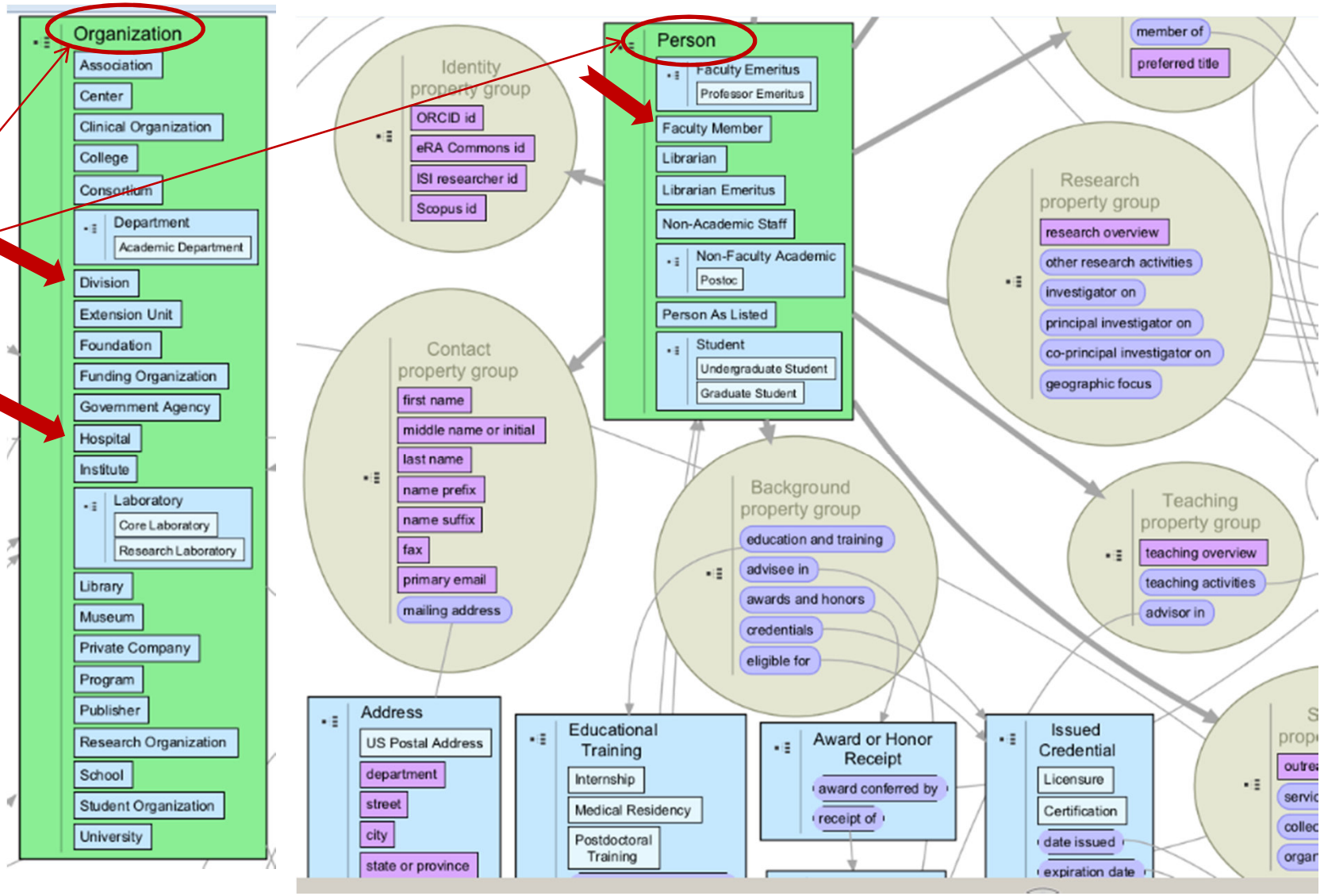


Extension of the ontology

Examples of needed extensions



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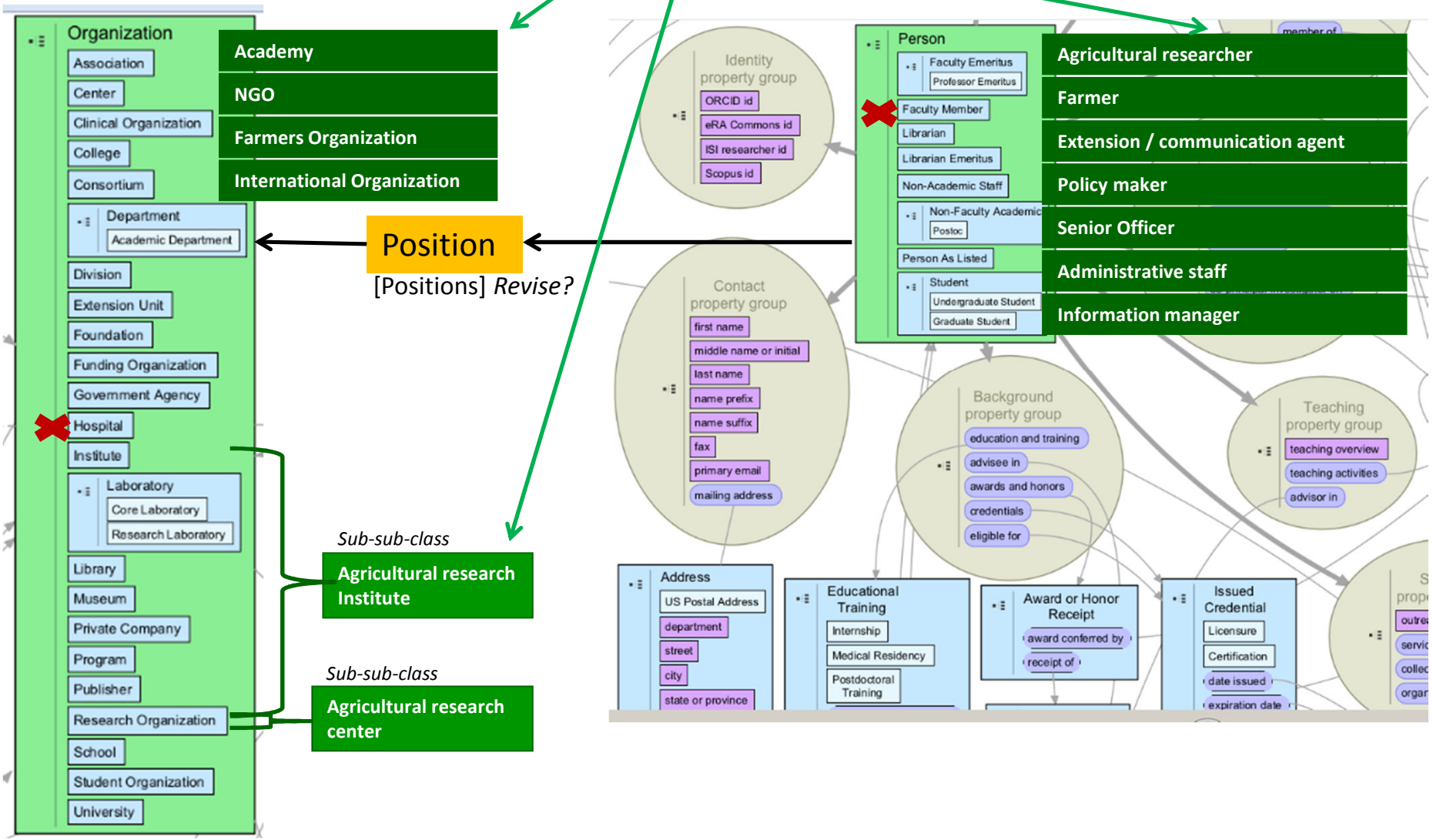
Extension of the ontology

