

European conference of the Czech Presidency of the Council of the EU
TOWARDS eENVIRONMENT
March 25-27, Prague

Workshop W4 eEnvironment Terminology

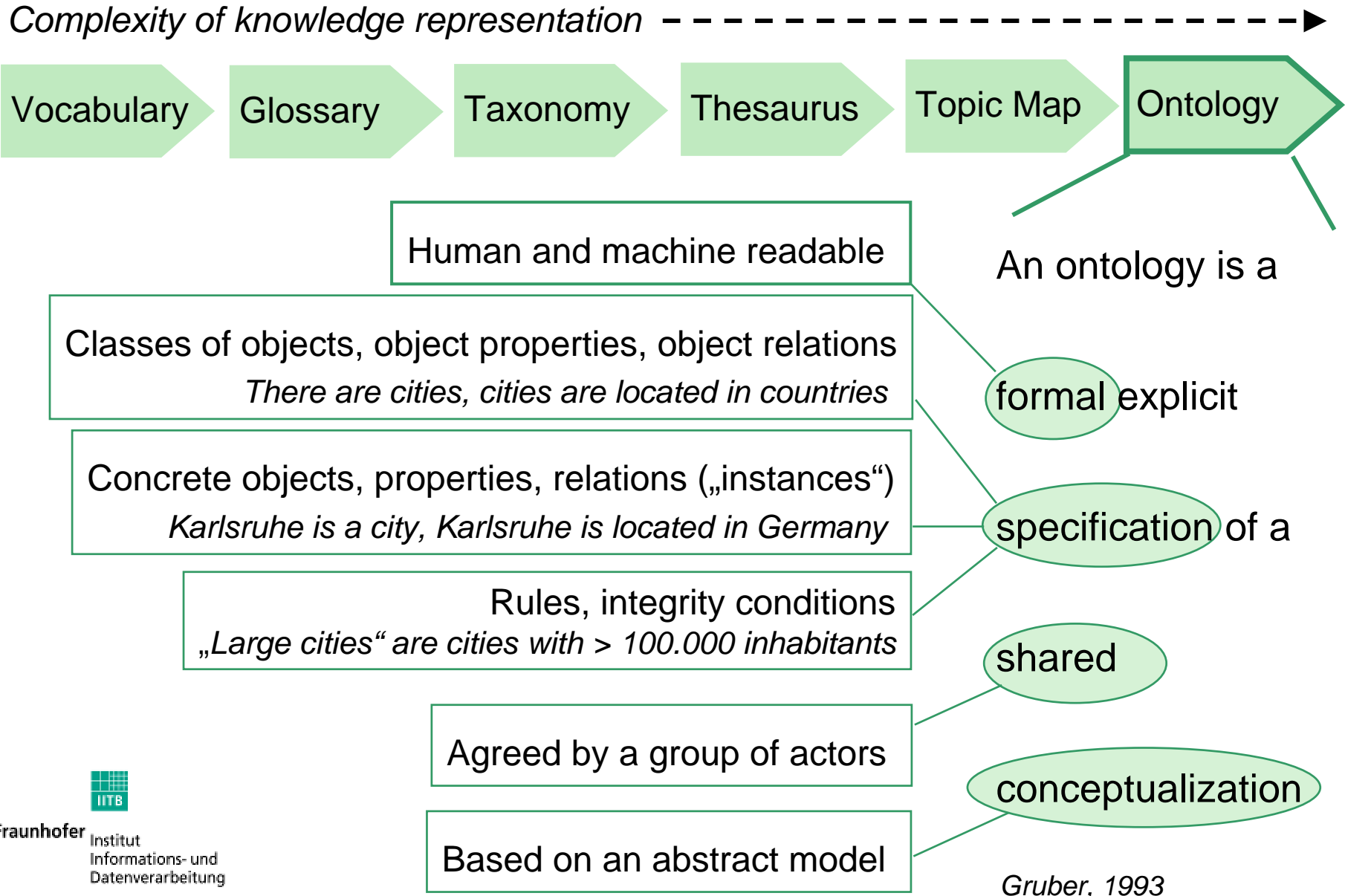
Discovery and Analysis of Environmental Information
based on Formalised Terminology

