



SNS-NAVIGATOR: A GRAPHICAL INTERFACE TO ENVIRONMENTAL META-INFORMATION

Wolf-Fritz Riekert and
Jörg Jochims
Media University Stuttgart

<mailto:riekert@hdm-stuttgart.de>
<http://v.hdm-stuttgart.de/~riekert>



OVERVIEW

- Objectives
- Environmental Meta Information
- Semantic Networks
- Semantic Web
- Semantic Network Service
- Topic Maps
- Demonstration
- Features of the User Interface
- Implementation
- Result

OBJECTIVES OF THE WORK DESCRIBED



- Construct the **SNS-Navigator**, a graphical interface to a semantic network containing environmental meta-information
- Make use of the **Semantic Network Service (SNS)** of the German Federal Environment Agency (UBA)
- Communication between the graphical interface and the Semantic network via the **webservice technology**
- Use advanced **XML technology**
 - ⇒ XML Topic Maps (XTM) as data format
 - ⇒ Scalable Vector Graphics (SVG) for the graphical display
 - ⇒ XHTML for the textual display
 - ⇒ XSLT for data transformations

ENVIRONMENTAL META-INFORMATION



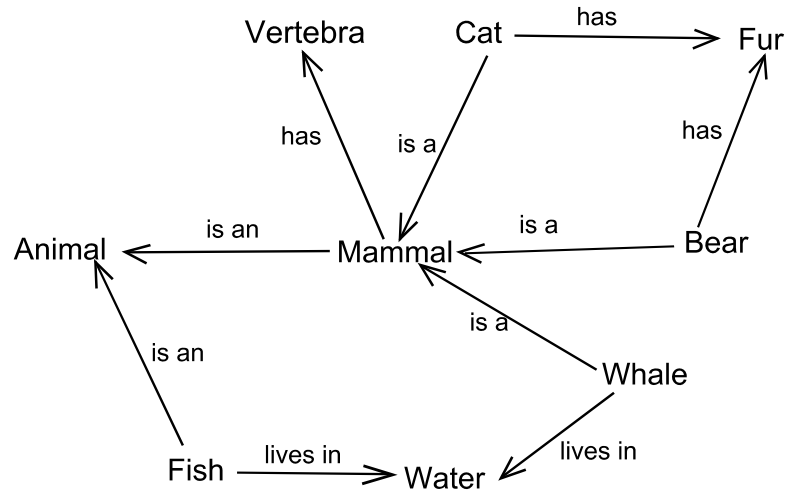
Environmental meta-information

- **Meta:** Information about information, describes environmental information resources
- Facilitates retrieval, processing, management of environmental information resources

Terminology needed to formulate meta-information

- **Thesauri**
 - ⇒ Terms plus limited number of relationship types
 - ⇒ Environmental thesauri: UMTHESES, GEMET
- **Semantic Networks, Ontologies**
 - ⇒ Knowledge structure more complex than in thesauri
 - ⇒ Challenge: interface design

SEMANTIC NETWORKS: AN EXAMPLE



Source: http://en.wikipedia.org/w/index.php?title=Semantic_network&oldid=154570175

SEMANTIC NETWORKS

- Semantic network = directed graph consisting of
 - ⇒ Vertices, representing concepts (e.g., Vertebra, Mammal, Whale, Water)
 - ⇒ Edges, representing semantic relations between the concepts (e.g., “has”, “is a”, “lives in”)
- Knowledge structure more complex than in thesauri
 - ⇒ More specific types of concepts (compared with terms)
 - ⇒ Larger (unlimited) number of relationship types
- Old knowledge representation idea (Quillian, 1967)
- New Web-based approaches: Semantic Web (Berners Lee)

SEMANTIC WEB

Tim Berners-Lee:

The Semantic Web is an extension of the current web in which information is given well-defined meaning, better enabling computers and people to work in cooperation.

Approaches:

- Resource Description Framework RDF, RDF Schema (W3C)
- Web Ontology Language OWL (RDF extension)
- XML Topic Map (alternative approach, ISO 13250)
 - ⇒ Used in this work

SNS = SEMANTIC NETWORK SERVICE

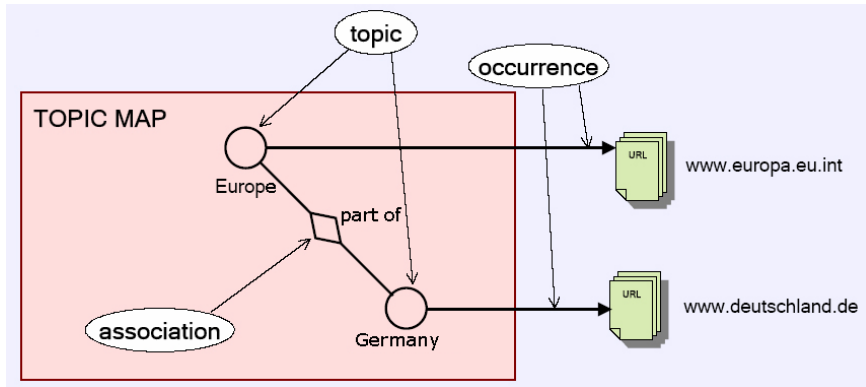
Basis of this work: SNS = Semantic Network Service