Examples of needed extensions

Organization



Person and education

Extension of the ontology: where?

- VIVO ontology editor?

→ Issues of future compatibility with new versions of the VIVO ontology

- Ontology extension published independently?

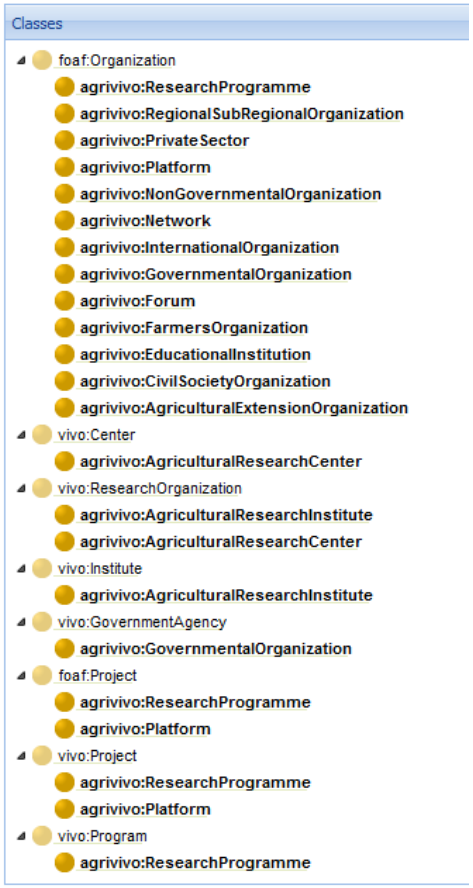
- If published independently, “domain-specific” or “scope-specific” ontology extensions (e.g. for libraries) can be re-used by VIVO instances with the same needs
- Extensions that are general enough could be considered for inclusion in the core or as a general-use extension package
- Extensions can be imported into the VIVO instance

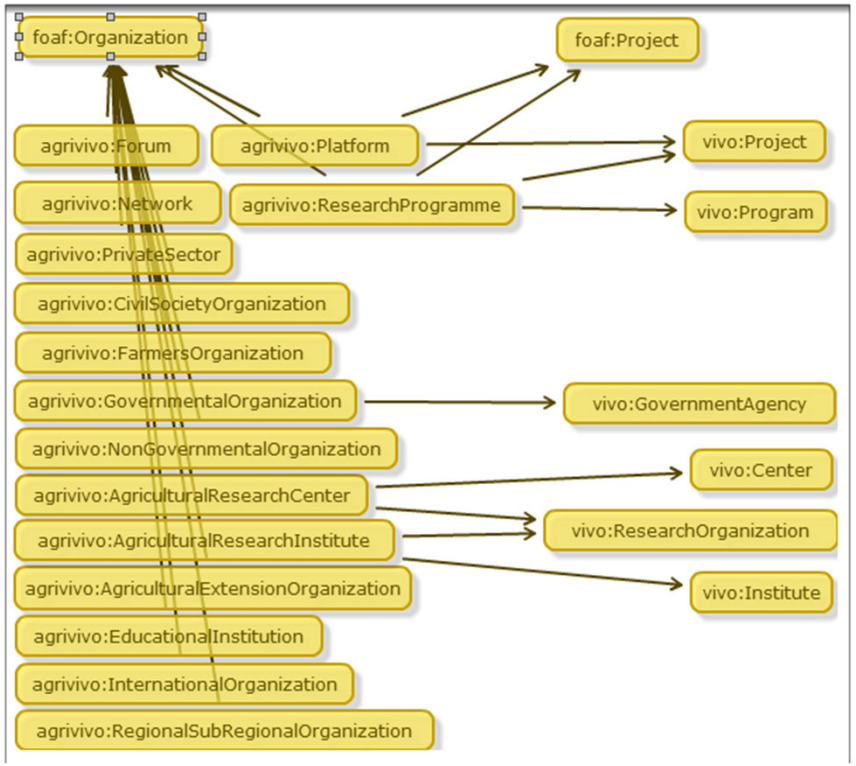
→ **We created an ontology extension called “agrivivo” and published it**

Extension of the ontology so far

http://www.agrivivo.net/ontology

We used an RDF vocabulary editing tool called **Neologism** (a Drupal distribution)