Ulrich Bügel, Thomas Usländer

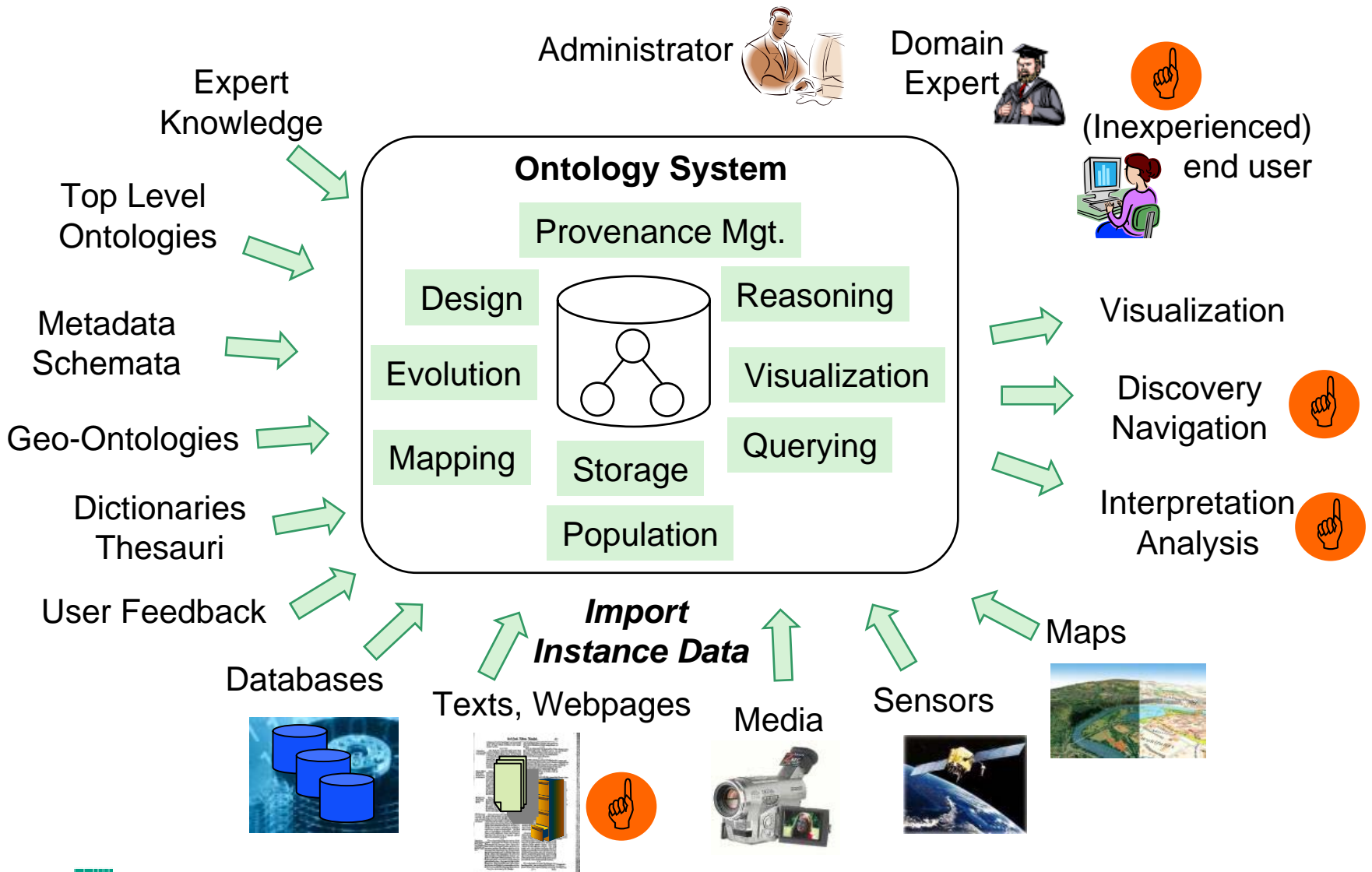
Fraunhofer IITB, Fraunhoferstr. 1
76131 Karlsruhe, Germany
e-mail: {buegel | uslaender}@iitb.fraunhofer.de



