Chapter 1

Geospatial Web Services

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Abstract

As Web service technologies mature in recent years, a growing number of geospatial Web services designed to interoperate spatial information over the network have emerged. Geospatial Web services are changing the way in which spatial information systems and applications are designed, developed, and deployed. This chapter introduces all aspects of geospatial Web services from service-oriented architecture to service implementation. It covers the life cycle of geospatial Web services in terms of geospatial interoperable standards, including publish, discovery, invocation, and orchestration. To make geospatial Web services more intelligent, semantic issues about geospatial data and services are discussed here. Furthermore, the applications of standard-compliant geospatial Web services are also reviewed.
Introduction

Web service technology promises standard-based information interoperability. There are many different definitions for Web services (Andersson, Greenspun, & Grumet, 2003; Booth et al., 2004; Hirsch & Just, 2003; Mateos, Zunino, & Campo, 2005; Skonnard, 2002; Vaughan-Nichols, 2002). In essence, a Web service is a modular, self-describing, and self-contained software application which is discoverable and accessible through standard interfaces over the network (Tsalgatidou & Pilioura, 2002).

The core technology associated with Web service is the standardization of data/message exchange between applications or systems during every stage of their life cycle, including transporting, invoking, and discovering (Akinci, 2004; Di, 2004a; Hecht, 2002). XML (eXtensible Markup Language) is used as the primary language to encode data/message in Web services since it hides the details of underlying transport protocols and provides a platform-independent structured information format. Structured information can be exchanged using standard protocols, such as simple object access protocol (SOAP), or XML-RPC (Gudgin, Hadley, Mendelsohn, Moreau, & Nielsen, 2003; Winer, 1999). The public interface (functionality and input/output parameters) of a Web service is described following a machine-processable format, such as Web Service Description Language (WSDL) (Booth & Liu, 2005; Chinnici, Haas, et al., 2005; Chinnici, Moreau, Ryman, & Weerawarana, 2005; Christensen, Curbera, Meredith, & Weerawarana, 2001; Vedamuthu, 2005). A standard registry or catalog is often used to publish and discover these Web services, such as UDDI (Universal Description, Discovery and Integration) (Booth et al., 2004; Clement, Hatley, Riegen, & Rogers, 2004). These characters distinguish a Web service from traditional proprietary distributed systems, such as distributed common object model (DCOM) by Microsoft, java remote method invocation API (RMI) by Sun, and common object request broker architecture (CORBA) by Object Management Group (OMG).

The major benefit of Web services is the interoperability enabled by those standards; in other words, Web services are capable of collaborating process control and sharing data and information across applications over different platforms (Di, 2005; Di, Zhao, Yang, Yu, & Yue, 2005; Kralidis, 2005). A Web service hides all the details of implementation under a well-defined interface, and thus other applications or services can invoke such a Web service through the standard interface. Such type of interoperation is not just limited within one organization, but also can be conducted across organizations. From the technical point of view, the advantages of using Web services can be summarized as: (1) enabling the sharing of computational resources (hardware, software, and data/information holdings) across the organization boundary; (2) easy to maintain and wrap legacy system since the modularity of Web service allows the partial updating and change to existing systems; (3) independent from
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