



Establishing a knowledge management for the interdisciplinary exchange of geoscientific information and models

Rainer Haener (1), Sylvain Grellet (2), and Henning Lorenz (3)

(1) Helmholtz Centre Potsdam GFZ German Research Centre for Geosciences, CeGIT, Potsdam, Germany (rainer.haener@gfz-potsdam.de), (2) The French Geological Survey, Orleans, France, (3) Uppsala University, Department of Earth Sciences, Sweden

Current developments with regard to worldwide sharing scientific information across discipline boundaries, sometimes down to real time (early warning systems), reveal the high demand for interoperable methods concerning the exchange and further processing of data. However, despite major efforts in establishing scientific infrastructures, a seamless and cross-domain integration of heterogeneous data remains unsatisfactory. In particular, their automated processing and visualisation is not readily possible. In addition, a representation of the scientific (semantic) context, essential for further processing, is still only insufficiently available.

This presentation illustrates an approach that has been designed, developed and implemented within a European Research Infrastructure, the European Plate Observing System (EPOS). It adapts enterprise integration patterns for stream-aware and reactive integration pipelines and thus establishes suitable methods for an efficient and interoperable exchange of data, metadata, and semantic information.

Based on the use case “Testing the coherence of geological models”, the utilisation of common, standardised, and well-established information models as well as a comprehensive knowledge representation for the fusion (correlation) of information from different domains is demonstrated. For this case, borehole measurements are used either to create geological models or to verify models, which were obtained by means of geological and geophysical investigation methods (e.g., electrical resistivity tomography). Among many others, this use case is also subject to an evaluation within the Borehole Interoperability Experiment (BoreholeIE) of the Open Geospatial Consortium (OGC), which is conducted currently.

Further potential applications emphasise the needs for establishing a seamless exchange of interoperable scientific and technical data: Within borehole management systems, the participants involved are for example put in the position to detect and prevent drilling risks in good time based on the analysis of existing drilling logs from other boreholes. A web-based real-time support of operators and scientists allows collaboration across projects.

In general, it is of great importance that also knowledge, necessary for further processing the exchanged information is conveyed suitably. Often, even in communities of the same domain, specific terms or semantic contexts are not harmonised. This fact underlines the necessity of a standardised knowledge representation. For this reason, a semantic registry has been established, which enables the various scientific communities sharing a manifold of semantic information like domain-controlled vocabularies, concepts (ontologies), and their relations.

An important part of this presentation is the demonstration of various technologies for knowledge representation. A suitable method for this is visualising the scientific context of the information, allowing participating scientists to assess its usability. This not only includes a graphical representation of the semantic context, but also a scientific visualisation of (pre-) processed and analysed data.