

Open and Intuitive Search: Designing a Biligual Eco-Ontology

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Datacenter Nature and Landscape (DNL)

**Geographic information system
(GIS)**

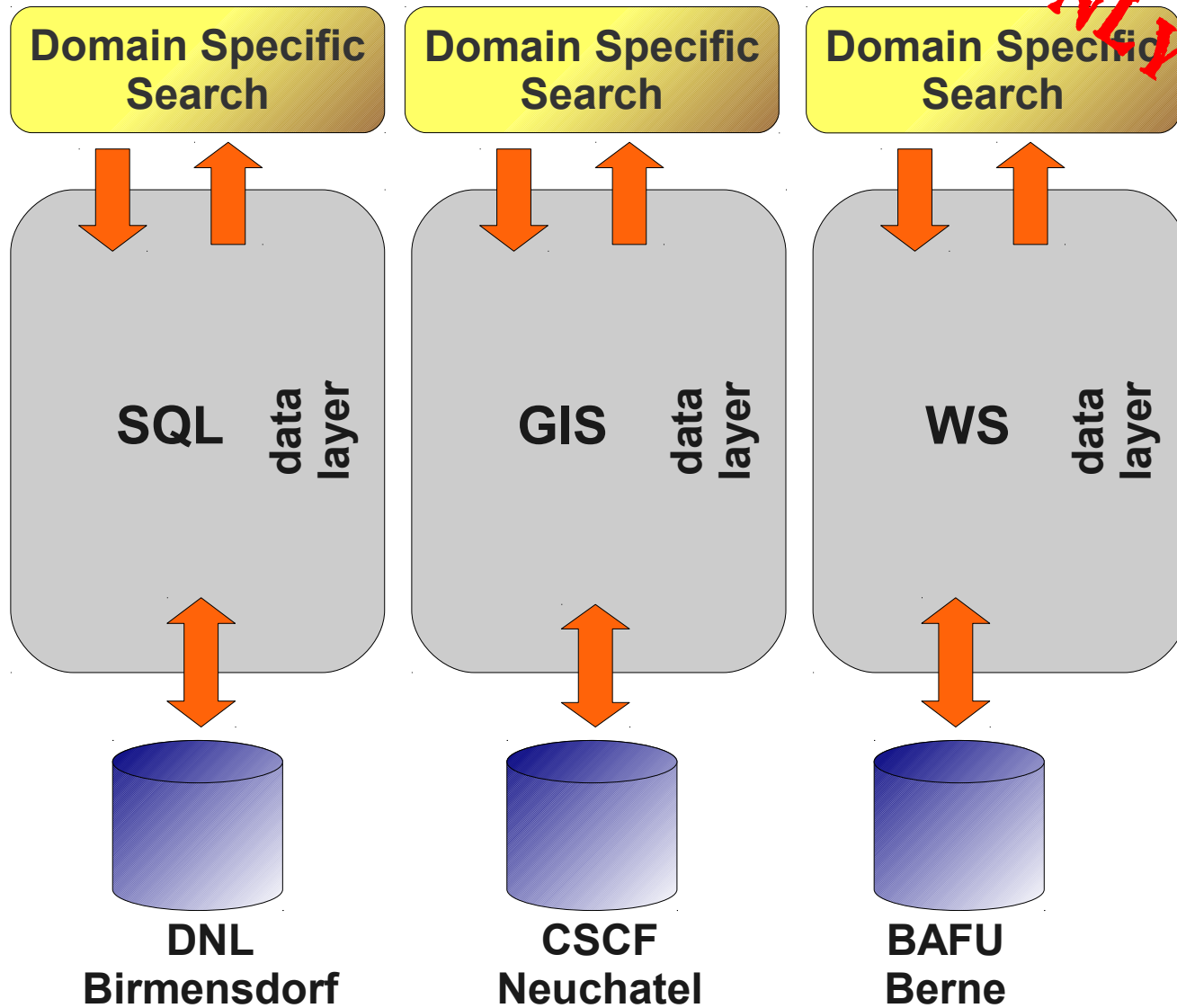
**Inventories of protected biotopes
of national relevance.**



Waldvogel et al. (2009)

