Geophysical Research Abstracts,
Vol. 10, EGU2008-A-05160, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-05160
EGU General Assembly 2008

RESTful Implementation of Geospatial Services

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In the last years REST (Representational State Transfer) has emerged as an alternative to existing approaches for Web applications development. Indeed, its characteristics of scalability and simplicity make it appealing for building complex Web services systems. Anyway an investigation is required to verify if and how it can be applied to specific domains. We analyzed the case of Geospatial services also building a prototype of a RESTful OGC WCS implementation. The WCSplus community discussions were considered as a starting point for our work.

REST is an architectural style for distributed systems defined to describe the Web architecture and to guide its future evolution. It allows to describe a set of Resource-Oriented architectures which share six constraints: client-server and stateless interaction, uniform interface, caching and code-on-demand (optional) support, multi-layer distribution. The fundamental characteristics of REST is the uniform interface which is defined by four interface constraints: identification of resources; manipulation of resources through representations; self-descriptive messages; and, hypermedia as the engine of application state. It is a generic (not resource-specific) interface, in the sense that it allows to perform the same set of actions on all the resources. Thus it exposes very basic operations for retrieving and sending representations of resources. Different application-level protocols can be used, but the most common implementation makes use of HTTP with GET/POST/PUT/DELETE verbs detailing the four basic operations mapping the CRUD (Create, Retrieve, Update, Delete) pattern. Since representations are generally encoded in XML, REST applications looks much like the traditional Web applications, usually referred to as POX-HTTP (Plain-Old-XML over HTTP), which implements Web Services using HTTP-GET and HTTP-POST operations. The uni-

form interface is what makes REST architectures different from POX-HTTP. Indeed, in a RESTful implementation no specific service can be implemented: each operation must be implemented as a representation transfer.

While at a first sight OWS (Open Geospatial Consortium Web Services) data access services (WCS, WFS, and WMS), also in the HTTP binding, look like Service-Oriented Web Services their implicit architecture is not far from a REST implementation. Indeed the only constraint which is violated is the uniform interface, since their interface (e.g. getCapabilities, getDescription and get<entity>) defines domain-specific services. However, since they transfer representations of resources (e.g. the Capabilities, the Description and the content Entity) they could be rewritten in a RESTful way. This "RESTyling" operation is feasible but involves semantic (e.g. what a resource is in the Geospatial domain?) and syntactic (e.g. URL encoding of parameters) issues. We proposed a solution and tested it building a prototype of a RESTful WCS. It is implemented as a proxy accepting the RESTful request and translating them in the standard OGC WCS requests.

The caching problem was also analyzed. Geospatial data are often extracted from complex datasets according to query parameters. This makes difficult to cache requests. A complex caching system supporting requests canonicalization, format translation and other advanced functionalities could be generally required. Anyway it is noteworthy that also the absence of any cache management does not affect the feasibility of the REST porting since the cache constraint is an optional constraint introduced in REST "only" for performances issues.

We also investigated the problem of OGC WPS (Web Processing Services) which seems to be inherently Service-Oriented. We proposed two different approaches to integrate it in a RESTful Geospatial Architecture. The first solution is the WPS "restyling": an interpretation of the WPS in a REST architecture. The second one is a SOA-ROA reconciliation approach. Future works will deal with the comparison of these approaches to evaluate their respective capabilities and potentials.