First Steps in the Development of a Web Service Framework for Heterogeneous Environmental Information Systems

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Abstract

Nowadays as a rule, one will observe that environmental information systems have to be combined with various heterogeneous information from distributed sources in order to support users in decision-making for instance as in the case of disaster management. Further this information has to be available on most devices like PCs, laptops, PDAs, or cell phones almost constantly. Often these distributed information systems use common middleware technologies like CORBA as communication infrastructure. But triggered by the omnipresence of the internet and the standardization of XML one can observe a shift in communication using web services as data and method sources, and XML as transfer protocol for data exchange.

Two international consortiums aspire to standardize the use of web services. In the geo information working area the Open GIS Consortium (OGC) specifies geo-related web services (GI-Services) in order to allow a range of different networks, applications, and platforms to profit from these methods and information. The OGC defines the semantics as well as the syntax of web services using a common geo-related vocabulary. In this way the homogeneity of GI-Services should solve the problem of interoperability in the geo information working area. But during standardization highly sophisticated and specialized GI-Services as well as non-geo-related web services needed in decision-making, cannot be taken into account. The World Wide Web Consortium (W3C), however, specifies a technical basis for web service by defining XML-based languages such as SOAP or WSDL.

In this paper, we present our strategy for combining heterogeneous information services deriving benefit from both standardization approaches proposed by the two consortiums. Taking into account the various forms of heterogeneity of data formats and method specifications, we build the first prototype of a flexible and extensible framework, supporting a higher interoperability of web services. The integration of web services is fulfilled by a generic adapter component which relies on XML-based service interface definitions like WSDL. Then the data exchange between two integrated services occurs through a communication component defined within our framework. Further, this component provides a generically and dynamically extensible mechanism for exchanging structured data between any of the services involved.

The web service framework acts as a web service itself. Therefore different instances of this framework can be combined hierarchically together building aggregated services. Further, using HTTP as communication protocol and XML-based languages for data transfer, the web service framework supports internet-capable mobile devices directly.

Finally, we can identify three roles of users taking advantage of our web service framework. Firstly, method and data providers can use this framework for easy publishing their information as web service to the information community. Secondly, standardization consortiums like the OCG can use WSDL to define their services and thereby profit from the generic mechanisms of our framework, and the third role being assumed by applications like environmental information systems that can benefit from this framework as described above.