Heterogeneous Data

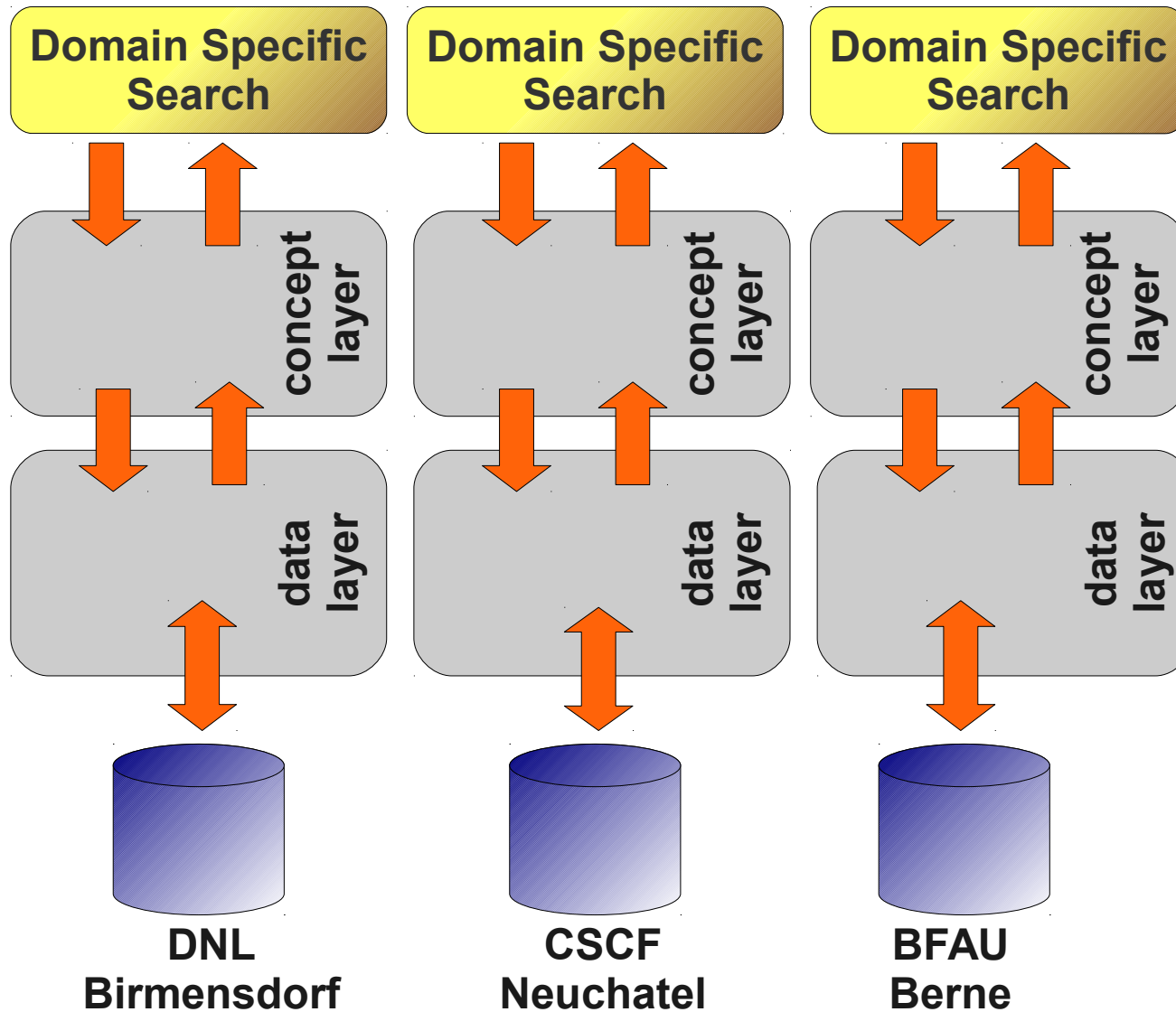
FOR EXPERTS ONLY



Keyword Based Search

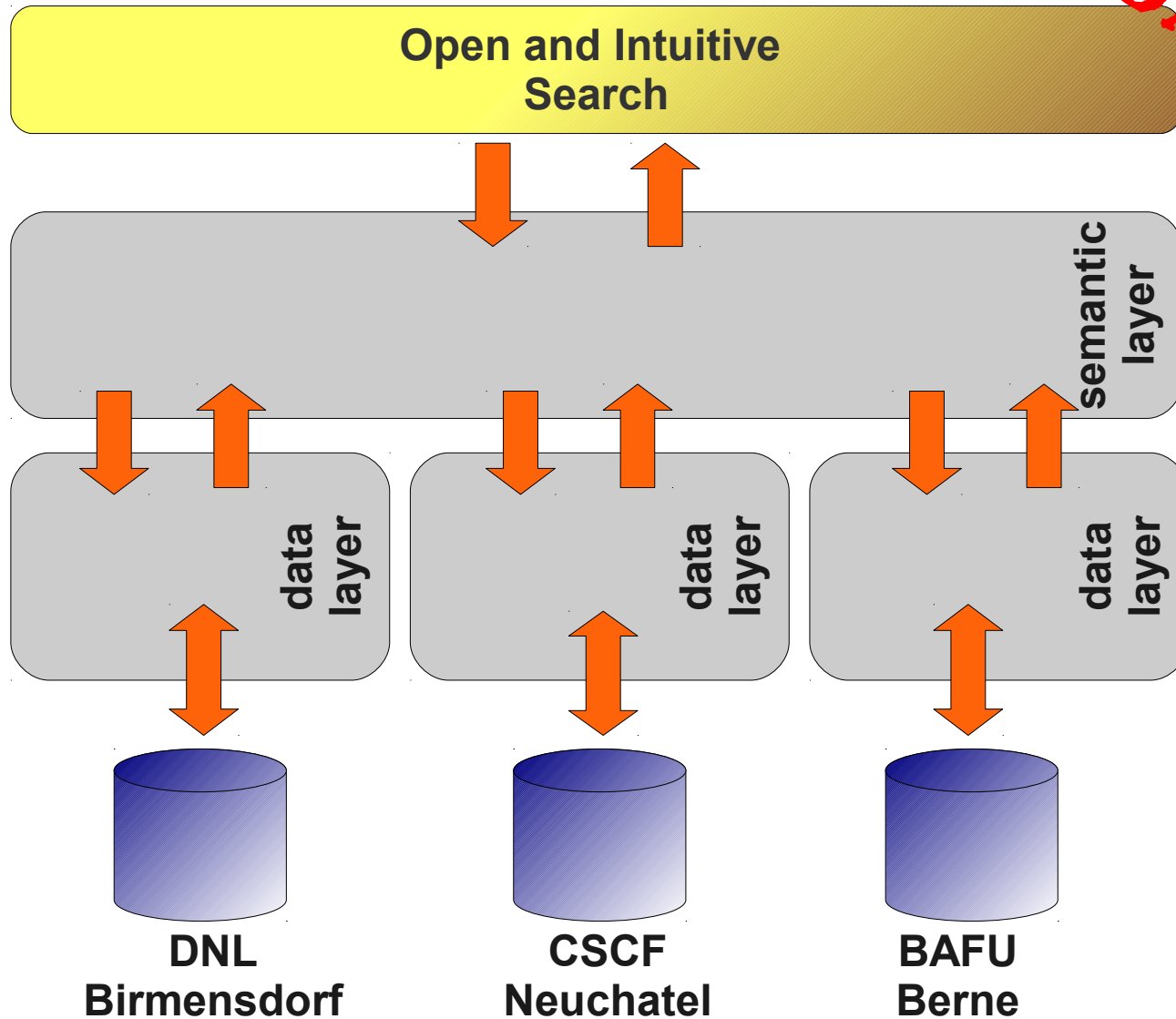
- High recall, but poor precision
- Results are not structured
 - Keywords treated independently
- Restrict results to desired concepts
 - Concepts as sets of keywords (or tags)
 - Look for matching concepts