Subset of organization classes in AgriVIVO

Label	Class	Sub-class of
Agricultural Extension	AgriculturalExtensionOrganization from AgriVIVO vocabulary	foaf:Organization
Agricultural Research Center	AgriculturalResearchCenter from AgriVIVO vocabulary	vivo:ResearchOrganization vivo:Center
Agricultural Research Institute	AgriculturalResearchInstitute from AgriVIVO vocabulary	vivo:ResearchOrganization vivo:Institute
Association	Association from VIVO core	foaf:Organization
Civil Society Organization	CivilSocietyOrganization from AgriVIVO vocabulary	foaf:Organization
Educational Institution	EducationalInstitution from AgriVIVO vocabulary	foaf:Organization
Farmers' Organization	FarmersOrganization from AgriVIVO vocabulary	foaf:Organization
Forum	Forum from AgriVIVO vocabulary	foaf:Organization
Foundation	Foundation from VIVO core	foaf:Organization
Funding Organization	FundingOrganization from VIVO core	foaf:Organization
Governmental and Inter-Governmental organization	GovernmentalOrganization from AgriVIVO vocabulary	foaf:Organization vivo:GovernmentAgency
International Organization	InternationalOrganization from AgriVIVO vocabulary	foaf:Organization
Library	Library from VIVO core	foaf:Organization
Network	Network from AgriVIVO vocabulary	foaf:Organization
Non-Governmental Organization	NonGovernmentalOrganization from AgriVIVO vocabulary	foaf:Organization
Platform	Platform from AgriVIVO vocabulary	foaf:Organization foaf:Project vivo:Project
Private Sector	PrivateSector from AgriVIVO vocabulary	foaf:Organization
Regional / Sub-Regional Organization	RegionalSubRegionalOrganization from AgriVIVO vocabulary	foaf:Organization
Research Programme	ResearchProgramme from AgriVIVO vocabulary	foaf:Organization vivo:Project vivo:Program foaf:Project

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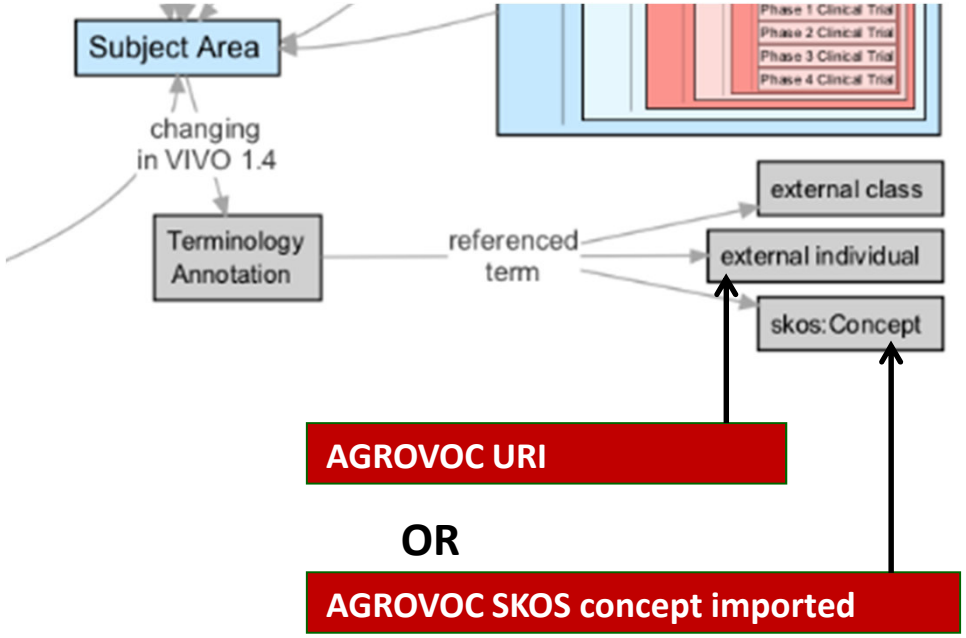
Besides extending the ontology with necessary new classes, we decided not to use some of the existing VIVO classes.

This is **sort of an "Application Profile"** with selected VIVO classes and AgriVIVO classes that are suitable for the domain of agriculture.

Extension of the ontology

- Adding **AGROVOC** as domain-specific reference vocabulary



- For annotations
- For research areas

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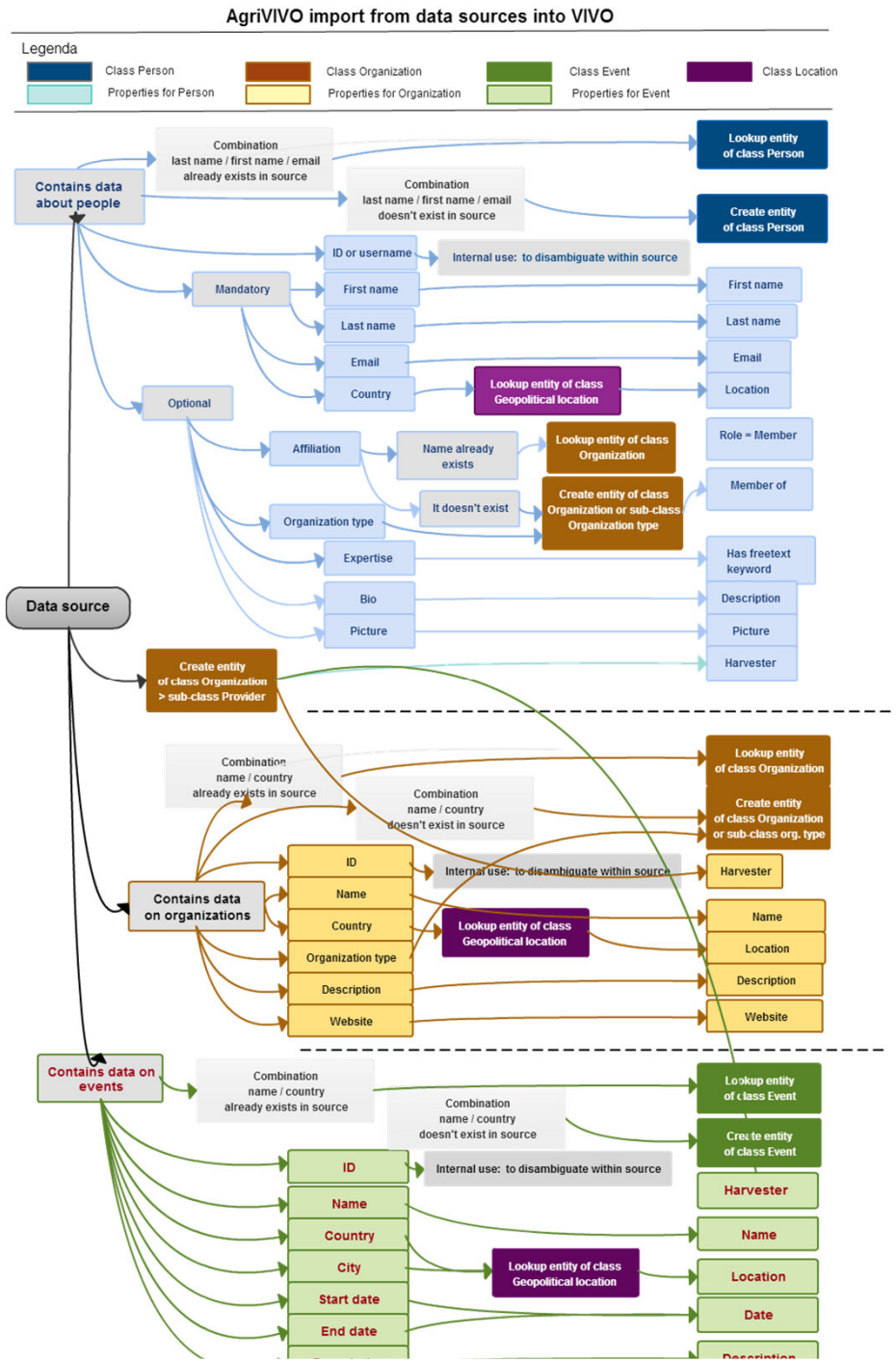
How we adapted VIVO and built AgriVIVO

