OGC
Open GIS Consortium

Overview of OGC's Interoperability Program

An Open GIS Consortium (OGC) White Paper

1 Introduction

OGC's **Interoperability Program** provides an industry consensus process to develop, test, demonstrate, and promote the use of interfaces and protocols that enable interoperable geoprocessing. The Interoperability Program organizes and manages **Interoperability Initiatives** that address the following needs of industry and government Sponsors:

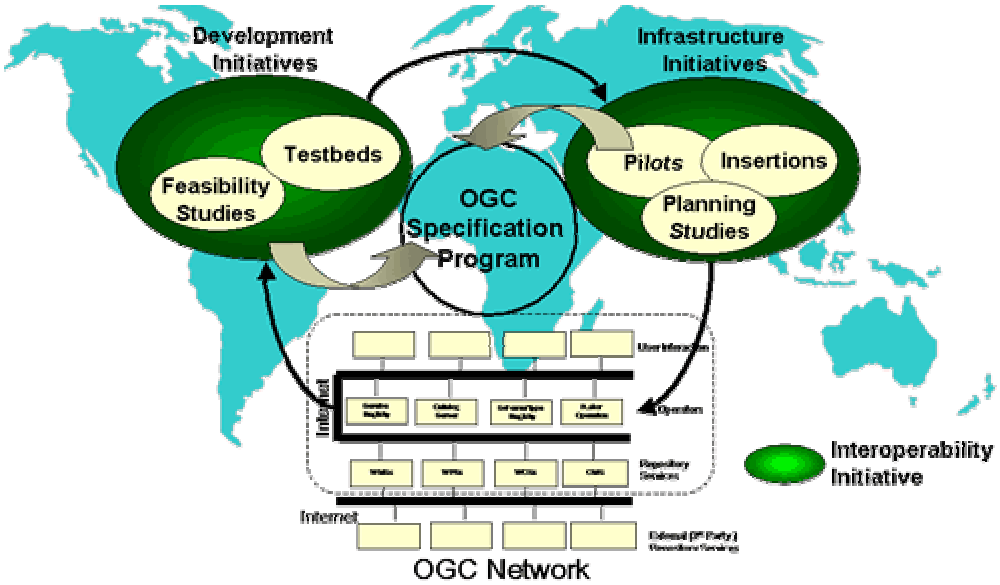
- *"Plug and Play" Geoprocessing:* Development of the technical infrastructure for open distributed and component-based geoprocessing takes place largely in Testbeds. Testbeds provide an environment for fast-paced, multi-vendor collaborative efforts to define, design, develop, and test candidate interface and encoding specifications. These draft specifications are then reviewed, revised, and approved in the formal OpenGIS® Specification Adoption Process. Vendors implement the specifications in Standards-based Commercial Off-The-Shelf ("SCOTS") products that are "open," i.e. interoperable with other vendors' products that implement the same interfaces.
- *Collaborating Communities:* In **Pilot Projects**, collaborating user communities apply and test OGC's interface specifications in real world settings using SCOTS products that implement OGC's OpenGIS® interface and encoding specifications.Geospatial Integration with Enterprise and Domain Architectures: Through the Interoperability Program, OGC manages **Planning Studies, Insertion Projects, and Feasibility Studies** that assist organizations that want to design and implement enterprise and domain architecture policy and solutions that require integration with an/or interoperability with geospatial data, applications, and services.
- *Outreach and Education*: OGC and its members are developing a growing set of resources to assist technology developers and users in the implementation of OpenGIS® Implementation Specifications and interfaces in their product development and procurement programs. Technical documents, training materials, test suites, reference implementations and other interoperability resources developed in OGC's Interoperability Initiatives become available for use by members and/or the public on the **OGCNetwork** (www.ogcnetwork.org). In addition, OGC and its members support workshops, seminars and other interactive experiences to further assist technology developers, integrators and procurement managers introducing OGC plug and play capabilities into their architectures.

2 The Genesis of the Interoperability Program

OGC was established in 1994. The OGC Vision was ". . . the full integration of geospatial data and geoprocessing resources into mainstream computing and the widespread use of interoperable, commercial geoprocessing software throughout the information infrastructure."