- Developed for the German Federal Environment Agency (UBA) by an industrial working group, project leader: Thomas Bandholtz (www.semantic-network.de).
- The **semantic network**: A **topic map** integrates three terminological information sources of the UBA in a :
 - ⇒ Environmental Thesaurus *UmThes* (“*Umweltthesaurus*”) ≈ 34000 terms
 - ⇒ Environmental Gazetteer *GTU* (“*Geo-Thesaurus Umwelt*”) ≈ 19000 geographic names
 - ⇒ An environmental chronicle ≈ 550 environmentally-related events.

Linkage by a large number of relationship types

- The **service**: Multiple applications may access the semantic network remotely through a **web service**

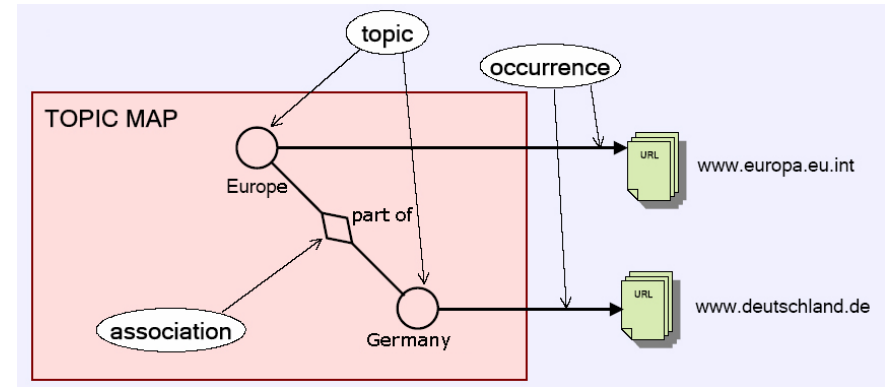
TOPIC MAPS EXAMPLE



Basic elements of a topic map:

- **topics** (concepts),
- **associations** (relationships),
- and **occurrences** (references to information resources)

TOPIC MAPS EXAMPLE



Navigation in a topic map:

- along associations: discovery of new knowledge
- towards occurrences: discovery of information resources

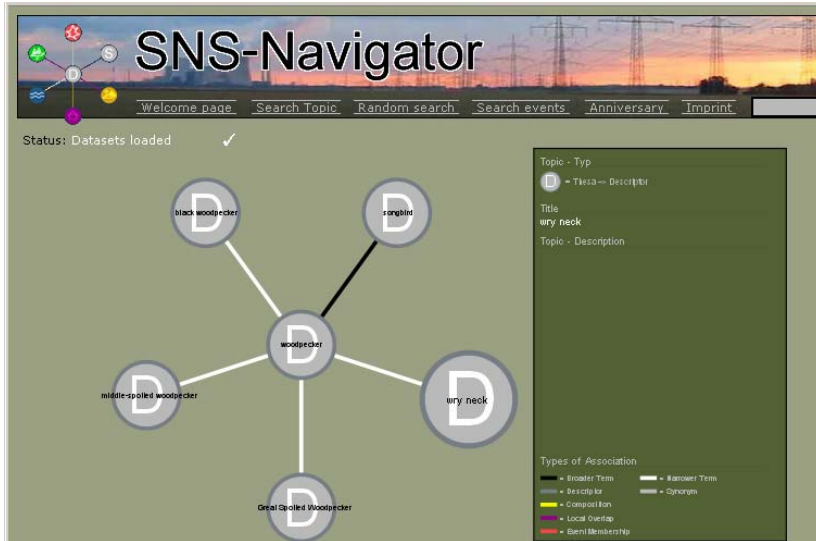
Semantic web technology: knowledge added to the web

DEMONSTRATION (1)