Ontologies



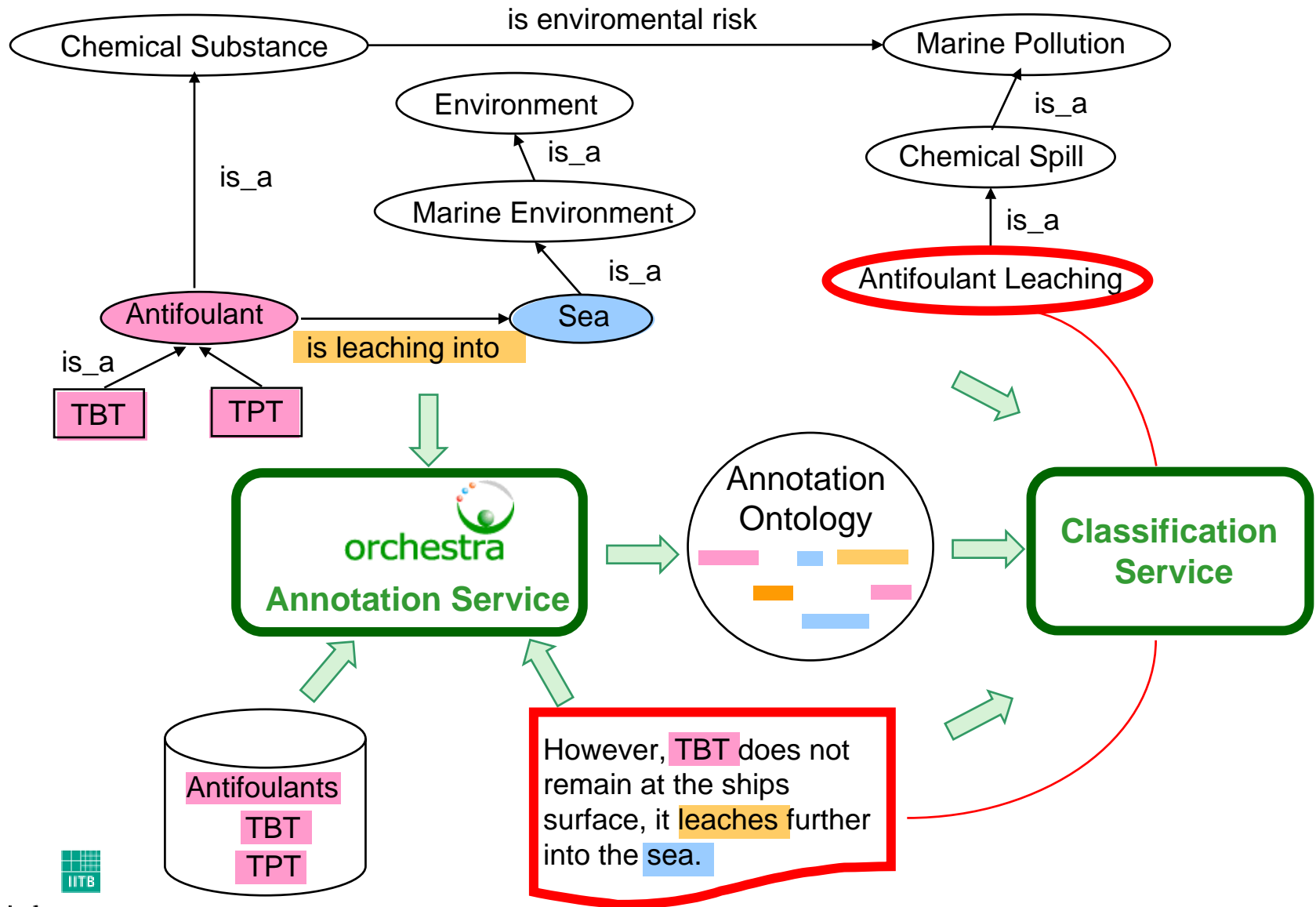
Ontology Construction, Management and Usage



„Semantic Web“ Approach:

