Geophysical Research Abstracts
Vol. 13, EGU2011-8689-2, 2011
EGU General Assembly 2011

Towards a Multi-Style Service-Oriented Architecture for Earth Observations

Sven Schade (1), Paolo Mazzetti (2), Zoheir Sabeur (3), Denis Havlik (4), Thomas Usländer (5), Arne Berre (6), and Jose Lorenzo Mon (7)

(1) Institute for Environment and Sustainability, EC-JRC, Ispra, Italy (sven.schade@jrc.ec.europa.eu), (2) CNR - National Research Council of Italy, Institute of Methodology for Environmental Analysis, Tito Scalo, Italy (mazzetti@imaa.cnr.it), (3) University of Southampton IT Innovation Centre, Southampton, United Kingdom (zas@it-innovation.soton.ac.uk), (4) Austrian Institute of Technology, SIM, Vienna, Austria (denis.havlik@ait.ac.at), (5) Fraunhofer Institute of Optronics, System Technologies and Image Exploitation, Karlsruhe, Germany (thomas.uslaender@iosb.fraunhofer.de), (6) SINTEF - Foundation for Scientific and Industrial Research, Norwegian Institute of Technology, Oslo, Norway (Arne.J.Berre@sintef.no), (7) ATOS Origin S.A.E., Madrid, Spain (jose.lorenzo@atosresearch.eu)

Our societies and culture are inevitably becoming digital and the Internet has become essential for a wide range of applications and services, including the geosciences. Advances in ad-hoc networks, affordable sensors, and social networking technologies are changing the societal role of geospatial information systems. What used to be a well-defined activity of Earth scientists is increasingly becoming a loosely coupled mash-up of technologies, observations, and stakeholders from various authorities, research organizations, citizen scientists and private sector organizations. In spite of the large on-going investments in Earth Observation, the sheer quantity and the heterogeneity of information, as well as the variety of the end user's requirements prevents full utilization of available observations in cross-domain applications. The underlying infrastructure needs to be adapted to the increasing demands made upon it. A next generation cyber-infrastructure, consisting of loosely coupled distributed software components has been requested (Yang et al. 2010).

Service-oriented architecture (SOA) is widely accepted as the paradigm of choice. Still, no agreed conceptual foundation of a geospatial SOA, i.e. a common service meta-model that is also compliant with geospatial service standards of the Open Geospatial Consortium (OGC) exists today (Usländer 2010). We investigate the possibilities to harmonize existing and emerging service meta-models and ontologies of OMG (SoaML) or OASIS (SOA reference models) with ISO/OGC (ISO 19119, OGC 07-097 RM-OA) with the objective of conceptualizing a so-called multi-style SOA; that is a SOA that supports multiple architectural styles and communication patterns such a request/reply messaging, event-driven interactions and resource-oriented services (commonly known as RESTful Web services) following a unified service meta-model.

This multi-style SOA for Earth Observations shall be rigorously based upon comprehensive SOA design patterns (Erl 2008) and leverage the Future Internet functions, such as access to the Internet of Things, Cloud Services and Location Services (Kennedy 2010). Furthermore, by combining these styles through a common model, multiple geospatial usage scenarios shall be supported: mash-up applications, handling of large datasets, as well as 'plug-and-play' of physical sensors, environmental models and user contributed content. Semantic annotation of the SOA elements shall be used in order to bridge multiple thematic communities and enable cross-domain applications.

Above all, we want to advance the handling of information in observation networks by supporting in-network processing. A networked cluster of sensors, models, and users should be able to provide a consolidated answer to geospatial and environmental questions without relying on a central processing instance. This is essential to control the amount of data communicated across networks, especially in highly dynamic ad-hoc scenarios with mobile sensors, sensors with limited energy supplies, multiple publishers and consumers (clients) of the same or related information.

In order to foster our research on a multi-style Service-Oriented Architecture for Earth Observations, we plan to environmentally-enable (envirofy) the Future Internet (Schade 2010). Efforts include a detailed requirements specification for the Future Internet platform, the specification of environmental enablers for the Future Internet, and a mapping between mainstream and environmental service architectures. A generalization to other geosciences may follow.

References

Erl, T. (2008). SOA design patterns. ISBN 0-13-613516-1. Prentice Hall.

Yang, C.P., Raskin, R., Goodchild, M.F., Gahegan, M. (2010). Geospatial Cyberinfrastructure: Past, present and future. Computers, Environment and Urban Systems 34(4), pp. 264-277.
Kennedy, D. (2010). The European Future Internet Initiative. Workshop on the Future Internet Public-Private-Partnership: When smart technologies connect people. Nice, France.
S. Schade (Ed.) (2010). The Future Internet PPP and its Usage Areas: A Sensor Web for the Environment in Europe. Position paper for 2nd Usage Area Workshop: Future Internet Initiative, Brussels, Belgium.
Usländer, T. (2010). Service-oriented Design of Environmental Information Systems. PhD thesis, Karlsruhe Institute of Technology (KIT), Faculty of Computer Science, KIT Scientific Publishing. ISBN 978-3-86644-499-7.