

Chapter 16

Operational Delivery of Customized Earth Observation Data Using Web Coverage Service

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ABSTRACT

Global long term Earth Observation (EO) provides valuable information about the land, ocean, and atmosphere of the Earth. EO data are often archived in specialized data systems managed by the data collector's system. For the data to be fully utilized, one of the most important aspects is to adopt technologies that will enable users to easily find and obtain needed data in a form that can be readily used with little or no manipulation. Many efforts have been made in this direction but few, if any, data providers can deliver on-demand and operational data to users in customized form. Geospatial Web Service has been considered a promising solution to this problem. This chapter discusses the potential for operational and scalable delivery of on-demand personalized EO data using the interoperable Web Coverage Service (WCS) developed by the Open Geospatial Consortium (OGC).

INTRODUCTION

Earth observation (EO) data are routinely collected by hundreds of instruments on board various plat-

forms, especially the several dozens of spacecraft operated by the world's major space agencies. The EO data are precious resources and are obtained with huge investments from both governments and the private sector. The data and their derived products are potentially useful to a very wide

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range of user communities from specific domain scientists to the general public. There are, however, many challenges in utilizing all the EO data fully, not only because of their high heterogeneity and very diverse archival forms but also because of their massive and rapidly increasing volumes. This chapter discusses the perspective of providing an operational and scalable interoperable Web Service, OGC's WCS, to allow easy and customized access to EO data. The chapter is structured in the following way. First, a background on interoperable Web Services for EO data access is provided and the OGC WCS data models and specifications are introduced. Second, the current status of WCS usage is reviewed and the potential problems in using WCS in a production environment are discussed. Finally, a summary is provided and the perspective of broad adoption of this technology across EO communities is analyzed.

GEOSPATIAL WEB SERVICE FOR EO DATA ACCESS

Geospatial Web Services and Standards

Geospatial Web Services are Web-based geospatial applications that are modular, self-contained, and self-described with standard interfaces and thus support application-to-application interaction across different systems. Geospatial Web Services can be used to search for, access, and process geospatial data and information. The primary advantage of adopting Web Services is that they are standards-based and thus potentially fully interoperable among different applications and systems. There is a rich literature on Web Services and comprehensive reviews of Geospatial Web Services can be found (e.g., Zhao et al, 2007; Kralidis, 2007; Dietz, 2010). In addition to standards used in general Web Services such as

the extensible markup language (XML) and the Simple Object Access Protocol (SOAP), most geospatial Web Services are developed using two suites of standards, namely those developed by the Technical Committee for Geographic information/Geomatics of the International Organization for Standardization (ISO/TC211) and those by the Open Geospatial Consortium (OGC). The TC/211 standards are mainly on the theoretical, conceptual, framework, or content levels, although some also specify implementation encodings such as ISO 19139:2007, which provides an XML schema implementation for TC/211's metadata (ISO 19115:2003) and service standards (ISO 19119:2005). TC/211 standards "specify methods, tools and services for data management (including definitions and description), acquiring, processing, analyzing, accessing, presenting and transferring such data in digital/electronic form between different users, systems and locations."¹ OGC standards are focused on detailed protocols, interfaces, and encodings for geospatial Web Services so that "software developers use these documents to build support for the interfaces or encodings into their products and services."² Such implementable standards are called OGC implementation specifications and are developed based on OGC abstract specifications where the conceptual foundations are defined. The two standards bodies, ISO/TC211 and OGC, have collaborated closely in the past few years. Some OGC standards have been adopted by ISO/TC211 as international standards, such as the Web Map Service standard (as ISO 19128:2005) and Web Feature Service standard (now ISO 19142). Many geospatial Web Services have been developed and deployed in the past decade. The most relevant geospatial Web Service for EO data access is the Web Coverage Service because it deals primarily with data modeled as multi-dimensional arrays, which is the predominant EO data model.

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