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Geospatial Web Services Gridification in enviroGRIDS

Denisa Rodila , Victor Bacu , Vlad Ardelean , Claudia Borlea , and Dorian Gorgan
Technical University Cluj-Napoca, Computer Science Department, Romania (denisa.rodila@cs.utcluj.ro, victor.bacu@cs.utcluj.ro, ardelean.vlad@gmail.com, borlea_claudia@yahoo.com, dorian.gorgan@cs.utcluj.ro)

The interoperability between different scientific domains has been a challenge and a research topic for many research projects due to the major benefits it could bring if solved. Particularly the interoperability between the Geospatial domain and the Grid environment can bring major accomplishments and open new perspectives. The Geospatial domain involves large amount of raw spatial data which can be used in many scientific areas but which have to be gathered, analyzed, processed and shared in a distributed environment to become meaningful.

A Spatial Data Infrastructure (SDI) refers to an infrastructure build to give access to geospatial data and information in a distributed environment in an interoperable and efficient way, using standardized geospatial services such as OpenGIS Web Services standardized by the Open Geospatial Consortium (OGC) [1]. The Grid technology brings the necessary functionalities to overcome the distributed computing problems introduced by the processing of large amounts of data and complex computation required in the Geospatial field. In addition to these functionalities, the Grid technology is capable to enhance the Geospatial domain and to support data management and secure data transfer.

The interoperability between Geospatial domain, exposed through OGC Web services, and the Grid environment is a major interest in the FP7 Project enviroGRIDS (Black Sea Catchment Observation and Assessment System supporting Sustainable Development) [2]. The project aims to develop a SDI and to offer standardized tools for storing, analyzing, processing, and visualizing information regarding this area but also for performing distributed simulations of environmental changes.

This presentation analyses the interoperability between the OGC Web services and the gLite middleware. The interoperability reveals important problems common for integrating two incompatible standards. We discuss those problems and give a solution to integrate the OGC Web services with the Grid. The experiments exposed in the presentation are focused on a specific service type but the presented concepts are common for OGC Web Services in general: Web Map Service (WMS), Web Feature Service (WFS), and Web Coverage Service (WCS), etc. For gridifying an OGC Web service we introduce a new component – Mediator, capable to handle the identified interoperability issues. This component performs an analysis of the service complexity based on the service type and the requested parameters, and filters the cases in which the execution of the services on the Grid is needed or not. The component will be responsible for augmenting the OGC Web service with Grid security (authentication and authorization) and also for mapping the service requests to Grid jobs (split the requests, manage the jobs, collect and merge the result).

The experimental tests are accomplished on the standard implementation of several OGC Web services provided by the deegree project [3]. The implementation of the gridified services following the presented concepts is integrated within the enviroGRIDS project at different levels of its architecture.

References:
[1] Open Geospatial Consortium, http://www.opengeospatial.org/
[2] enviroGRIDS project, http://www.envirogrids.net/
[3] deegree project, http://www.deegree.org/