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Category: Recommended Standard
Updates/Obsoletes: None

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OpenGIS ® WMS 1.1.1

Open Geospatial Consortium, Inc. OpenGIS ® Web Map Service

1 Status of this Memo

This is a description of an ESDS Community Standard.

Distribution of this memo and the referenced standard is unlimited.

2 Change Explanation

Version 1 - First approved version.

3 Copyright Notice

4 Abstract

The purpose of this memo is to nominate the OpenGIS® Web Map Service Implementation Specification (WMS) for adoption as a NASA ESDS community standard for disseminating `views` of raster and vector data (“maps”) via the World Wide Web. WMS uses HTTP and defines several operations that allow a client to discover the functions a server is capable of providing, request a specific ”map”, and, optionally, request information about individual features shown on a map.

This nomination is for version 1.1.1 of the WMS specification. Future installations of WMS should consider use of the most recent version. WMS 1.3 is identical to ISO 19128, which the International Organization for Standardization (ISO) released as an International Standard during calendar year 2005.

objects from map layers.

Though this nomination is for version 1.1.1 of the WMS specification existing implementations of earlier WMS versions are not made obsolete and it does not require replacing existing 1.0 and 1.1 implementations. Version 1.1.1 is in widespread use within NASA as well as elsewhere. The more recent version, WMS 1.3 is the topic of RFC-005 and its use is encouraged in order to expand the operational experience of that version. All of the versions of the specification provide the same functionality using the same interfaces. The only impact of having a NASA system that has WMS 1.0, WMS 1.1, WMS 1.1.1 and even WMS 1.3, services in it, is on those clients that need to work with all of them. Commercial and open source practice for WMS clients includes the ability to negotiate versioning of the server and send the proper query to each one, which means version specificity is not a factor.

7 Motivation to Adopt the OGC WMS

Why adopt a standard that has been approved by both International Organization for Standardization (ISO) (the premier legally empowered standards body in the world) and the OGC (the leading provider of geospatial implementation specifications)? Two opportunities: reduced costs for NASA and the user, and broader use of NASA data. NASA is under continual pressure to operate more efficiently and at the same time engender greater use of its products and services. A recently published Return on Investment study funded by NASA demonstrates the cost effectiveness of not only using standards, but the WMS Specification itself. That study is found at Appendix C. The service orientation that WMS and the overall OGC Service Oriented Architecture (SOA) bring will, over time, relieve NASA of the need to have a custom viewer for each of its data sources. It will simplify the process of adapting legacy systems to an interoperable architecture and also relieve NASA of the high integration costs of having custom interfaces on each of its new systems. One viewer or a set of viewers for communities of practice will be able to display and fuse data from services that did not even exist when they were provided. Integration via shared, industry-standard interfaces, will be easier and often done automatically by software after a new service is simply registered. The use of WMS will also enable citizens to access and exploit the NASA data from their existing desktop and browser software, driving costs down, and use and benefits up.

WMS is an important step into the world of SOA as defined in the Federal Enterprise Architecture. It provides an inexpensive, straight forward way for NASA to evaluate the applicability of a SOA. WMS and other OGC specifications (listed in Appendix B) will extend the reach and use of NASA data to other government departments and the general citizenship, and will lower barriers between internal scientific uses and external applications.

8 OpenGIS ® Web Map Service Implementation Specification 1.1.1

The specification is included as Attachment A. It can also be found at
http://portal.opengeospatial.org/files/?artifact_id=1081&version=1&format=pdf

9 References

Normative References:

Attachment A - OpenGIS ® Web Map Service Implementation Specification 1.1.1

Informative References:

http://www.opengeospatial.org/specs/?page=abstract

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11 Appendix A - Glossary of Acronyms

2D	Two Dimensional
AOS	Application Objects Specification
API	Application Programming Interface
AVIRIS	Airborne Visible/Infrared Imaging Spectrometer
BNF	Backus-Naur Form
DAAC	Digital Active Archive Center
ESDS	Earth Science Data Systems
ESE	Earth Science Enterprise
ESIP	Earth Science Information Partner
GC	Grid Coverage
GIS	Geographic Information System
GLOBE	Global Learning and Observations to Benefit the Environment
GML	Geography Markup Language
GO-1	Geographic Objects - Version 1
GSFC	Goddard Space Flight Center
HTTP	Hyper Text Transfer Protocol
JPL	Jet Propulsion Laboratory
OGC™	Open Geospatial Consortium, Inc.
OGCRM	OGC Reference Model
ORM	OGC Reference Model
OpenGIS ®	Registered Trademark of the OGC.
OWS	OpenGIS Web Services
PO	Physical Oceanography
ROI	Return On Investment
SFS	OpenGIS ® Simple Feature Implementation Specification
SLD	OpenGIS ® Styled Layer Descriptor Implementation Specification
SOA	Service Oriented Architecture
SQL	Structured Query Language
SVS	Scientific Visualization System
TDB	Technical Document Baseline
URL	Uniform Resource Locator
WCS	OpenGIS ® Web Coverage Service Implementation Specification

WFS	OpenGIS ® Web Feature Service Implementation Specification
WMC	OpenGIS ® Web Map Context Documents Implementation Specification
WMS	OpenGIS ® Web Map Service Implementation Specification See Attachment A
XML	eXtensible Markup Language

12 Appendix B. OGC's Work

The full collection of OGC specifications is included to illustrate the depth of the work performed by the consortium and to enable an understanding of the 'architecture' of which WMS is a part. As an international consortium OGC has produced a number of specifications that are related which allows a user to assemble them in new and innovative ways. The architecture itself and the overall scope of OGC are described in the OGC Reference Model. The OGCRM is available at the URL listed in Section 9 References . The existence of this architecture and multiple products that support it insures that NASA will enjoy a wide selection of products and options to implement and expand an SOA.