Make meta-information explicit, formal, accessible and transferrable

Annotation and Classification



Discovery (1): Benefits of Semantic Search

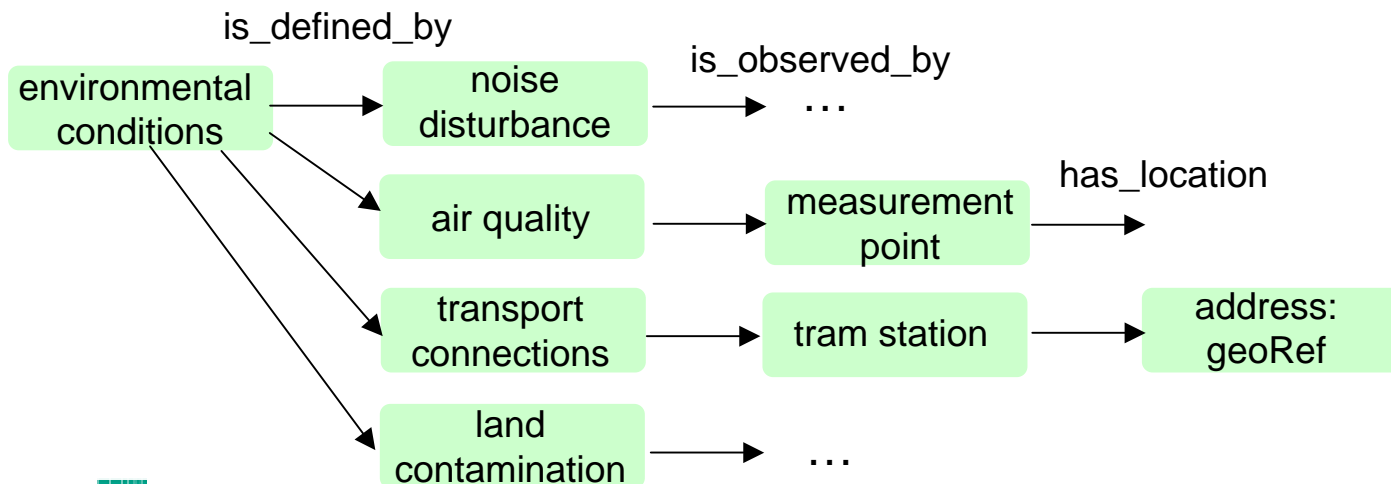
Example search: “Environmental conditions at Karlsruhe”

“Circumstances”: User wants to move to other location, considers to build a house, ...

Problems with conventional search:

- Search terms not specific enough, common terms lead to many irrelevant hits
- Considerable amount of information to gather in order to take a decision
- Combination of spatial reference and environmental terminology can't be handled
- Systems are not integrated

Ontology defines “Semantic bounding box”



Moderated, integrated search for “meaning”



Correct integration of spatial information



Discovery (2): Catalogue Query Expansion

Semantic Bounding Box:

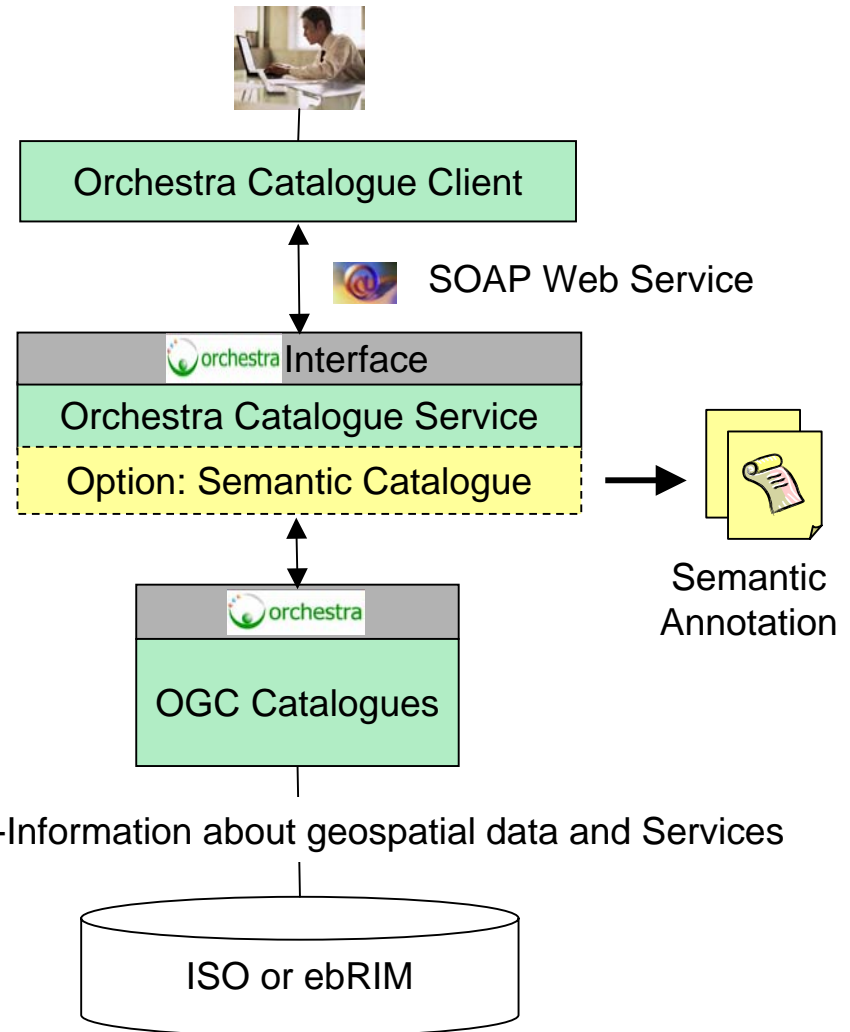
Used Ontology: metapilotSC

- Parents (1 results)
- Original (3 results)
- Children (0 results)
- Relations (46 results)
 - + consistsOf (10 results)
 - + hasPartner (21 results)
 - isAddressingRisk (9 results)
 - MultiRisk**
 - antifoulant pollution**
 - environmental risk**

orchestra [AnyText]"antifoulant pollution"






Search Reset Extend the last query item

with the **MaritimeAuthority** ontology



Interpretation: A Reading Assistant





Tributyltin (TBT) and triphenyltin (TPT) are among the most toxic compounds deliberately released into the marine environment by man (Fent, 1996). The purpose of the application of TBT, and to a lesser degree also TPT, is to prevent ship's hulls from fouling by organisms such as barnacles, bivalves, and algae. Anti-fouling paint has an intended beneficial effect for ships' sailing and manoeuvring properties by keeping the hull smooth and hence lowering the drag coefficient of the ship and associated fuel consumption. However, TBT does not remain at the ships surface, it leaches further into the sea, adheres to particles and biota and settles into the sediment, where it can last for decades (Chau, Maguire, Brown, Fang, & Donard, 2000) allowing a rapid transport over large distances. This might also explain the finding of organotins in the liver of male sperm whales (Physeter macrocephalus) stranded on the Dutch and Danish coasts, although these deep sea animals had apparently not been feeding after they accidentally entered the shallow waters (Ten Hallers-Tjabbes, 1998).






 **Class: marine specie**    






Input of TBT from antifouling paints in the open sea is continuing, despite a ban for ships not larger than 25 m in EU countries. A major reduction of TBT input is expected from the implementation of the International Convention for the Control of Harmful Anti-fouling Systems for Ships (IMO, 2001) has entered into force. In the marine environment, non-target organisms have frequently been found to be affected by toxic effects of organotin biocides (Fent, 1996). The most sensitive organisms are gastropods (snails) and oysters; these animals can already be found between 1 and 10 ng TBT/l. The phenomenon of penis and vas deferens formation in females is called imposex. In some species such as the well-investigated dogwhelk, the development through the stages of imposex has been described (Burt, Gibbs, Burt, & Hummerstone, 1987; Gibbs & Burt, 1986). Recently, the biochemical mechanism of imposex formation was further elucidated in the mud snail. The neuro-peptide 7R-Oxyamide, which is involved in the control of sexual differentiation in molluscs. The male steroid hormone testosterone and its derivatives can play a secondary role in the process. Laboratory experiments with *Buccinum undatum* showed that juveniles <1 year of age, which still lacked primary sexual organs, were more sensitive than adults (Mensink, Everaarts, Kralt, ten Hallers-Hjabbes, & Boon 1996; Mensink et al., 2002). In the juveniles, TBT concentrations 57ng Sn l⁻¹ induced the development of a penis and a vas deferens. In contrast to *N. lapillus*, the developing vas deferens did not show a tendency to overgrow the female genital pore.