Heterogeneous Data



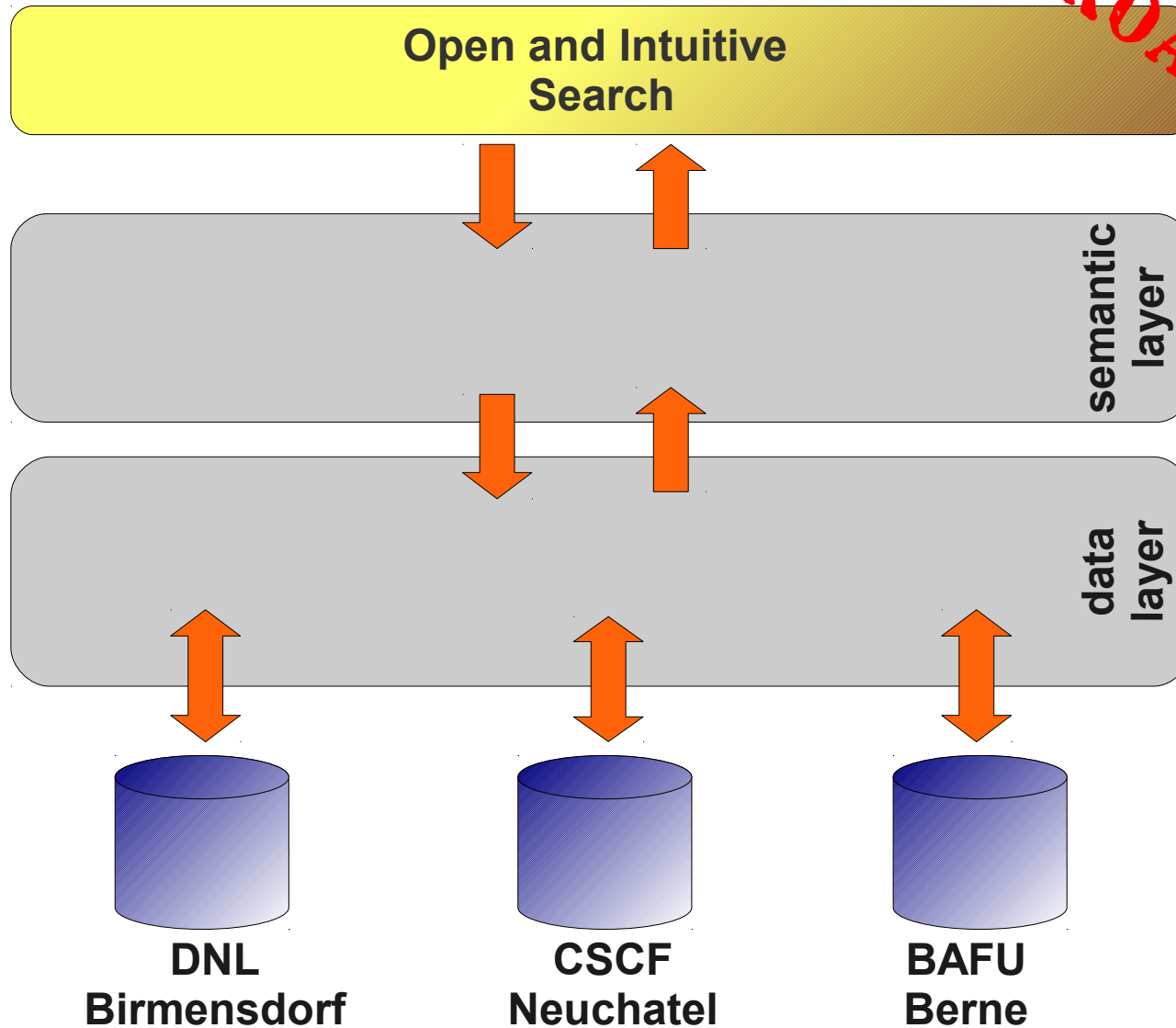
Heterogeneous Data

META-DATA



Virtual Data Center (VDC)

**INTEGRATIVE
APPROACH**



What is an Eco-Ontology?

Ontologies:

- embodiments of **shared conceptualizations**
- Additional **taxonomic hierarchy**
- **Reasoning** and automatic consistency checking

Eco-Ontologies:

- **semantic heterogeneity** of source communities



Gruber (1993)
McGuinness (2005)
Fonesca et al. (2002)

Linguistic Challenge

- **Regional** dialects
- **Historic** changes
- Ethnic and **cultural** differences
- American dictionaries:
 - More than 1'770 words with **no general agreement** on the preferred spelling.



