Chapter 19
GeoBrain Online Analysis System:
An SOA-Based Geospatial Web Portal

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ABSTRACT

The geospatial Web portal is the gateway to combining news, information, data, and applications from the geosciences community. Service Oriented Architecture (SOA), Software as a Service, Rich Internet Application, and other emerging Web standards and technologies have revolutionized the implementation of Web portals. The GeoBrain project is developing a comprehensive Web service-oriented geospatial portal, the GeoBrain Online Analysis System (GeOnAS). This data-rich and service-centric geospatial portal provides easy, fast, and federated Web access to geospatial data, information, and services compliant with Open Geospatial Consortium standards from multiple sources. It offers standards-based geospatial data discovery, retrieval, visualization and analysis to facilitate geosciences research and education around the world, and to help decision-makers and analysts work more efficiently and effectively within an SOA runtime environment. Asynchronous JavaScript and XML (Ajax) also brings more responsive, interactive, and dynamic features to this Web portal and creates a better Web experience to its end users in the confines of a modern browser.

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1. INTRODUCTION

Service Oriented Architecture (SOA) provides a modern computing infrastructure for integrating data, services, and applications in a flexible and loosely coupled manner. This evolving technology offers an adaptive architecture for the construction of Web geospatial applications. As a collection of techniques, the growing popularity of Ajax leads to the delivery of appealing Web geospatial applications in a completely new way.

To make geospatial information and services from distributed sources accessible, the Open Geospatial Consortium (OGC) has led the development and implementation of a series of standards for geospatial contexts and services since its founding in 1994 (Nativi et al, 2006). Many organizations have published their geospatial data and services adhering to these standards. How to search, discover, download, visualize and analyze these resources in a comprehensive geospatial Web portal utilizing the full potential of emerging technologies is a challenging and meaning task.

To achieve this challenging goal, the GeoBrain project funded by NASA aims to make geospatial data, information, and services from distributed sources publicly reusable and consumable across the Web (Di et al., 2007). A comprehensive Web service-oriented online geospatial analysis system, the GeoBrain Online Analysis System (GeOnAS, http://geobrain.laits.gmu.edu/OnAS/), has been built to make petabytes of geospatial data and information from multiple providers easily accessible through a compelling interface, and provide powerful geospatial analysis service and modeling capabilities to the public and the wider geospatial user community in SOA environment.

This chapter mainly introduces the architecture and implementation of GeOnAS. The reminder of this chapter is organized as follows. Section 2 reviews the progress in the development of the geospatial Web portal and the related technologies. Section 3 presents the system general architecture, design and implementation in details. In section 4, stream extraction is used as a demonstration of system functionality. Finally, section 5 summarizes the conclusions and directions for future work.

2. OVERVIEW

This section reviews the progress and applications of SOA, OGC Web services, Ajax, and the Geospatial Web portal.

2.1 SOA

SOA is an architecture that organizes discrete software functionality in a uniform way as discoverable and reusable Web services over the Internet. It offers an innovative and flexible approach for the design and development of Web applications across organizations to meet business or mission needs. This technology is designed to improve interoperability between diverse applications and support seamless business integration with a set of linked Web services (Nezhad et al, 2006).

Web Services empower software functionality with standards-based Web interfaces. They should be self-contained, self-describing, reusable, and application-based units of work. To comply with these principles, providers of these services publish information about them in service registries through the Universal Description, Discovery and Integration (UDDI) service, and describe them in Web Services Description Language (WSDL) for consumers to discover those services they need dynamically and retrieve the required information for service composition and invocation (Christiensen et al, 2001), as shown in Figure 1. Simple Object Access Protocol (SOAP) is adopted to communicate among these services on the network (Box et al, 2000).

The development of various standards, products, and tools for supporting SOA is advancing at a rapid pace. SOA has been widely adopted to design and build composite applications for achieving desired business processes and col-

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