The Value Proposition of Semantic Technologies and Ontologies for the Earth Sciences

A Brief Overview

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August, 2012

From Why to How

- Discussions on the use and benefits of semantic technologies are shifting away from the **why** to the **how**
- Surprisingly this more in stakeholder interest is not accompanied by a more **detailed understanding** of what semantics research is about
- We need to emphasize the **paradigm shift** proposed by semantics research while **abstracting from technical details** and advocate the **added value** for the individual stakeholder
- Still, we should **not oversell**

For details see:

- Krzysztof Janowicz, Pascal Hitzler, The Digital Earth as Knowledge Engine. Semantic Web 3 (3), 213-221, 2012.
- Krzysztof Janowicz, Pascal Hitzler, Key Ingredients For Your Next Semantics Elevator Talk. In: Proceedings SeCoGIS 2012. To appear.

Publishing and Retrieving

For the individual scientist, the added value of semantic technologies and ontologies starts with publishing own data. **By creating more intelligent meta-data, researchers can:**

- Support the **discovery** and **reuse** of their data
- Improve the **reproducibility** of their scientific results
- Reduce the risk that their data and results are **misinterpreted**
- Meet the **data requirements** of journals and funding organizations

Participating in the Semantic Web is a **staged process** with a **low entry level**

- Large & **active community** in science, government, and industry
- Many open source and commercial **tools** and infrastructures
- Existing **ontologies** and huge amounts of interlinked **data**
- Highly modular and distributed, **no SPOF**

Interacting and Accessing

One of the key paradigm shifts proposed by the Semantic Web is to enable the creation of **smart data** in contrast to smart applications, i.e., move more of the business logic in the data, not the software.

- Smart data enables more **usable, flexible, and robust applications**, while smarter applications fail to improve data along the same dimensions
- Semantic technologies and ontologies **reduce** implementation and maintenance **costs**
- Access external datasets via own **preferred user interface**
- **Exploratory interaction** with heterogeneous data
- **Interlinked** data provides **context** and disambiguation

Reusing and Integrating

Semantic technologies and ontologies support **horizontal** as well as **vertical** workflows.

- **Data-Model Intercomparison** – ontologies reduce the risk of combining unsuitable data and models.
- Semantic technologies support the creation of rules for **integrity constraint checking**
- Semantic technologies **foster interoperability** without restricting **diversity** which is a motor of (interdisciplinary) science
- Semantic technologies and ontologies can also assist scientists in **selecting appropriate analysis methods**
- To a certain degree, the Semantic Web can help to automatically **translate** between conceptual models

A Final Thought

... It seems that we hope to arrive at semantic ***interoperability by standardization*** *instead of investing into research on alignment and* ***semantic translation to reduce incompatibility****. This may turn out to be a fundamental* ***misconception****. I believe that standardization is the more difficult of both approaches...*