2. Importers

VIVO importers

- VIVO allows for different types of “importers” to ingest contents from heterogeneous sources
- Some basic RDF and CSV are available in the core and can be used via the GUI to ingest data
- New custom importers can be written
  - To allow to parse different types of sources, map their elements to VIVO metadata and ingest them

VIVO custom importers



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Importers: core and extensions

Our approach: One VIVO core with different extensions

- The same VIVO core with a combination of different extensions (ontology, importers, languages) instead of local hard-coded customizations
- Some importers can be packaged as “domain-specific” extensions and be re-used in the domain-specific community
- Some importers can be packaged as “scope-specific” extensions (e.g. importers from HR databases, importers from library catalogs)
- Importers that are general enough could be considered for inclusion in the core or as a general-use extension package

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How we adapted VIVO and built AgriVIVO

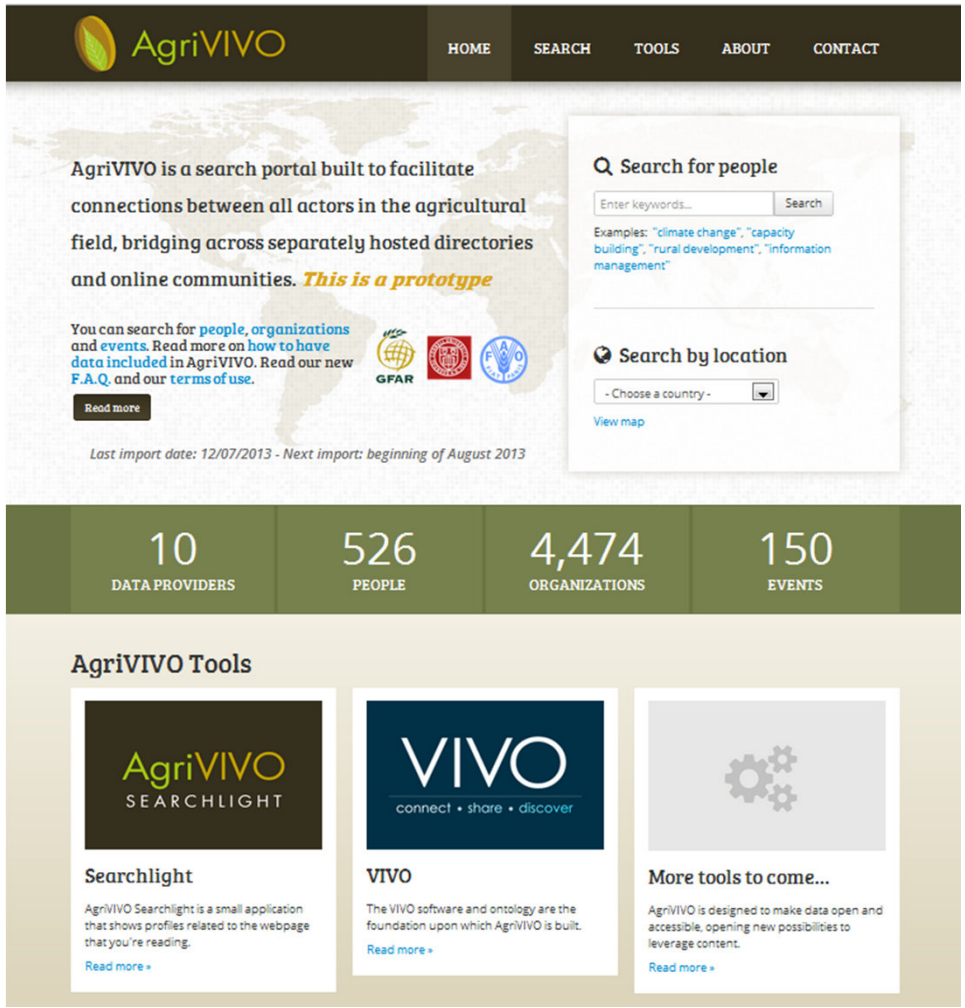
3. Search interface

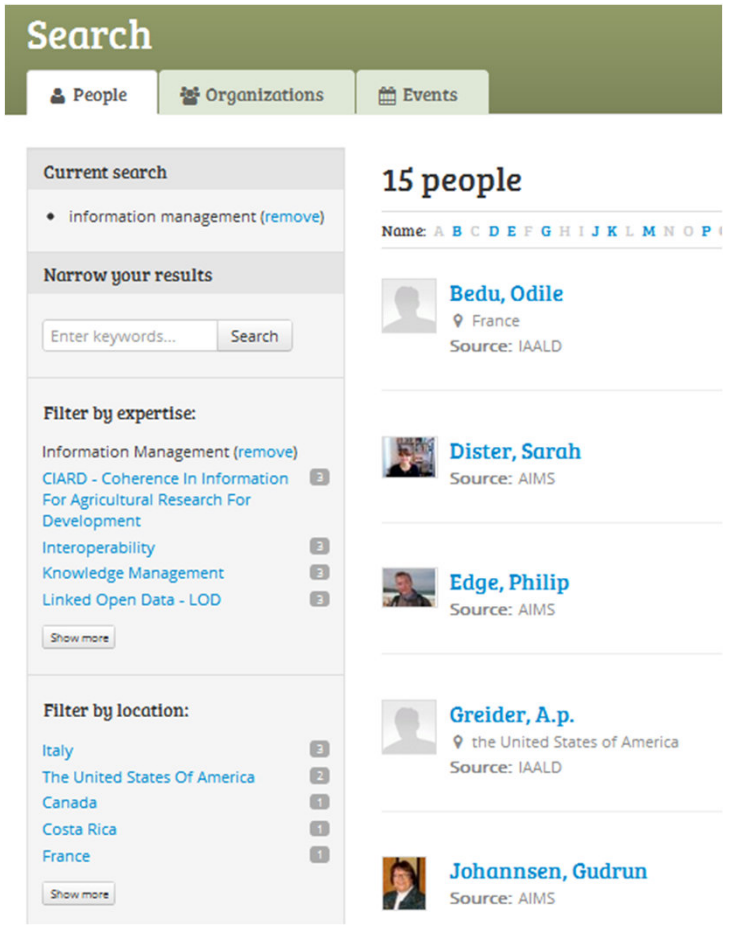
Search interface

Search portal (Drupal)

www.agrivivo.net

This is NOT the VIVO tool





VIVO data > search interface

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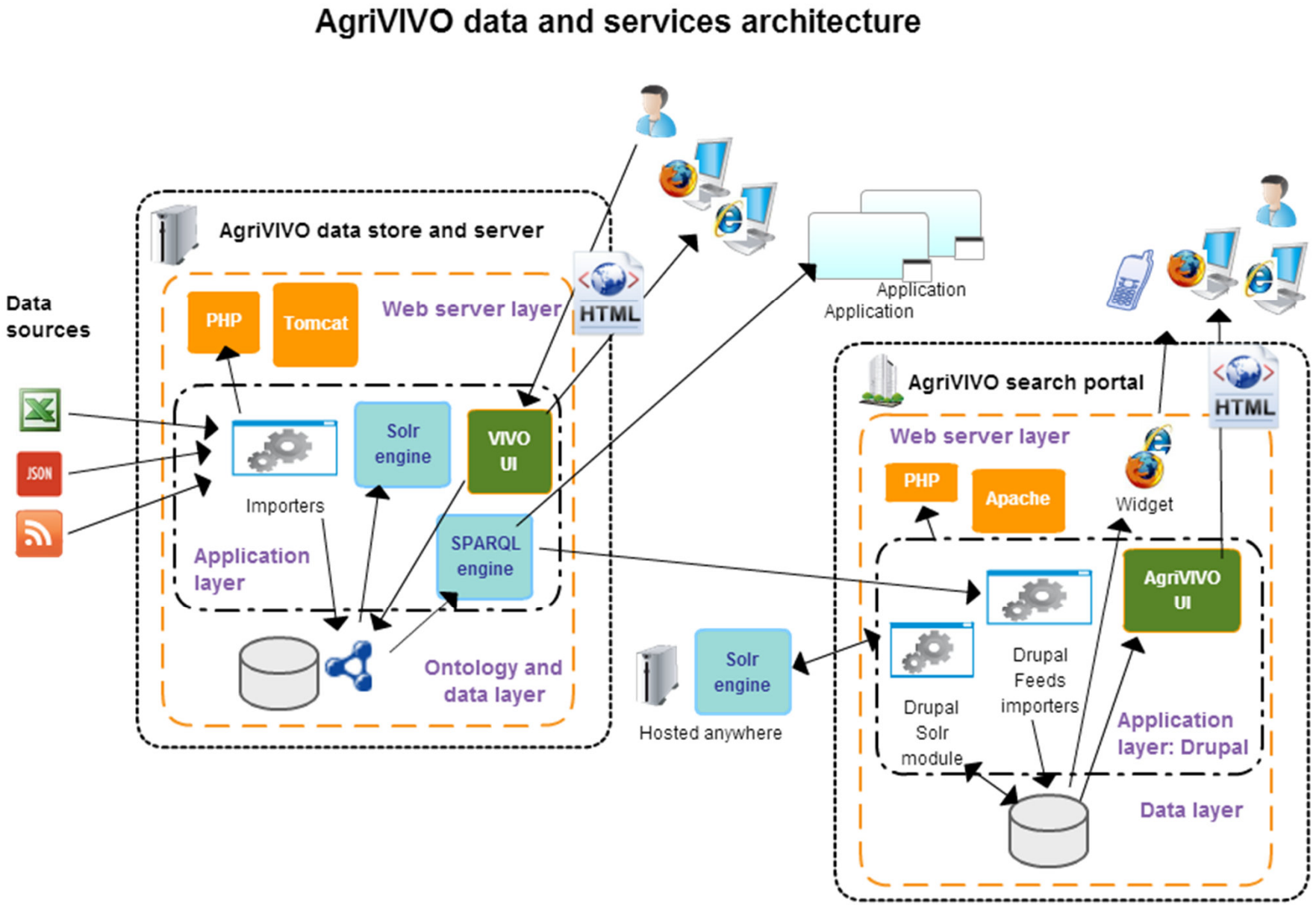