During the first few years, the OpenGIS® Abstract Specification, the foundation model for interoperability, was defined. In the late 1990's, several core specifications were developed using the formal OGC RFP and consensus process. As the OGC process evolved, there was a growing desire to speed up the process.

In 1997, OGC conducted an Interoperable Web Mapping demonstration. In this demonstration, US government sponsors funded several vendors to 1) rapidly and cooperatively develop an http-based interface specification and 2) demonstrate how these interfaces enabled their products to generate overlaid web maps from different spatial data servers over the Internet. That successful demonstration resulted in a formal engineering initiative in 1999 known as Web Mapping Testbed 1. Several government agencies and a consortium of Australian organizations provided interoperability use cases and funding. OGC issued a Request for Technology to design and develop web mapping interfaces that supported interoperability. SCOTS solutions to satisfy these use cases were built and demonstrated. Over 30 OGC industry members participated. The Interoperability Program was subsequently formalized to organize and manage an ongoing series of similar initiatives.



OGC Interoperability Initiatives

3 Roles in OGC Interoperability Initiatives

In each Interoperability Initiative, **Sponsor Organizations** and an **IP Team** composed of OGC staff and consultants provide initial guidance in developing Initiative concepts and setting and documenting the vision, business objectives, use cases, and technology objectives. **Participant Organizations** establish specific technical requirements, technical scope and agenda, and work with the IP Team to determine the form and content of demonstrations. Sponsors typically contribute resources (financial, personnel, facilities, etc.) to support the Initiative. **OGC staff** work with Sponsors to help develop Initiative concepts and to set and document the vision, business objectives, use cases, and technology objectives. OGC staff also solicit participants; publish Requests for Technology, Requests for Proposals (RFPs), and Calls for Participation (CFPs); manage the Initiatives; and provide liaison with other industry consortia and *de jure* standards organizations.

Participant Organizations are technology provider organizations that, in response to the Sponsors' published requests, provide engineering support, principally to define new consensus-based candidate interfaces and protocols and to provide prototype implementations and demonstrations. Sponsors may compensate Participants for the time and technology they make available during the initiative. But Participants often work for little or no compensation just to gain early experience through the engineering and development of a given specification.

Once an Interoperability Initiative is completed, participants formally document agreed upon interfaces in Interoperability Program Reports (IPRs), which can be technology reports, position papers or white papers. These reports can be nominated by OGC members, typically in the form of an RFC (Request for Comment) to proceed toward formal adoption as an OpenGIS® Implementation Specification. This work is accomplished using the formal OpenGIS® Specification Process. Within the Specification Process, the candidate specification advances through formal review, revision, and documentation processes before becoming a publicly available OGC Implementation Specification.

4 Interoperability Program Benefits

Sponsors benefit from:

- Fast delivery of tested interoperable products and OpenGIS® Specifications based on Sponsor requirements. Initiatives typically last 4-6 months. Adopted OpenGIS® Implementation Specifications can be completed in as little as 8 months from the start of a Testbed, and interfaces conformant with those specifications sometimes appear in products only a few months later.
- Reduced procurement risk and lower life cycle costs for new technologies.
- Greater potential for extending market reach by emphasizing interoperable (plug and play) technology offerings.
- Efficient use of sponsor dollars. Technology providers work at a discount to gain early access to specifications and the development process.
- Establishing collaborative alliances with organizations that have similar goals.

Participants benefit from:

- Early insight into customer needs and the strategic ramifications of open interfaces.
- Rapid time to market for their products through early experience with specifications.
- Reduced development costs by sharing interface development with other participants.
- Reduced development risk by agreeing on and using industry-wide interfaces rather than developing unique one-of-a-kind interfaces.
- Flexibility to respond to rapidly changing market requirements.

5 OGC Interoperability Program Accomplishments

Listed below are some of the Interoperability Initiatives that have been completed since the inception of the Interoperability Program in 1999:

Web Mapping Testbed Phase 1 (WMT1), April, 1999 - August, 1999, yielded open interfaces vendors use to write software that enables users to immediately overlay and operate on views of thematic map data from different online sources (subject to limitations of the data), regardless of which vendor's software is serving that data.

Geospatial Fusion Testbed (GFS), May, 2000 - November, 2000, addressed standard ways of "fusing" disparate kinds of data into one spatial framework. The Testbed mainly addressed text, but ultimately text, video, sound, and photos will easily be geo-indexed, integrated with other spatial data, and shared across the Internet.