<http://www.sns-navigator.de>

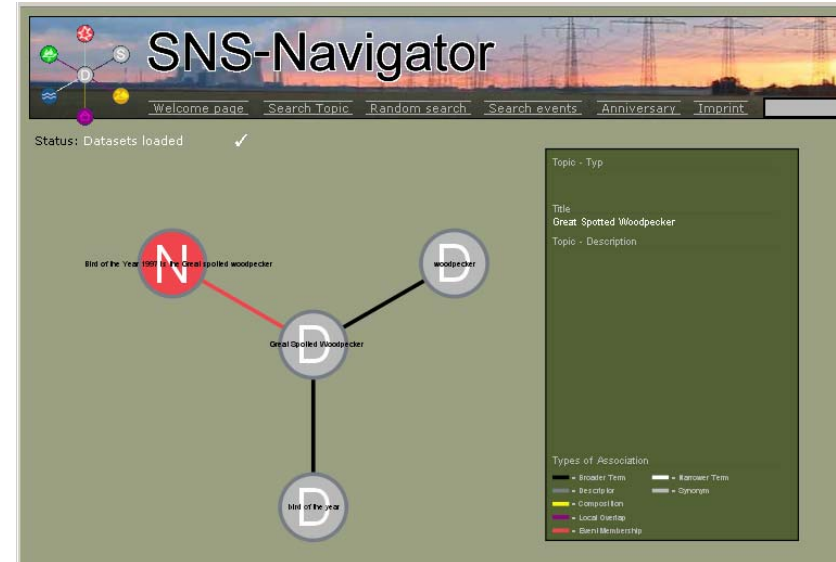
DEMONSTRATION (2)

DEMONSTRATION (3)



SNS-NAVIGATOR

DEMONSTRATION (4)



SNS-NAVIGATOR

SEARCH OPTIONS

- **Search topic:** text search (e.g., “animal protection”)
 - ⇒ Various search options
- **Search events:** indicate a time interval
- **Anniversaries** of environmental events
- **Random search** facility: returns an arbitrary topic

SNS-NAVIGATOR

GRAPHIC REPRESENTATION OF TOPIC & ASSOCIATION TYPES

Topic types - Legend:		
Events		
⊗ = Conference	⊙ = Convention	⊛ = Disaster
→ = Guideline	⊞ = History	⚠ = Accident
N = Nature of the year	↑ = Institution	⌚ = Law
⚓ = Marine Accident	! = Initiative	P = Publication
Location -> Admin		
⊕ = Community	⊖ = District	⊗ = Nation
⊖ = State		
Location -> Land		
⊙ = Catchment Area	⊙ = Island	⊙ = Landscape
⊙ = Mountain	⊙ = Mountains	⊙ = Natural Area
Location -> Protected Area		
⊙ = Biosphere	⊙ = Natural Park	⊙ = National Park
⊙ = Protected Area		
Location -> Waters		
⊙ = Channel	⊙ = Lake	⊙ = River
⊙ = See	⊙ = Reservoir	
Thesa		
① = Component	D = Descriptor	S = Synonym

