Implementation of the GEOSS architecture using Open Geospatial Consortium (OGC) standards for geoinformatics

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The Global Earth Observation System of Systems (GEOSS) will achieve comprehensive, coordinated, and sustained Earth Observations providing decision-support to users in a wide variety of Societal Benefit Areas (SBAs). This 'system of systems' will promote common technical standards so that data from the thousands of different sensors and models can be combined into coherent information. The compatibility of different types of data and systems will be ensured by the emerging architecture of GEOSS based upon Interoperability Arrangements chosen by the Group on Earth Observations (GEO) [1].

GEOSS Interoperability Arrangements are being used to define access to data and information through service interfaces. GEOSS is adopting standards for the service interfaces with a preference to formal international standards, for example, standards from the Open Geospatial Consoritum (OGC). OGC is a not-for-profit standards developing organization with the mission to lead in the development, promotion and harmonization of open geospatial standards. The OGC standards apply broadly to any geospatial application and been specifically to the geosciences. The geosciences are implementing OGC standards for discovery, access and processing of geospatial information. These standards provide for interoperability well tuned to the geosciences, because members of the same community developed the standards in venues such as ISO and OGC.[2]

To support GEOSS and other geospatial applications, OGC standards continue to increase in capability, for example, going beyond the flat earth by addressing three and four dimensions. First, the need for landscape and city models led to the development of CityGML. CityGML is a common information model for the representation of three-dimensional urban (and beyond) objects. It defines the classes and relations for the most relevant topographic objects in cities and regional models with respect to their geometrical, topological, semantic and appearance properties. Second, the Web Coverage Service (WCS) specification has been extended with specific information models and corresponding encodings. WCS supports distributed access and often georectification and re-projection of remotely sensed (e.g. from satellites) data on demand, sub-setting and resampling as well as reformatting to number of different formats. One prominent extension is the CF-netCDF extension, an information community data model intensively used by the climate modeling community. The CT-netCDF maps the netCDF (network Common Data Form) version 3.0 file format using the CF (Climate and Forecast) conventions version 1.1 to the WCS model. WCS requests for 3D data can be made with the altitude dimension in units of length or in atmospheric pressure.

In addition to the standards, OGC processes play a key role in the elaboration of the GEOSS Architecture. The GEOSS Architecture Implementation Pilot (AIP) leads the incorporation of contributed components consistent with the GEOSS Architecture using a GEO Web Portal and a Clearinghouse search facility to access services through GEOSS Interoperability Arrangements in support of the GEOSS Societal Benefit Areas. AIP is one of the core tasks of the GEO Architecture and Data Committee. OGC is leading the AIP through application of the OGC Interoperability Program procedures for conducting an interoperability pilot.

An Initial Operating Capability (IOC) of the GEOSS Common Infrastructure (GCI) has been established. Many of the components of the GCI IOC were initially deployed and tested in the first phase of AIP: GEOSS Web Portals and Clearinghouse. The GCI is based upon Interoperability Arrangements including several OGC standards: Web Map Service and KML. The second phase of AIP is being completed in 2009 and will augment the GCI IOC. During AIP-2 a process for

SBAs to use the GEOSS architecture has been defined and applied. This reusable process is now available for additional communities of practice to meet the GEOSS objective of providing Earth Observations a valuable resource in decision-making in a variety of SBAs.

References

[1] Group on Earth Observations, http://earthobservations.org/

[2] "Geospatial Standards for Earth and Space Sciences" European Geosciences Union, April 2009, http://www.ogcnetwork.net/node/525