Search interface: local model

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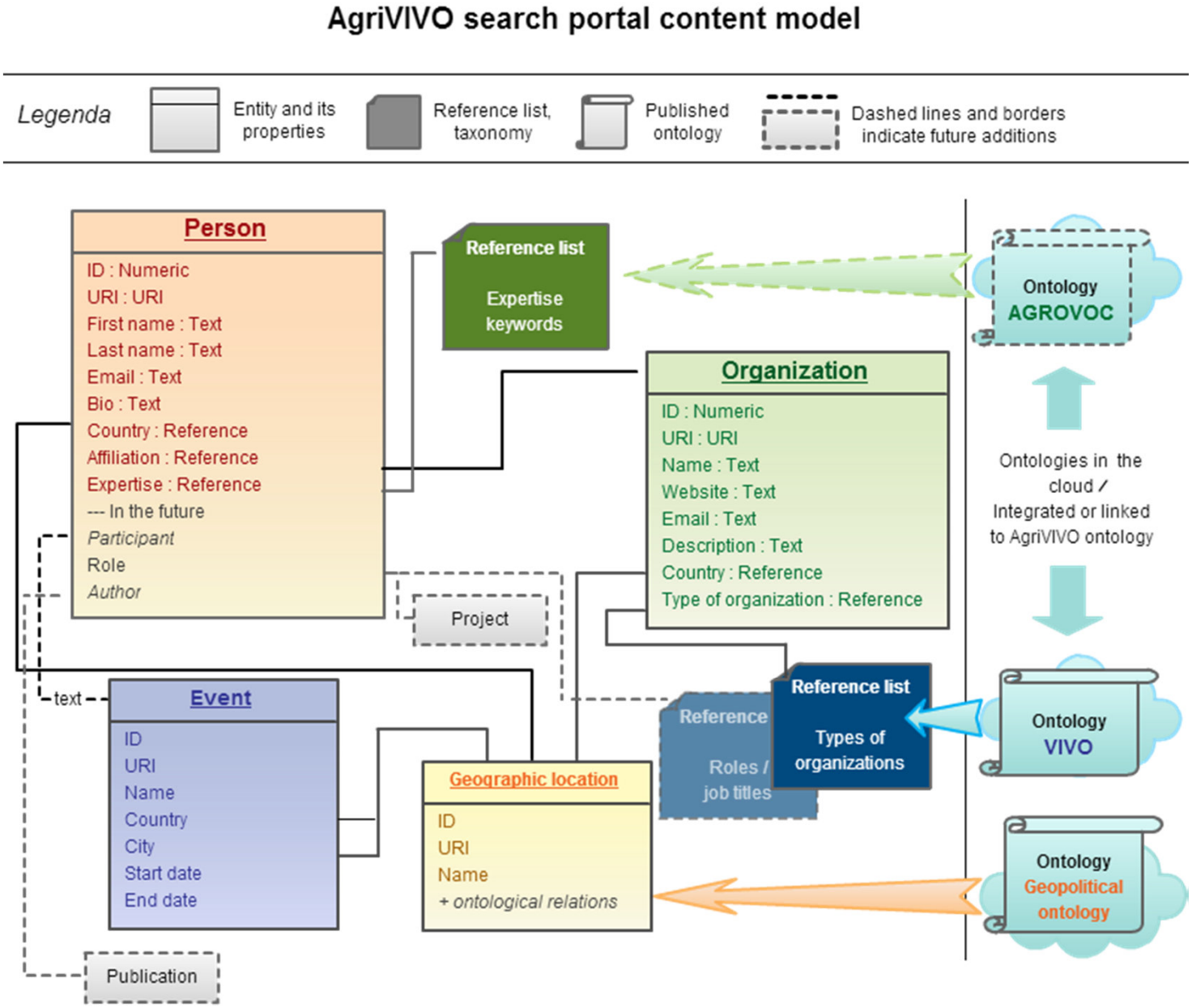

Search interface: importing the data

- **Drupal Linked Data Import module:** https://github.com/milesw/ldimport plugins for the Feeds module that let you turn remote linked data resources into Drupal entities
- **Customized for VIVO**: https://github.com/milesw/ldimport_vivo

SOURCE	TARGET	TARGET CONFIGURATION
URI	URL	Used as **unique**.
Label	Title	Not used as unique.
http://vivoweb.org/ontology/core#primaryEmail	Email	
http://xmlns.com/foaf/0.1/firstName	First name	
http://xmlns.com/foaf/0.1/lastName	Last name	
http://vivoweb.org/ontology/core#webpage [] http://vivoweb.org/ontology/core#linkURI	Webpage: URL	
http://vivoweb.org/ontology/core#webpage [] http://vivoweb.org/ontology/core#linkAnchorText	Webpage: Title	
http://vivoweb.org/ontology/core#overview	Overview	
http://vivoweb.org/ontology/core#phoneNumber	Phone number	
http://vivoweb.org/ontology/core#positionInOrganization [] http://www.w3.org/2000/01/rdf-schema#label	Organization	

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Future plans

Integration of publications

- Integration of publications
  - linked to experts (authors)
  - retrieval from open systems (e.g. AGRIS for agriculture) using universal identifiers
  - possibly also manual curation by the experts themselves
  - Essential preliminary step: disambiguation of authors

