Chapter 6
Web–Based Geospatial Services:
Implementing Interoperability Specifications

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ABSTRACT

This chapter characterizes the requirements of Geographic Information Systems (GIS) middleware and its components for dynamic registering and discovering of spatial services specifically for collaborative modeling in environmental planning. The chapter explores the role of Web services with respect to implementation standard and protocols and identifies implementation features for exposing distributed GIS business logic and components via Web services. In particular, the chapter illustrates applications of the interoperability specifications of Open GIS Consortium's (OGC) Web Mapping Service and (WMS), Web Processing Standards (WPS) with respect to implementation feature. The chapter demonstrates a prototype implementation of collaborative environmental decision support systems (GEO-ELCA- Exploratory Land Use Change Assessment) where Web service-enabled middleware adds core functionality to a Web mapping service. The application demonstrates how individual workspace-based namespaces can be used to perform Web mapping functionality (such as spatial analysis in visualization) through the integration of environmental simulation models to explore collective planning scenario. Built on OGC compliant connector and supports WMS and WPS, the system includes interactive supports for geospatial data query, mapping services and visualization tools for multi-user transactions.

INTRODUCTION

Both public and private enterprises have recently produced a surge of interest in Web applications for Geographic Information Systems (GIS). In recent years service oriented middleware has emerged as an essential ingredient in distributed systems (Alonso, 2004; Chang & Park, 2006; Chatterjee & Webber, 2004). This has triggered a new wave of enthusiasm in composition of complex services in a meaningful way involving not only traditional alphanumeric data but complex geographic data and services (Jones & Taylor, 2004; Sikder & Gangopadhyay, 2003, 2004). In particular, collaborative and groupware researches are being directed towards developing reusable generic model and procedures, which can be made to communicate each other in any distributed system in a heterogeneous environment. Integrating Web service with collaborative Geographic Information Systems (GIS) has triggered new wave of researchers who are composing dynamic services involving complex geospatial objects and models (Balram & Dragic´evic, 2006). The growing need for a service oriented middleware for GIS is especially realized in three main contexts: (1) to access GIS data from anywhere (2) to disseminate spatial information of analysis and exploration of spatial patterns and relationships between disparate GIS datasets and (3) to allow GIS modeling/processing tools and services to be downloaded or uploaded over the internet by remote users to work interactively by using existing Web browsers rather than installing proprietary GIS software locally on their machines (Peng & Tsou, 2003). The recent trend of geospatial computing is a gradual shift of traditional desktop GIS towards distributed GIS (also referred to as GIServices). With technology moving at such a fast pace, the services expected by a GIS user (including mobile ones) are quite demanding. The growing demand for users' need to view relationships between several geographically separate datasets and perform varying degree of analysis and geo-processing would inevitably require service oriented architecture (SOA) of core GIS which would define the use of services to support the requirements of software users. In this context, GIServices may be defined as a self-contained, stateless spatial processing function which accepts one or more requests and returns one or more responses through a well-defined, standard interface. By having such services distributed all over the Internet and accessible in a uniform standard manner, it is possible to envision the integration of several spatial services (chaining of services) to provide higher levels of functionality to existing services (Peng & Tsou, 2003). For example, a typical GIS query "Find the nearest Japanese restaurant along the highway" could possibly be answered by chaining Web services such as geocoding points of interest, integrating transport networks, dynamic segmentation of network, providing routing network, cartographic map rendering, and text-to-voice conversion.

This paper explores the role of Web services and their implementation standards and protocols and characterizes features for distributed GIS for modeling collaborative spatial processes with respect to the current interoperability standards and specifications. In particular the paper the identifies the interoperability requirements of OGC's (Open GIS Consortium) Web Mapping Service and (WMS), Web Processing Standards (WPS) with respect to implementation features. The rest of the paper is organized as follows: section 2 discusses the framework of service integration in distributed GIS; section 3 discusses implementation standard for interoperability-based distributed GIS; section 4 characterizes the essential features of distributed GIS components; and finally section 5 illustrates a prototype implementation of a system for geospatial resource integration in environmental planning.

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