Chapter 15
Web Services for the Global Earth Observing System of Systems

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ABSTRACT

Web services provide users ever better methods to access and use Earth Observation data. Development of a web services architecture for the Global Earth Observing System of Systems was conducted using an evolutionary development process that depended on standards for geospatial web services. Standards for geospatial web services provide interfaces that can be scaled to global deployment. The GEOSS Architecture Implementation Pilot defined an evolutionary development process and reusable architecting methods for applying web services to a global scale system of systems for Earth observations. ISO/IEC, OGC and other standards are used by the AIP architecture to meet the objectives of GEOSS to enable comprehensive, coordinated and sustained observation of the Earth and also efficient publication and use of the collected information.

INTRODUCTION

Anyone involved in building enterprise information systems might reasonably question the feasibility of the Global Earth Observation System of Systems (GEOSS). The scope and complexity are overwhelming: In the highly technical and legacy-heavy domain of Earth observation systems, GEOSS aims to meet information requirements of 80 nations and the European Union as well as the needs of multiple communities of practice in each of nine vast Societal Benefit Areas (SBAs): Agriculture, Biodiversity, Climate, Disasters, Ecosystems, Energy, Health, Water and Weather.

For hundreds of different organizations that provide and/or use geospatial information, GEOSS is supposed to enable comprehensive, coordinated and sustained observation of the Earth and also efficient publication and use of the collected information.

Remarkably, progress has been rapid. Participants in the GEOSS Architecture Implementation Pilot (AIP) have developed and deployed a new development process and they have also deployed working components for the GEOSS Common Infrastructure (GCI) and the broader GEOSS architecture. That is to say, the basic technical foundation of a web services architecture for GEOSS has been established, and it works. The technical foundation has been proven and has undergone continuous improvement in multiple pilot activities based on real-world scenarios and existing national technical resources. And the process for continuous improvement is in place.

Activities similar to GEOSS have been conducted in the past but with less comprehensive approach, e.g., CEOS emphasis on remote sensing, GCOS emphasis on climate, GSDI emphasis on geographic information:

- The Committee on Earth Observations (CEOS) was established in 1984 to coordinates civil space-borne observations of the Earth. CEOS agencies strive to enhance international coordination and data exchange and to optimize societal benefit. CEOS is a participating organization in GEO to provide the space component for GEOSS.
- The Global Climate Observing System (GCOS) is a joint undertaking of several agencies of the United Nations. The goal of GCOS is to provide comprehensive information on the total climate system. As a system of climate-relevant observing systems, it constitutes, in aggregate, the climate-observing component of GEOSS.
- The Global Spatial Data Infrastructure (GSDI) Association promotes international collaboration in support of local, national and international spatial data infrastructure developments that allow nations to better address social, economic, and environmental issues. GSDI emphasizes common conventions and technical agreements to make it easy for communities, nations and regional decision-makers to discover, acquire, exploit and share geographic information vital to the decision process.

GEOSS builds on these previous efforts with characteristic unique to GEOSS including: emphasis on quantifiable societal benefits; inclusion of remote sensed and in-situ data and data from spatial data infrastructures; identification of international standards as the means to coordinate a system-of-systems; and the establishment of GEO through a series of ministerial-level summits.

BACKGROUND

The Global Earth Observation System of Systems (GEOSS) will provide comprehensive, coordinated and sustained observations of the Earth system, in order to improve monitoring of the state of the Earth, increase understanding of Earth processes, and enhance prediction of the behaviour of the Earth system. GEOSS will meet the need for timely, quality long- term global information as a basis for sound decision making, and will enhance delivery of benefits to society. As with the Internet, GEOSS will be a global and flexible network of content providers allowing decision makers to access an extraordinary range of information at their desk. [GEO 2009]

The Group on Earth Observations (GEO) is coordinating efforts to build GEOSS. GEO is a voluntary partnership of governments and international organizations. It provides a framework within which these partners can develop new projects and coordinate their strategies and investments. As of September 2009, GEO's Mem-

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