Symbols

- Topic types

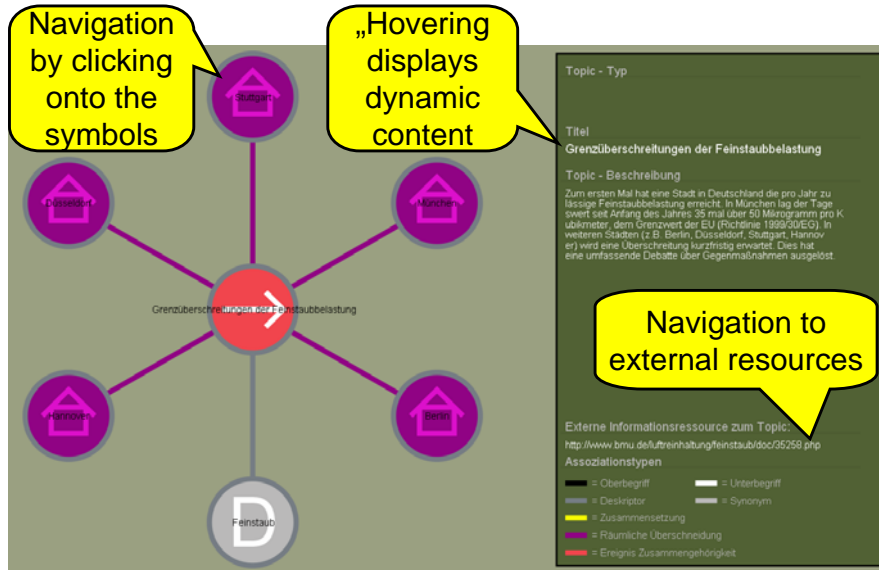
Colours

- Group of topic types
- Association types

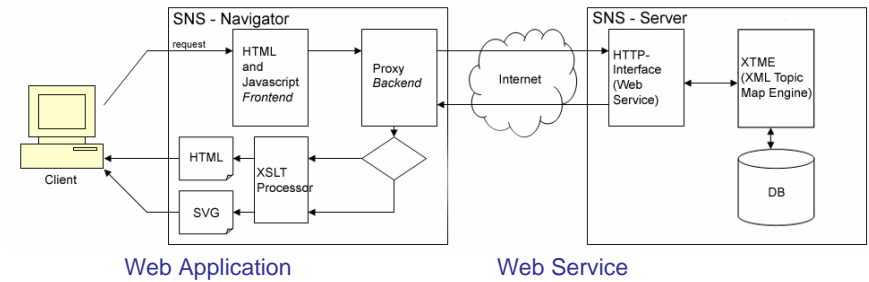
— = Broader Term	— = Narrower Term
— = Descriptor	— = Synonym
— = Composition	
— = Local Overlap	
— = Event Membership	

SNS-NAVIGATOR

GRAPHICAL DISPLAY: NAVIGATION THROUGH TOPIC MAP FRAGMENTS



IMPLEMENTATION

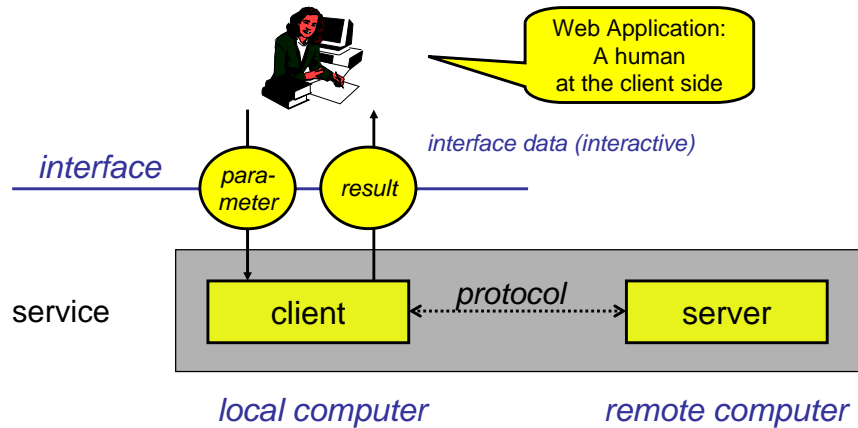


Three-tier architecture

- Web Browser
- SNS - Navigator
- SNS - Server of the UBA

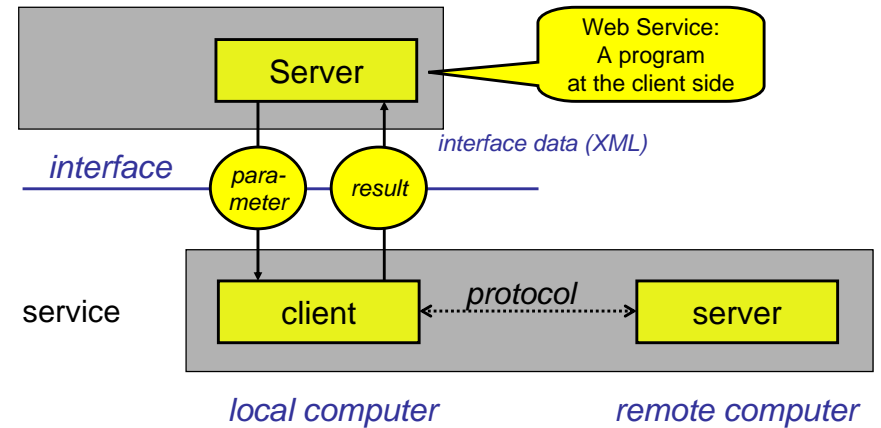
Combination of a web application and a web service

WEB APPLICATION



SNS-Navigator is a web application

WEB SERVICE



The Semantic Network Service is a web service

TECHNOLOGY USED

Advanced web technologies based on XML (*eXtended markup language*)

- SVG (*Scalable Vector Graphics*) used to display topic map fragments
 - ⇒ Enlargeable without loss of quality
- Ajax (*Asynchronous Javascript and XML*)
 - ⇒ XML Topic Maps (XTM) as data exchange format
 - ⇒ A Javascript program calls the web service via a proxy
 - ⇒ Processing status can be displayed
- XSLT (*eXtensible Stylesheet Language Transformation*)
 - ⇒ Used to transform XTM into XHTML and SVG representations.

RESULT

- Graphical display makes it easy to access and understand the information content provided by the Semantic Network Service
- Ajax approach: Smooth interaction with the system, processing status is displayed
- The SVG approach facilitates the use of the system. Environmental topics are displayed as an enlargeable network of graphical symbols.
- Develop an intuitive understanding of environmental topics
- Facilitate access to a large number of environmental information resources.