Title	Version	Date	Description
OpenGIS ® Catalog Services Implementation Specification	2.0	2004-08-02	Defines a common interface that enables diverse but conformant applications to perform discovery, browse and query operations against distributed and potentially heterogeneous catalog servers.
OpenGIS ® Coordinate Transformation Services Implementation Specification	1.0	2001-01-	12 Provides interfaces for general positioning, coordinate systems, and coordinate transformations.
OpenGIS ® Filter Encoding Implementation Specification	1.1	2005-05-03	This document defines an XML encoding for filter expressions based on the BNF definition of the OpenGIS Common Catalog Query Language as described in the OpenGIS Catalog Interface Implementation Specification, Version 1.0 [2].
OpenGIS ® Geography Markup Language Encoding Specification	3.1.1	2005-05-03	The Geography Markup Language (GML) is an XML encoding for the transport and storage of geographic information, including both the geometry and properties of geographic features.
OpenGIS ® GO-1 Application Objects (AOS) Implementation Specification	1.0.0	2005-05-04	The GO-1 Application Objects specification defines a set of core packages that support a small set of Geometries, a basic set of renderable Graphics that correspond to those Geometries, 2D device abstractions (displays, mouse, keyboard, etc.), and supporting classes. Implementation of these APIs will support the needs of many users of geospatial and graphic information. These APIs support the rendering of geospatial datasets, provide fine-grained symbolization of geometries, and support dynamic, event and user driven animation of geo-registered graphics.
OpenGIS ® Grid Coverages (GC) Implementation Specification	1.0	2001-01-12	This specification was designed to promote interoperability between software implementations by data vendors and software vendors providing grid analysis and processing capabilities.
OpenGIS ® OGC Web Services Common Implementation Specification (Common)	1.0	2005-05-03	This document specifies many of the aspects that are, or should be, common to all or multiple OWS interface Implementation Specifications. Those specifications currently include the Web Map Service (WMS), Web Feature Service (WFS), and Web Coverage Service

Title	Version	Date	Description
			(WCS). These common aspects include: operation request and response contents; parameters included in operation requests and responses; and encoding of operation requests and responses.
OpenGIS ® Simple Features - SQL (SFS)	1.1	1999-05-05	The Simple Feature Specification application programming interfaces (APIs) provide for publishing, storage, access, and simple operations on Simple Features (point, line, polygon, multi-point, etc).
OpenGIS ® Styled Layer Descriptor (SLD) Implementation Specification	1.0	2002-08-19	The SLD is an encoding for how the Web Map Server (WMS 1.0 & 1.1) specification can be extended to allow user-defined symbolization of feature data.
OpenGIS ® Web Coverage Service (WCS) Implementation Specification	1.0	2003-10-16	Extends the Web Map Server (WMS) interface to allow access to geospatial "coverages" that represent values or properties of geographic locations, rather than WMS generated maps (pictures).
OpenGIS ® Web Feature Service (WFS) Implementation Specification	1.1	2005-05-03	The OGC Web Feature Service (WFS) interface is a collection of operations (implemented as messages carried over HTTP) for retrieving and manipulating geographic features. An implementation of the OGC WFS IS allows a client to retrieve and update geospatial data encoded in Geography Markup Language (GML) from one or more Web Feature Services.
OpenGIS ® Web Map Context Documents (WMC) Implementation Specification	1.1	2005-05-03	This document is a companion specification to the OGC Web Map Service Interface Implementation Specification The present Context specification states how a specific grouping of one or more maps from one or more map servers can be described in a portable, platform-independent format for storage in a repository or for transmission between clients. This description is known as a "Web Map Context Document," or simply a "Context." Presently, context documents are primarily designed for WMS bindings.
OpenGIS ® Web Map Service (WMS) Implementation Specification	1.3	2004-08-02	Provides three operations protocols (GetCapabilities, GetMap, and GetFeatureInfo) in support of the creation and display of registered and superimposed map-like views of information that come simultaneously from multiple sources that are both remote and heterogeneous.
OpenGIS ® Reference Model (ORM)	0.1.2	2003-03-04	The ORM describes a framework for the ongoing work of the OpenGIS Consortium and our specifications and implementing interoperable solutions and applications for geospatial services, data, and applications.
OpenGIS ® Technical Document Baseline (TDB)	1.3	2004-04-22	Spreadsheet of OGC Technical Document Baseline (in update to reflect 05 changes)

Your attention is called to the Styled Layer Descriptor specification which offers a standard way to vary the symbology of a WMS ‘map’ and the WMS Context Document which provides a method

to not only ‘save a session’, but pass that session to another user who can then recreate it on their client. Links to both documents are provided in Appendix D, Related OGC Specifications.

13 Appendix C: NASA ROI study

Dated April 2005 by Booz Allen Hamilton

http://gio.gsfc.nasa.gov/docs/ROI%20Study.pdf

This study examines the use of the WMS specification in NASA and concludes that initial costs are higher than using proprietary interfaces, but that life cycle costs are dramatically reduced and flexibility and extensibility are dramatically increased. There is a reasonable expectation that the implementation premium will disappear as more experience is gained with using the specification.

14 Appendix D: Related Open GIS specifications

OGC Reference Model
http://portal.opengeospatial.org/files/?artifact_id=3836

OpenGIS ® Styled Layer Descriptor Implementation Specification
https://portal.opengeospatial.org/files/?artifact_id=1188

OpenGIS ® Web Map Context Implementation Specification
https://portal.opengeospatial.org/files/?artifact_id=8618

Attachment A. OpenGIS ® Web Map Service Implementation Specification 1.1.1