Harmonisation of Geodata

presented by

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Outline of Presentation

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3. Barriers to GIS Interoperability
4. Recent Developments in Resolving Semantic Heterogeneity in GIS
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1. Introduction

- ☐ The Necessity of Sharing Geodata
  - ■ to effectively manage the task at hand
  - ■ to facilitate better planning and decision making
  - ■ Example

- ☐ The Importance of Harmonisation of Geodata
  - ■ to extract all essential and complete info. available for quality geo-referenced applications
  - ■ to avoid duplication and conflict of existing data
  - ■ cost reduction purpose

2. Overview of 3 Generations of Interoperability Concern of Information System

Table 1 (extracted from Sheth, 1998):

	Generation I	Generation II	Generation III
Level of Interoperability Concern (emphasis underlined)	System; Data	System; Data; Information	System; Data; Information
Types of Interoperability emphasized	system and limited aspects of syntax and structure (data model)	syntax (data types and formats), structure	semantic
Interoperability Techniques (representative samples)	common data models, database exchanges and schema integration	schematic and metadata-level relationships, single ontology, mediators	information/semantic level relationships, context, metadata consistency
Representative Applications	integrations of business databases or public databases	integrated access to heterogeneous data for a software team	multi-step intelligence analysis, navigation application

3. Barriers to GIS Interoperability

- Syntactic Heterogeneity: difference in structures of schema

- Schematic Heterogeneity: difference in classification/generalization of objects

- Semantic Heterogeneity: difference in terminologies

4. Recent Developments in Resolving Semantic Heterogeneity in GIS

☐ Ontology-based Retrieval of GI

  ■ Multiple ontology approach: each info. source has its own local ontology

  ■ Single ontology approach: a single catalogue for all shared vocabularies

  ■ Hybrid ontology approach (M. Lutz et al., 2009) : a single catalogue with basic terms of domain

  ⋮

5. An application

- Ontology-based search for interactive digital maps (Hübner et al., 2004) – a bike trip example
    - background: a tourist cycling along a river in Bremen, Germany looks for a place for bathing and fishing
    - task: check for water quality of the river