Thomas Jefferson
Source: Wikipedia

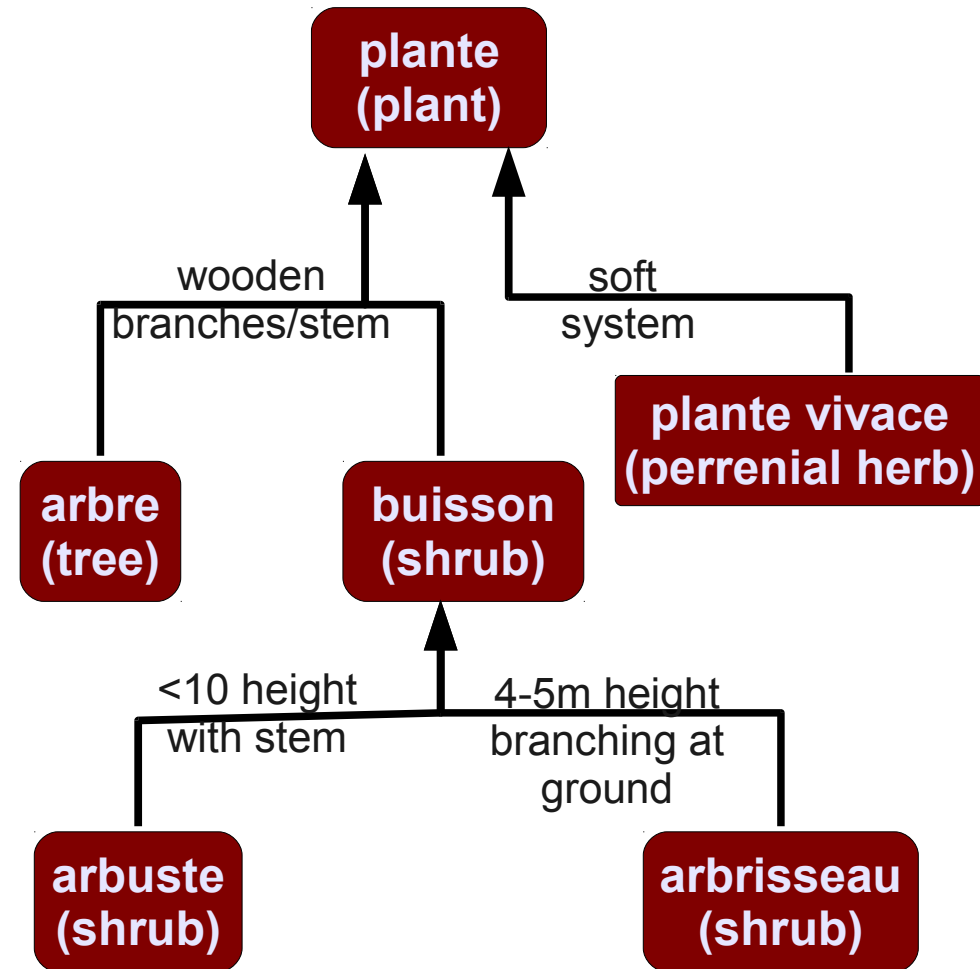
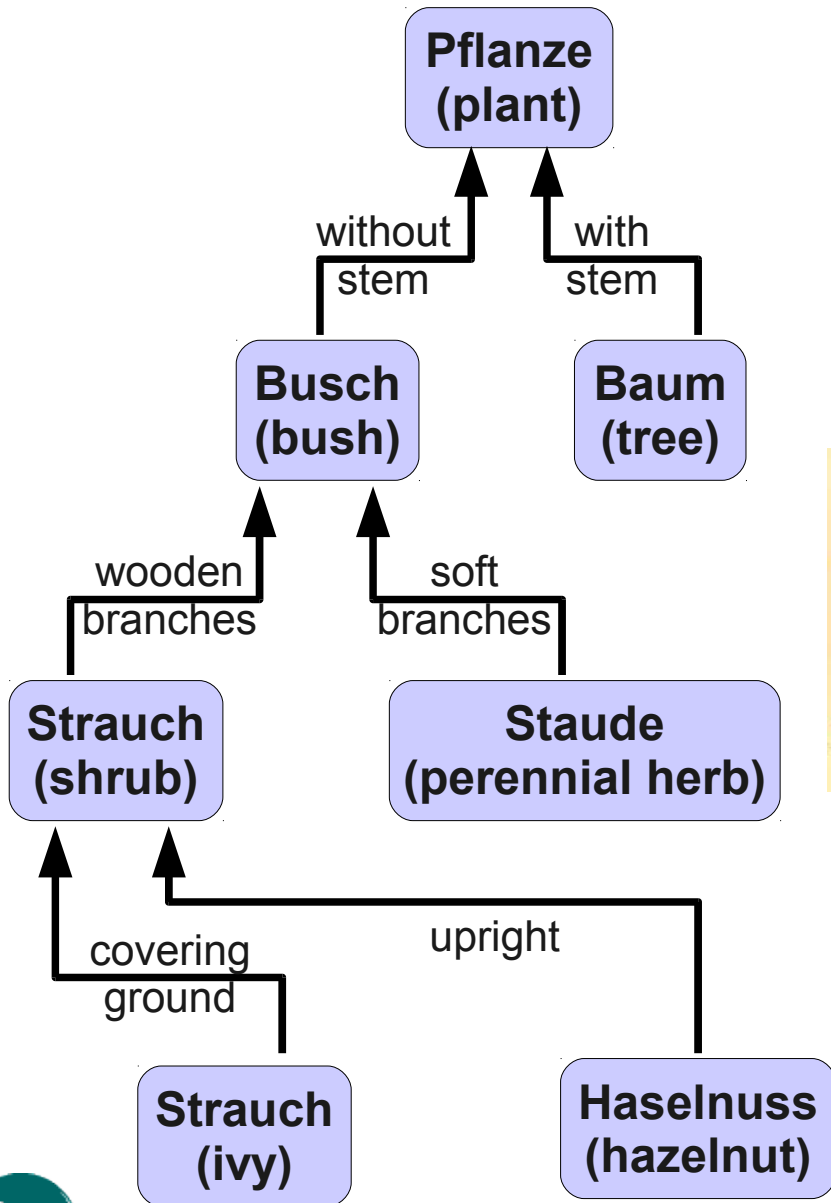
Heterogeneous Semantics Challenge

- Expert terminologies
- Different and Contradicting Taxonomies
- Partial Knowledge