 **Class: Mollusc**    

 **Class: Mussel**    

 **Class: Biocide**    

 **Class: Oyster**    

 **ObjectProperty: isHarmfulTo**    

 **DatatypeProperty: hasPollutionFactor**    

Analysis: Ranking Example

Two approaches:

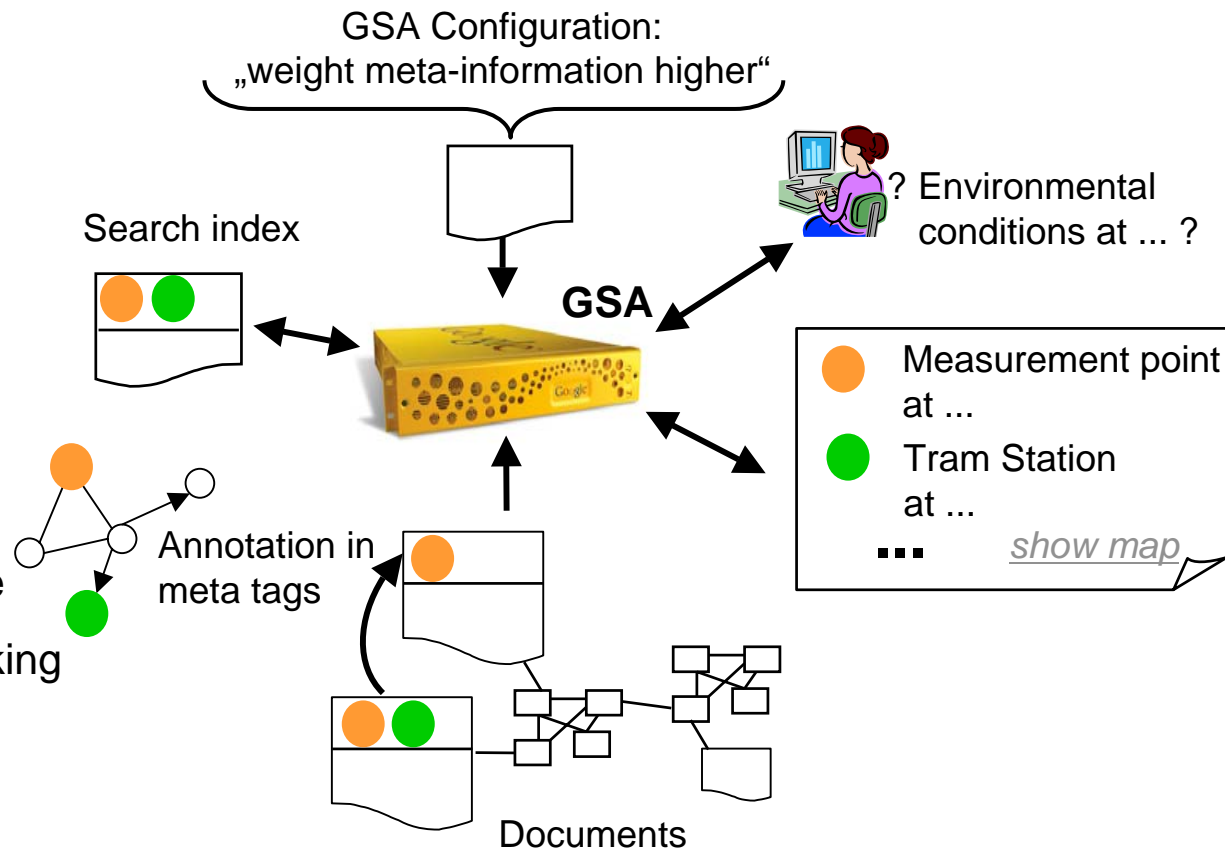
(1) Re-Ranking of Search Results

- ☞ Lookup occurs of semantic bounding box elements in the found documents
- ☞ Calculate weightings for search hits