5. An application
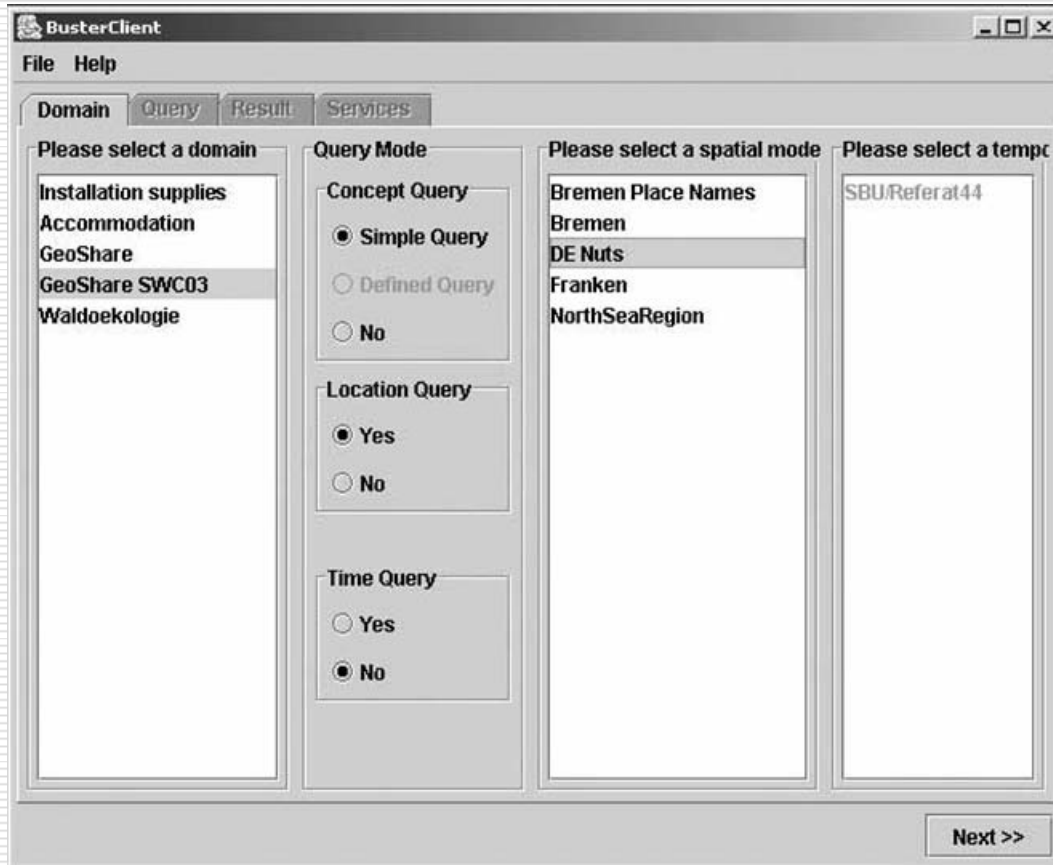
Figure 1. Selecting the domain and the spatial model

5. An application