VIVO ontology: author - publication

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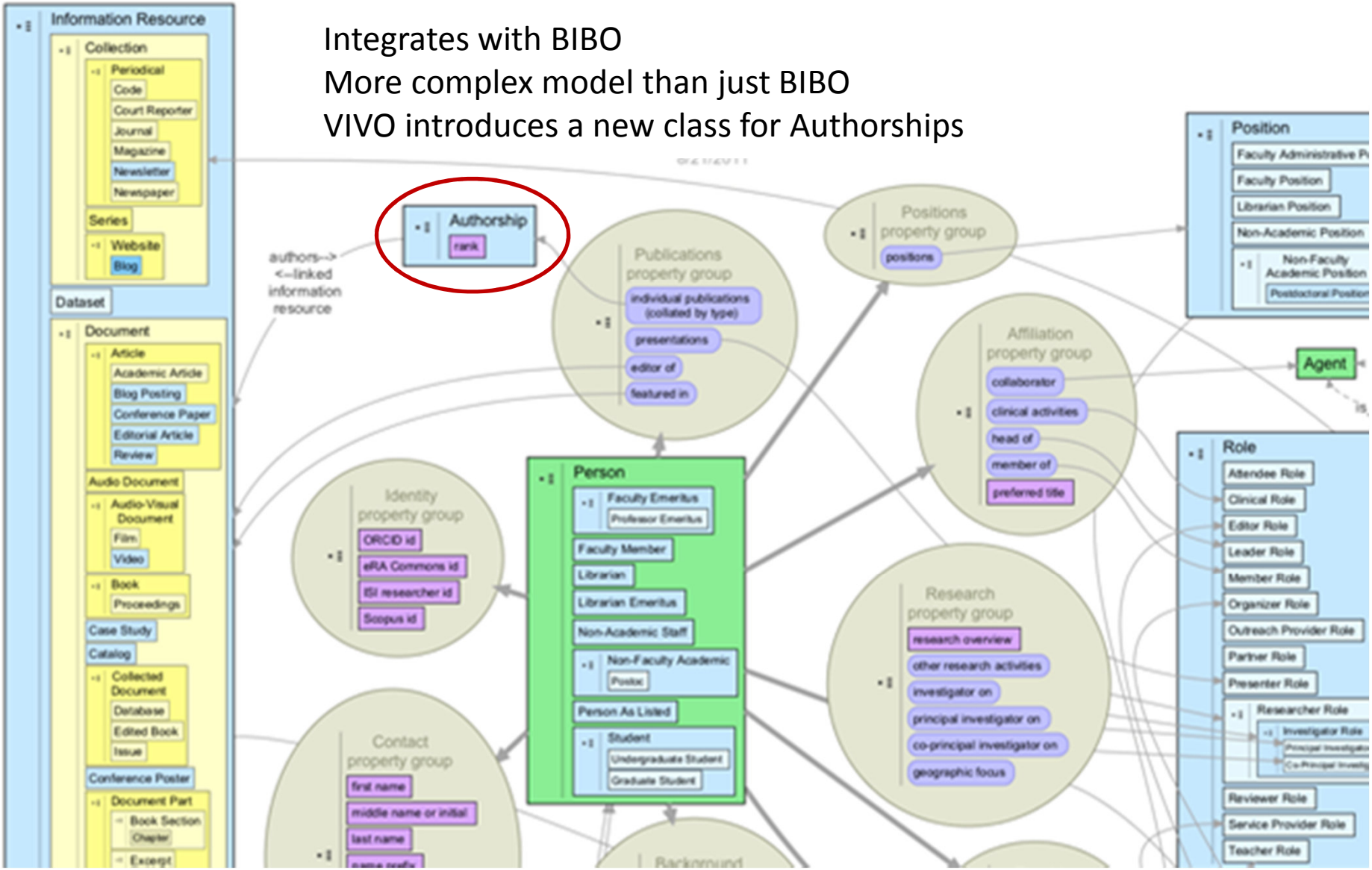
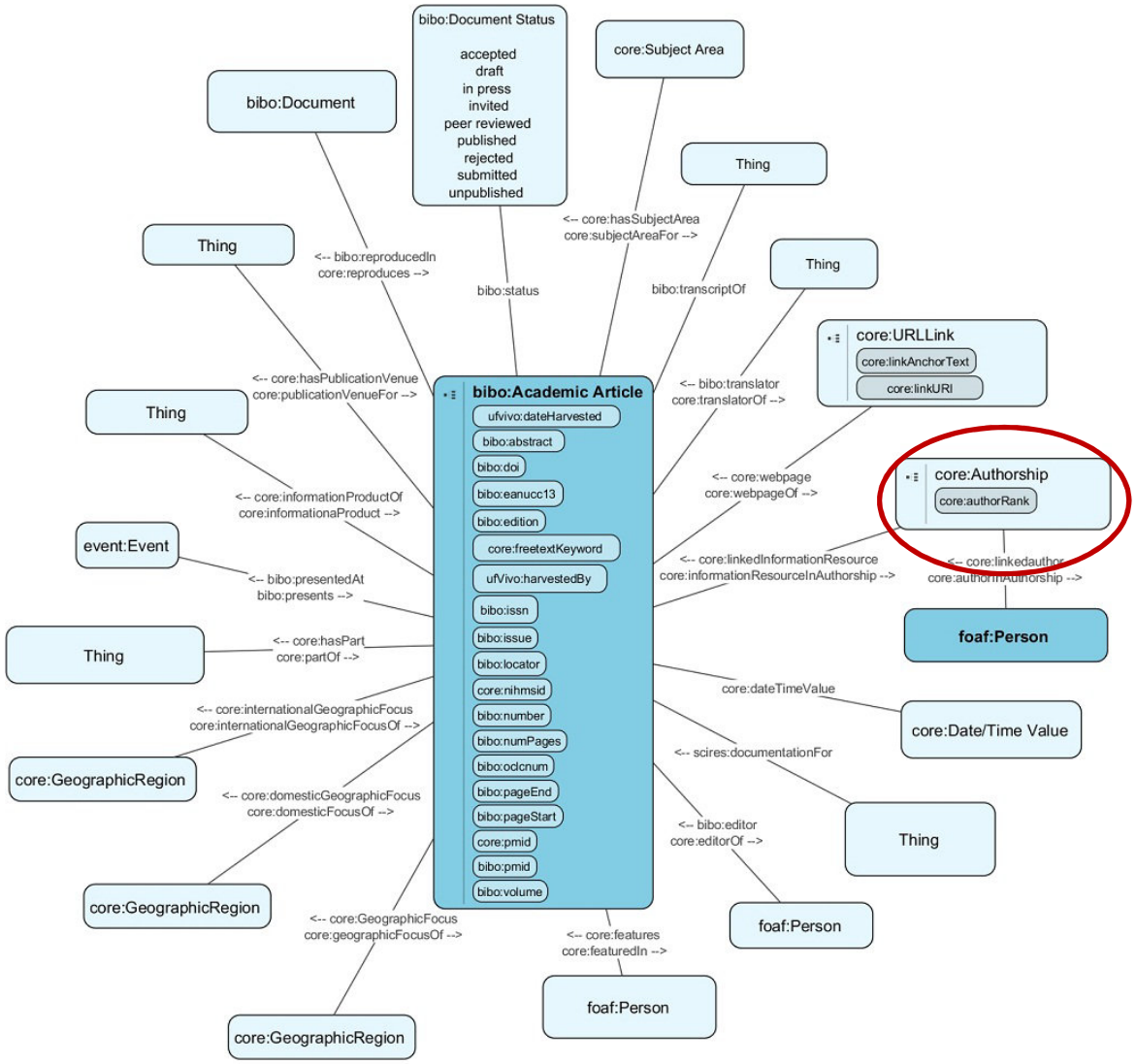
Integrates with BIBO
More complex model than just BIBO
VIVO introduces a new class for Authorships



VIVO ontology: author - publication



Another view of the author – publication model in VIVO

Disambiguation and identifiers

AgriVIVO as **authority data** for agricultural research actors

Disambiguating authors and researchers, sharing universal IDs

VIVO is collaborating with ORCID (http://orcid.org) and the Publish Trust Project (http://www.publishtrust.org/)

Disambiguating institutions

Using external naming authorities (VIAF?)