(2) Take influence on ranking

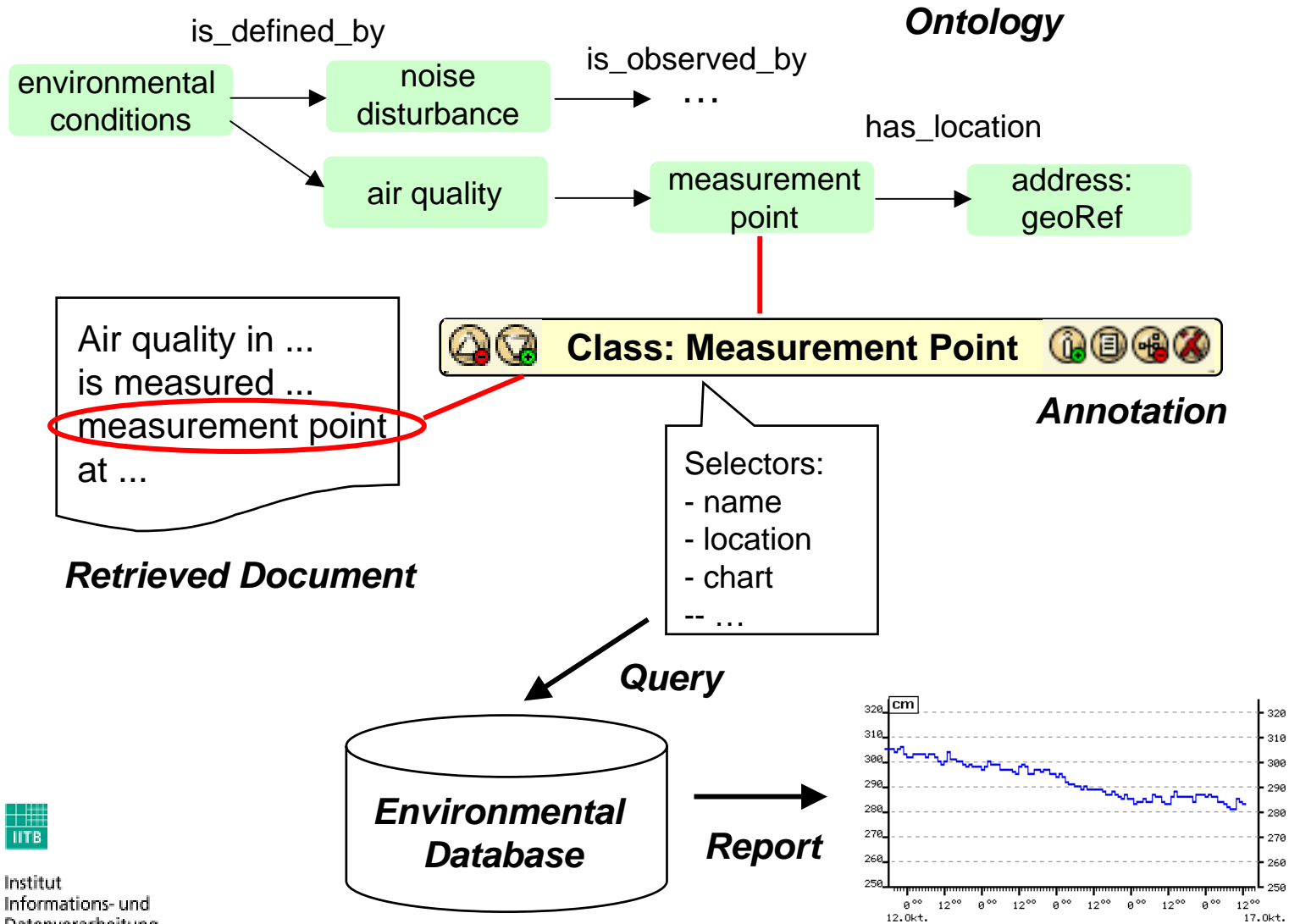
“Google™ Scenario”

- ☞ Annotate on-site
- ☞ Store annotations
e.g. in meta-tags
- ☞ Configure the
Google™ Search Appliance
- ☞ Obtain ontology based ranking



Integration

Example: document reference to a database



Conclusions

Ontologies foster best exploitation of environmental information technology

Main driving force for ontologies: W3C, Semantic Web

Integration into grown infrastructures is a challenge

Common view on structured and unstructured information is needed

Ontology construction, management and usage requires high automation degree

Ontologies can open the door for inexperienced users



THANK YOU FOR YOUR ATTENTION



Fraunhofer Institut
Informations- und
Datenverarbeitung

Ulrich Bügel

*Fraunhofer IITB, Fraunhoferstr. 1
76131 Karlsruhe, Germany
e-mail: buegel@iitb.fraunhofer.de*

Business Unit „Information Management“

- Information and Knowledge Logistics
- Thematic Information Systems (Environment)
- Simulation Systems
- IT consulting