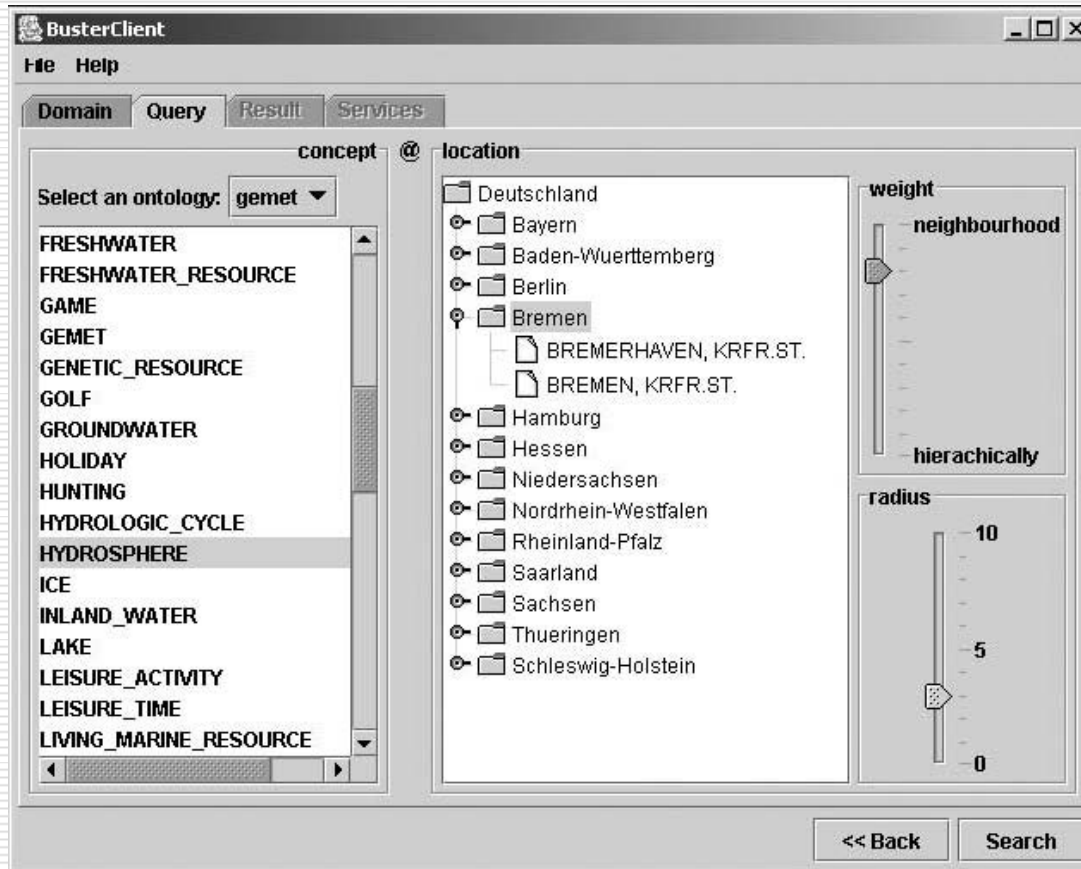
Figure 2. Selecting
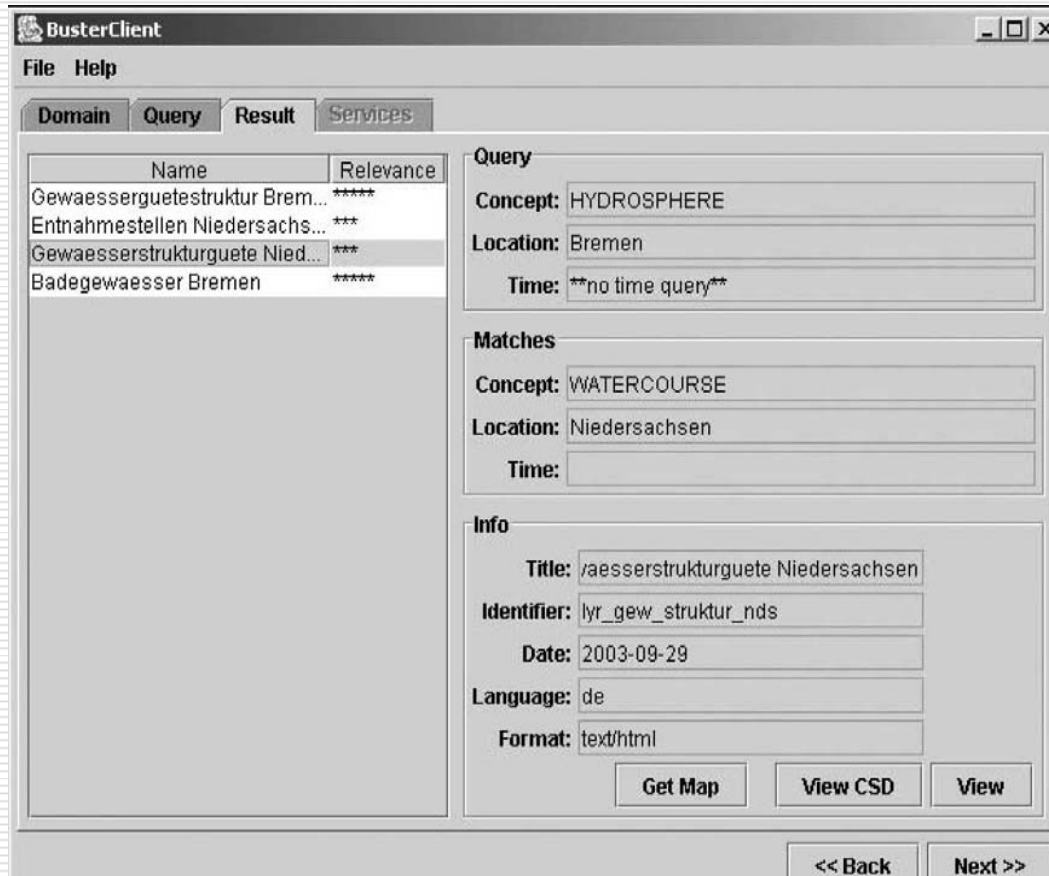a query concept
from GEMET and
a location from the
DE NUTS model