Becoming a subsidiary authority for agricultural institutions

Providing URIs and links between URIs for people's and institutions' profiles

E.g. link between a person's AgriVIVO URI and the corresponding author URI in AGRIS or the corresponding ORCID

Coordinate with data providers

Work with data providers to **improve their data management environments** as a way to improve overall data quality at the source

- Study the changes that are necessary in order for information to merge coherently in the RDF store: e.g.:
  - map **competence/skill information** about experts with Agrovoc
  - map **Institutions' names** with their URLs or other URIs (VIAF?)
  - Use identifiers for people; use email addresses to **identify people** and help merge duplicates and disambiguate records

Multi-language support

- Both for ontology labels and data
- Support for translations
- How to recognize translations when harvesting?

Interactive data curation?

AgriVIVO could also be used as **a community platform for interactive data curation**.

- Users can add/remove "relations" in which they are part of the relation:

person A "is author of" publication B, person A "participates in" project C

AgriVIVO can also be used for maintaining one profile that can provide consistent information across multiple websites.

- the VIVO development team is exploring ways of propagating editing changes from VIVO back to the original source system
- Provide ability to edit VIVO profiles in a client environment?

How to combine harvesting, manual curation and synchronization of data in sources?

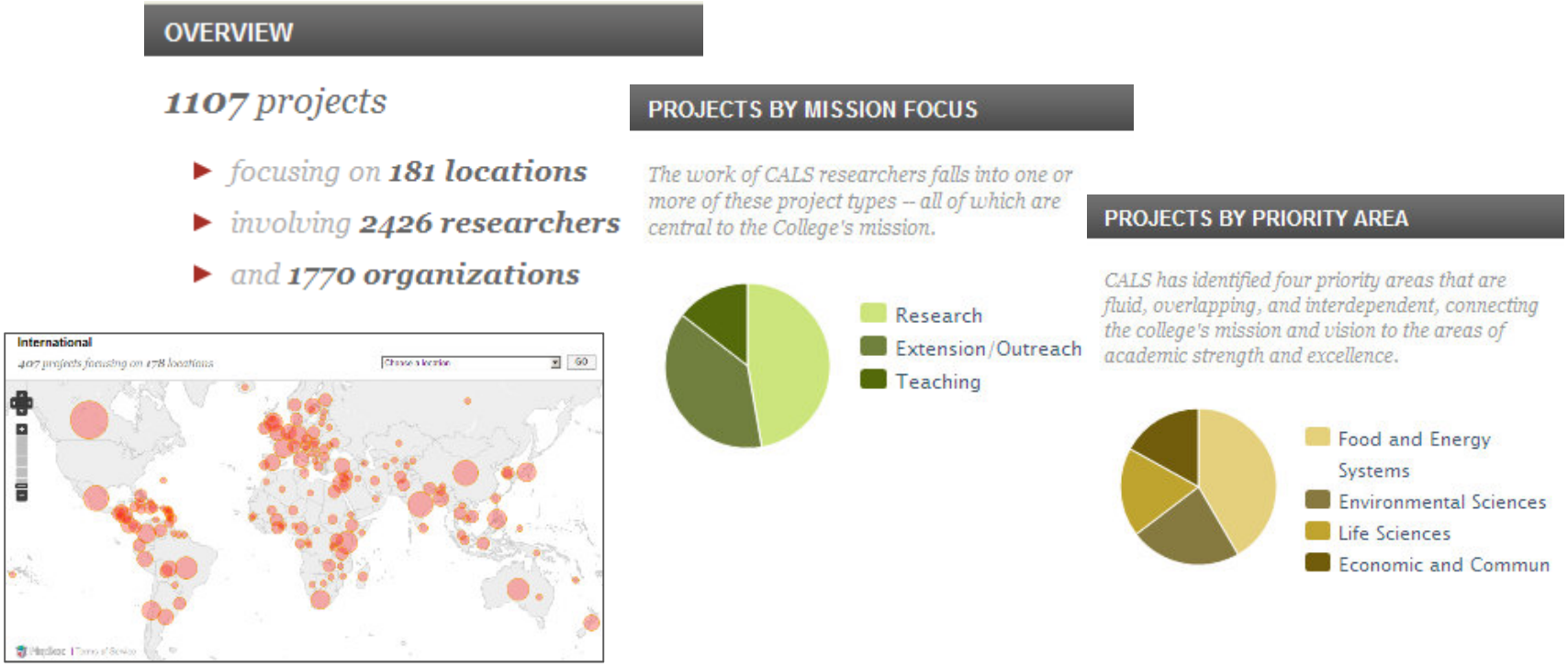
Getting data re-used

- VIVO's search functionalities can be **integrated in other websites** through remote calls. In this way, specialized and targeted search engines can give access to and offer highly customized "views" of the data coming from AgriVIVO

Better visualizations

AgriVIVO data → Semantic aggregation

→ **Maps, charts, statistics**



from http://impact.cals.cornell.edu/

- **AgriVIVO portal: http://www.agrivivo.net**

- AgriVIVO project: http://www.egfar.org/agrivivo

- VIVO portal at Cornell: http://vivo.cornell.edu/
- VIVOweb: http://vivoweb.org/
- VIVO search: http://beta.vivosearch.org/

- On VIVO: http://www.dlib.org/dlib/july07/devare/07devare.html
- VIVO going national: http://www.news.cornell.edu/stories/Oct09/VIVOweb.ws.html
- VIVO at USDA: http://www.usda.gov/wps/portal/usda/usdahome?contentidonly=true&contentid=2010/10/0507.xml

Contact: agrivivo@gmail.com