Blackberry
Picture: Wikipedia

Bilingual Challenge



Consequence

**It is not possible to build
one consistent ontology
for all terms used in our database!**

Ontologies

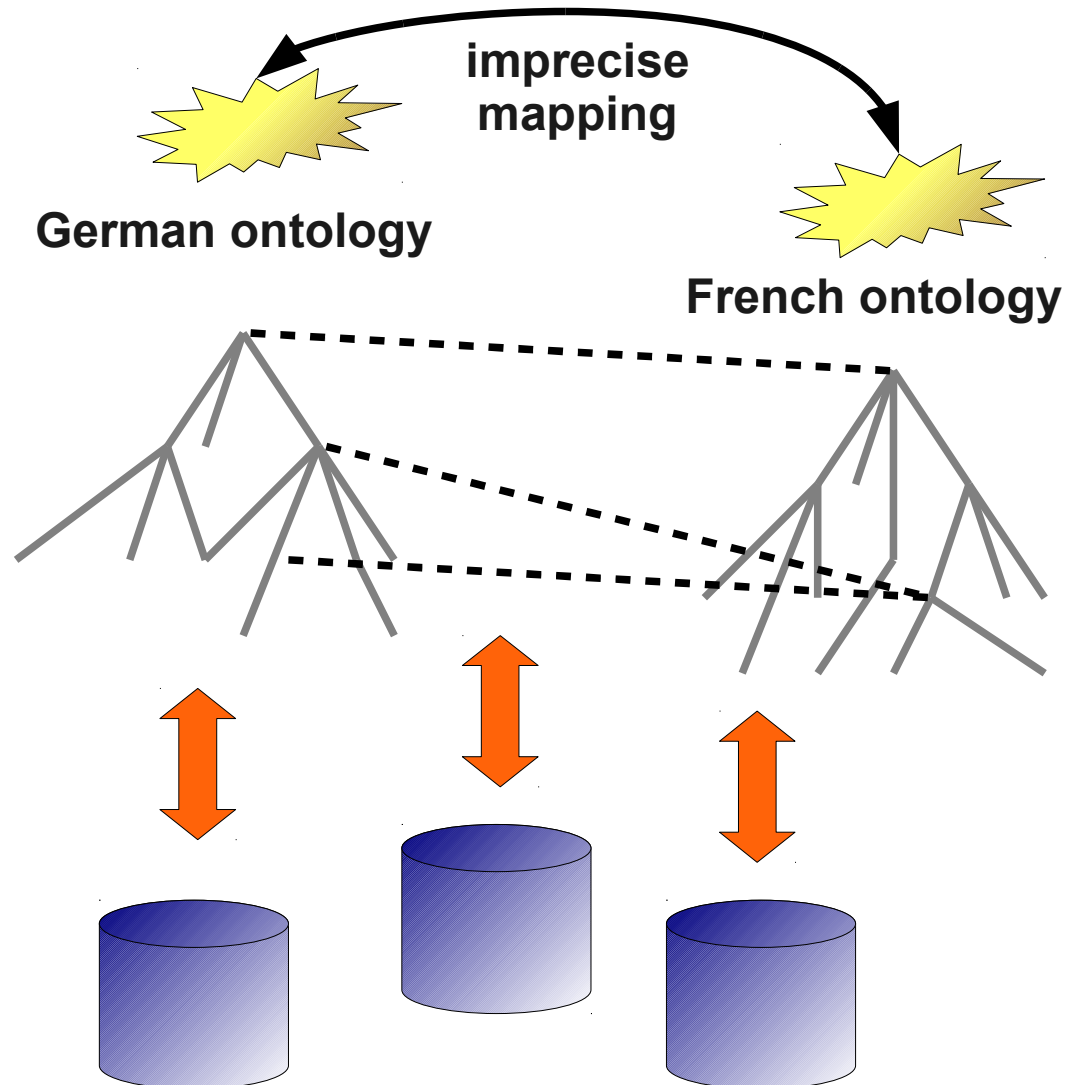
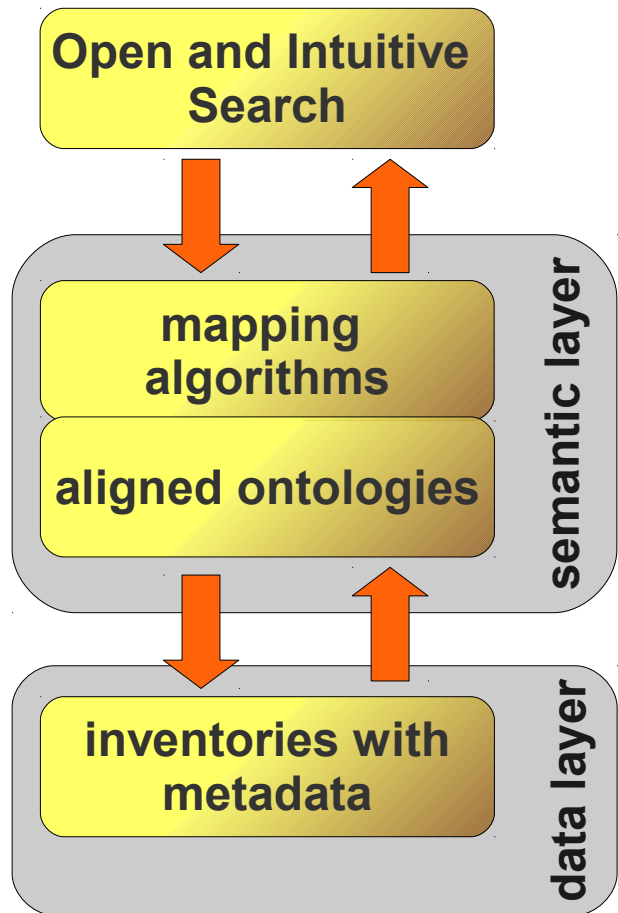
- automatic reasoning
- consistency checking