5. An application
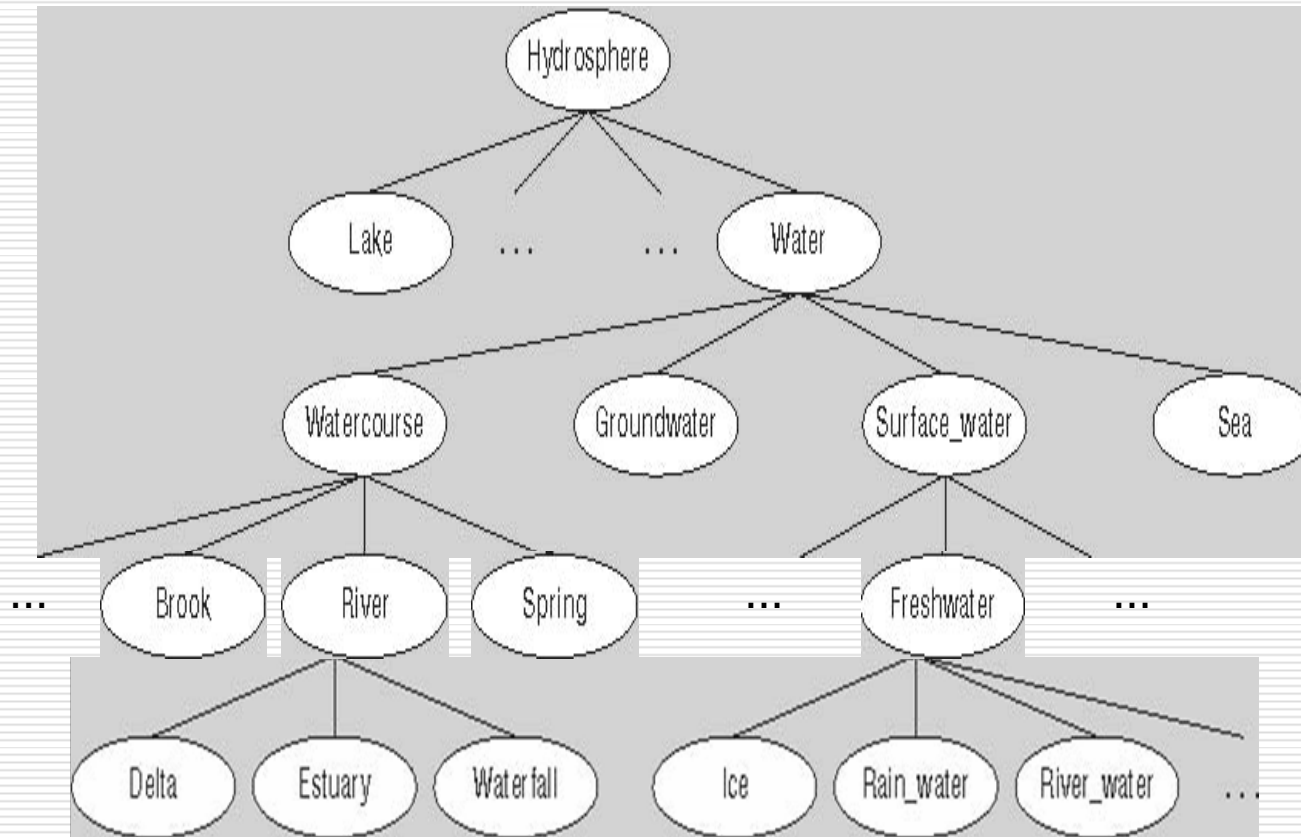
Figure 3. Excerpt of the GEMET application ontology

5. An application

Figure 4. Result page with information providers and their annotated metadata
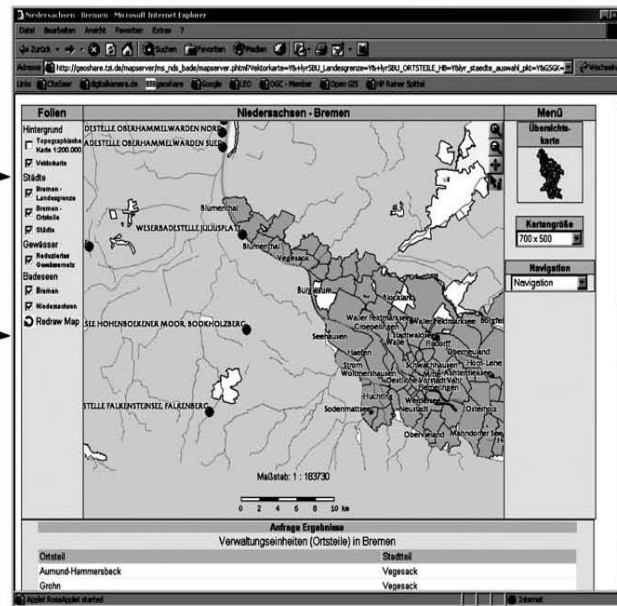
5. An application

Figure 5. Presentation of result on an interactive digital map

6. Conclusions

- Data sharing is important in GIS →difficulties in integrating geodata →data harmonization

- Latest problem: semantic

- Hybrid ontology-based retrieval of GI →resolve the semantic problem

- Certain complexity of creating and registrating application ontologies remains

Example:

-Sewerage Repair Work involves

water company; gas company; electricity company; telephone company and sewerage authority

Schematic Heterogeneity

Example:

Database A   Database B

Vehicles ≥ 3000   Width (m) ≥ 25

-- > Main Road   -- > Main Road