Geophysical Research Abstracts
Vol. 12, EGU2010-11854, 2010
EGU General Assembly 2010

Grid enablement of OpenGeospatial Web Services: the G-OWS Working Group

Paolo Mazzetti (1,2) and the G-OWS Working Group Team
(1) IMAA - CNR, Tito Scalo, Italy (mazzetti@imaa.cnr.it), (2) University of Florence at Prato, Prato, Italy

In last decades two main paradigms for resource sharing emerged and reached maturity: the Web and the Grid. They both demonstrate suitable for building Distributed Computing Infrastructures (DCIs) supporting the coordinated sharing of resources (i.e. data, information, services, etc) on the Internet. Grid and Web DCIs have much in common as a result of their underlying Internet technology (protocols, models and specifications). However, being based on different requirements and architectural approaches, they show some differences as well.
The Web's "major goal was to be a shared information space through which people and machines could communicate" [Berners-Lee 1996]. The success of the Web, and its consequent pervasiveness, made it appealing for building specialized systems like the Spatial Data Infrastructures (SDIs). In this systems the introduction of Web-based geo-information technologies enables specialized services for geospatial data sharing and processing.
The Grid was born to achieve "flexible, secure, coordinated resource sharing among dynamic collections of individuals, institutions, and resources" [Foster 2001]. It specifically focuses on large-scale resource sharing, innovative applications, and, in some cases, high-performance orientation.
In the Earth and Space Sciences (ESS) the most part of handled information is geo-referred (geo-information) since spatial and temporal meta-information is of primary importance in many application domains: Earth Sciences, Disasters Management, Environmental Sciences, etc. On the other hand, in several application areas there is the need of running complex models which require the large processing and storage capabilities that the Grids are able to provide. Therefore the integration of geo-information and Grid technologies might be a valuable approach in order to enable advanced ESS applications.
Currently both geo-information and Grid technologies have reached a high level of maturity, allowing to build such an integration on existing solutions. More specifically, the Open Geospatial Consortium (OGC) Web Services (OWS) specifications play a fundamental role in geospatial information sharing (e.g. in INSPIRE Implementing Rules, GEOSS architecture, GMES Services, etc.). On the Grid side, the gLite middleware, developed in the European EGEE (Enabling Grids for E-sciencE) Projects, is widely spread in Europe and beyond, proving its high scalability and it is one of the middleware chosen for the future European Grid Infrastructure (EGI) initiative. Therefore the convergence between OWS and gLite technologies would be desirable for a seamless access to the Grid capabilities through OWS-compliant systems. Anyway, to achieve this harmonization there are some obstacles to overcome. Firstly, a semantics mismatch must be addressed: gLite handle low-level (e.g. close to the machine) concepts like "file", "data", "instruments", "job", etc., while geo-information services handle higher-level (closer to the human) concepts like "coverage", "observation", "measurement", "model", etc. Secondly, an architectural mismatch must be addressed: OWS implements a Web Service-Oriented-Architecture which is stateless, synchronous and with no embedded security (which is demanded to other specs), while gLite implements the Grid paradigm in an architecture which is stateful, asynchronous (even not fully event-based) and with strong embedded security (based on the VO paradigm).
In recent years many initiatives and projects have worked out possible approaches for implementing Grid-enabled OWSs. Just to mention some: (i) in 2007 the OGC has signed a Memorandum of Understanding with the Open Grid Forum, "a community of users, developers, and vendors leading the global standardization effort for grid computing."; (ii) the OGC identified "WPS Profiles - Conflation; and Grid processing" as one of the tasks in the Geo Processing Workflow theme of the OWS Phase 6 (OWS-6); (iii) several national, European and international projects investigated different aspects of this integration, developing demonstrators and Proof-of-Concepts;
In this context, "gLite enablement of OpenGeospatial Web Services" (G-OWS) is an initiative started in 2008 by

the European CYCLOPS, GENESI-DR, and DORII Projects Consortia in order to collect/coordinate experiences on the enablement of OWS on top of the gLite middleware [GOWS]. Currently G-OWS counts ten member organizations from Europe and beyond, and four European Projects involved. It broadened its scope to the development of Spatial Data and Information Infrastructures (SDI and SII) based on the Grid/Cloud capacity in order to enable Earth Science applications and tools. Its operational objectives are the following:
i) to contribute to the OGC-OGF initiative;
ii) to release a reference implementation as standard gLite APIs (under the gLite software license);
iii) to release a reference model (including procedures and guidelines) for OWS Grid-ification, as far as gLite is concerned;
iv) to foster and promote the formation of consortiums for participation to projects/initiatives aimed at building Grid-enabled SDIs
To achieve this objectives G-OWS bases its activities on two main guiding principles: a) the adoption of a service-oriented architecture based on the information modelling approach, and b) standardization as a means of achieving interoperability (i.e. adoption of standards from ISO TC211, OGC OWS, OGF).
In the first year of activity G-OWS has designed a general architectural framework stemming from the FP6 CYCLOPS studies and enriched by the outcomes of other projects and initiatives involved (i.e. FP7 GENESI-DR, FP7 DORII, AIST GeoGrid, etc.). Some proof-of-concepts have been developed to demonstrate the flexibility and scalability of such architectural framework. The G-OWS WG developed implementations of gLite-enabled Web Coverage Service (WCS) and Web Processing Service (WPS), and an implementation of a Shibboleth authentication for gLite-enabled OWS in order to evaluate the possible integration of Web and Grid security models. The presentation will aim to communicate the G-OWS organization, activities, future plans and means to involve the ESSI community.

References

[Berners-Lee 1996] T. Berners-Lee, “WWW: Past, present, and future”. IEEE Computer, 29(10), Oct. 1996, pp. 69-77.
[Foster 2001] I. Foster, C. Kesselman and S. Tuecke, “The Anatomy of the Grid. The International Journal ofHigh Performance Computing Applications”, 15(3):200–222, Fall 2001
[GOWS] G-OWS WG, https://www.g-ows.org/, accessed: 15 January 2010