Loosely coupled

- Link heterogeneous data
- Multilingual

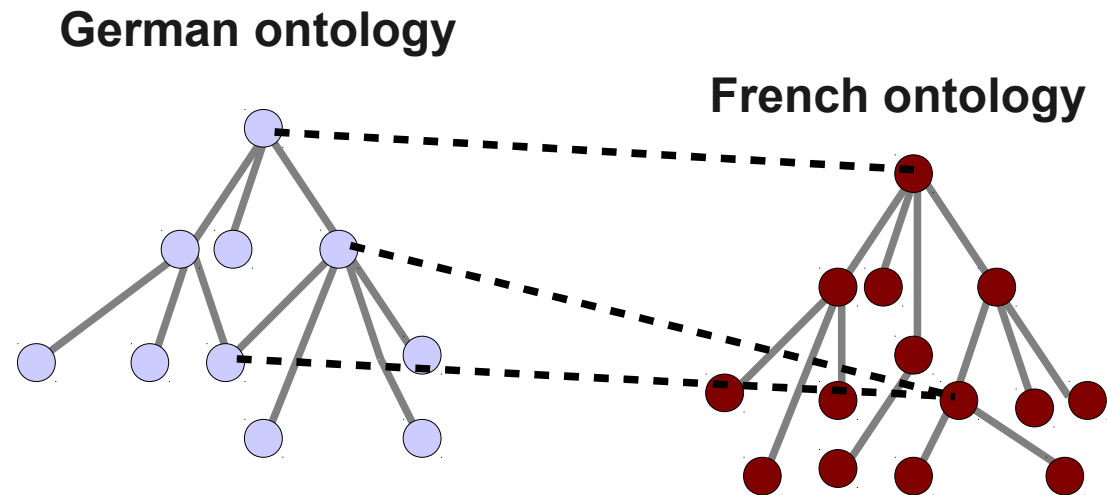
Bauer-Messmer and Grütter 2007

Loosely Coupled Ontologies



Expansion Scheme

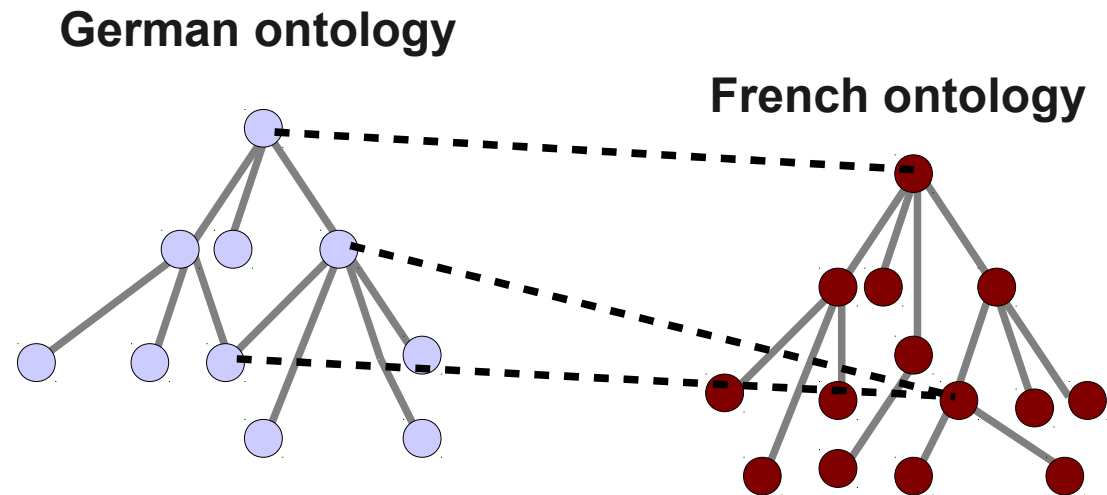
- **Declaration**
 - Entity itself
- **Generalization**
 - Parent entities
- **Specialization**
 - Child entities
- **Target**
 - Bridge Entity



Investigate Entity

BACKTRACKING

- Bridge exists
 - Add candidate entity
 - Add bridged entities
- Bridge does not exist
 - Add children of entity
 - Expand parents

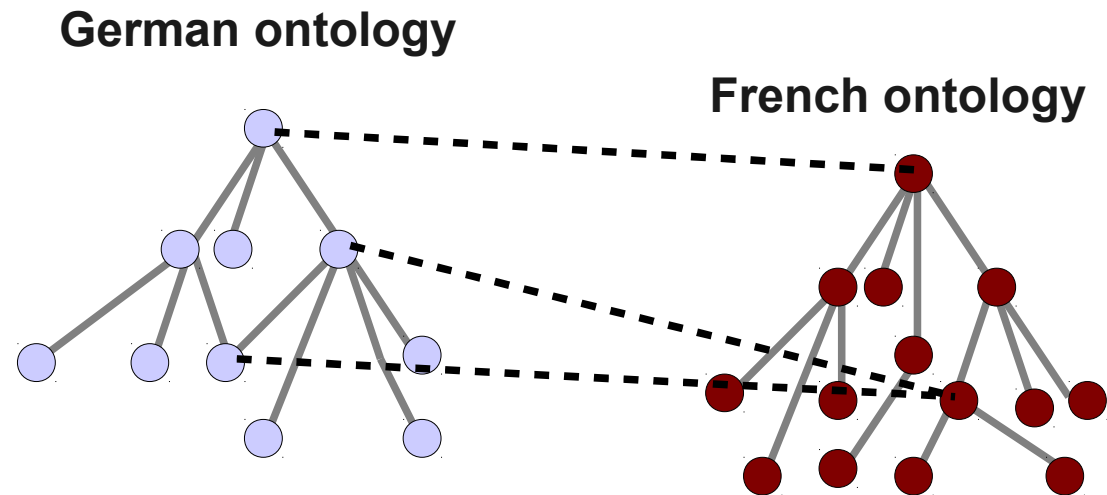


Expand Entity

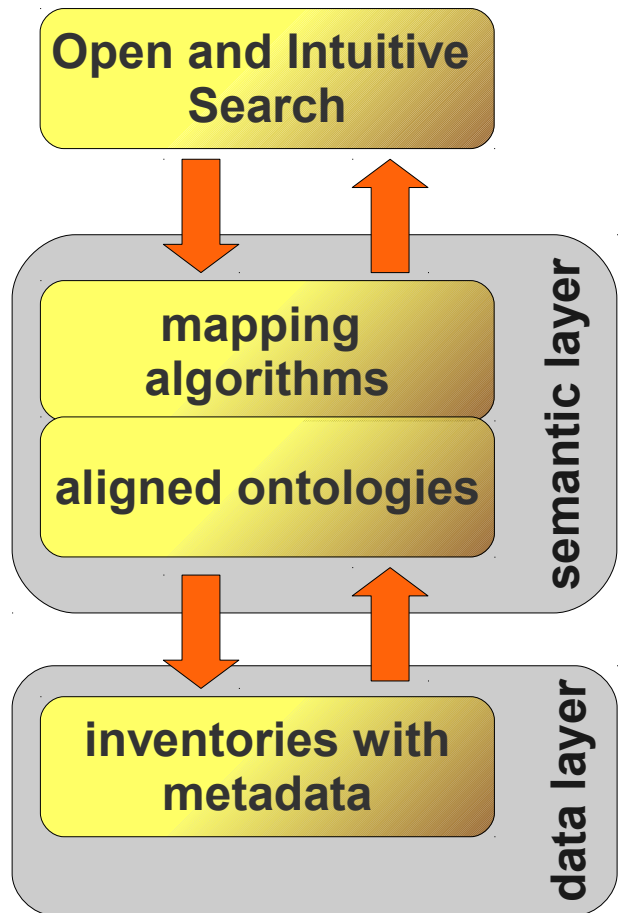
BACKTRACKING

- Bridge does not exist
 - Add children of entity
 - Expand parents

- Bridge exists
 - Add children of target



Implementation



- **Annotated OWL Entities** with keywords
- **Match search terms** with annotations
- **Investigate/Expand** matching entities
- **Query data layer** with search Term
- **Restrict results** with semantic expansion

Summary

- Ontologies for **data integration**
- **Loose coupling** of domains
- **Keyword based search**
- **Focus search** by semantic expansion



Thank you for your attention!

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