Web Mapping Testbed Phase 2 (WMT2), June, 2000 - January, 2001, produced new specifications related to legends and symbology, web authoring, vector packaging, GML, and coverage data (image and raster) access.

Upper Susquehanna-Lackawanna Pilot Project, (USL Pilot) February, 2000 - May, 2000, applied OpenGIS® Web Map Server technology to help the US Army Engineer Research and Development Center (ERDC) assess the feasibility of implementing a multi-user, multi-vendor web-enabled mapping and planning framework in Central and Northeastern Pennsylvania

Geospatial Fusion Pilot Project, January 2001 - June, 2001, Implemented Geospatial Fusion Services capabilities in a user setting to apply geospatial data fusion to intelligence analysis and to demonstrate the utility and effectiveness of these new technologies.

North Rhine Westphalia Pilot (NRWPP), May 2001 - Spring 2002. This pilot is part of a state-wide initiative of the German state of North Rhine Westphalia to establish solutions for network integrated geographic information systems, serving state, city and county offices as parts of the general geographic data infrastructure.

Civil Works Technology Insertion, Phase 1 (CTI-1), April 2001 - September 2001. The CTI Project, sponsored by the US Army Corps of Engineers, Engineer Research and Development Center (ERDC), integrated multiple map servers, including nodes at the Corp's Mississippi Valley Division and the New Orleans District Office.

FGDC Web Mapping CAP Support, August 2001 September, 2001. To advance the National Spatial Data Infrastructure, the Federal Geographic Data Committee (FGDC) provides seed money to local government and other organizations through the Cooperative Agreements Program (CAP). The FGDC contracted with OGC members to provide practical training to CAP recipients working to make their existing server and clearinghouse capabilities conformant with OpenGIS® Specifications.

Military Pilot Project Testbed, Phase 1 (MPP-1), April 2001 - April 2002, is a collaborative infrastructure development effort that applies commercial technology implementing OpenGIS® Specifications to the Defense and Intelligence Domain.

Multihazard Mapping Initiative, Phase 1 (MMI-1), October 2001- May 2002. This pilot project, sponsored by the US Federal Emergency Management Agency (FEMA), established a limited operational framework of interoperable services to illustrate the advantages of using products with OGC interfaces to access, fuse and visualize critical spatial information from multiple sources in support of FEMA multi-hazard mitigation, response and recovery functions.

Object Domain Modeling Support (ODMS) Initiative (ODMS), October, 2001 - January 2002. The ODMS Initiative developed domain models for utilities as a vehicle to achieve semantic interoperability within and across information communities. The model allows users within the utilities arena and those in related disciplines such as engineering and public safety to more easily share geographic data, even if they choose to name features differently.

OGC Web Services (OWS) Initiative 1.1. After the events of September 11, the OWS 1.1 sponsors agreed to align OWS 1.1 to address interoperability challenges defined by officials in New York City. The OWS 1.1 demonstration scenario developed by the sponsors challenged

participating technology developers and integrators to implement interoperability capabilities that address specific critical disaster management needs.

The demonstration showed users easily discovering, accessing, superimposing, and portrayed satellite and aerial imagery, vector data, and scientific data stored on servers in Europe, North America, and Australia. New draft OpenGIS® Specifications for metadata and services were used to implement registries that enabled discovery of data and geoprocessing services. Interfaces based on OGC's new OpenGIS® Sensor Web Specifications enabled discovery of and real-time access to measurements from meteorological, water quality, air quality, and seismic sensors. The OGC Web Coverage Service was demonstrated accessing a variety of imagery including visible, hyperspectral and radar. Attendees witnessed the first public demonstration of a Coverage Portrayal service which, acting in this case as a middleware web service, accessed complex coverage data to produce simple pictures for display in a web browser.

The next phase of the initiative, OWS 1.2, began in May 2002. See below.

6 Interoperability Program Initiatives Underway or Planned for 2002

Some of OGC's ongoing / planned initiatives for 2002 are listed below - consult the Interoperability Program page at www.opengis.org for the latest information:

Location Services Testbed (OpenLS Testbed) Phase I. August 2001 - November 2002. The goal is to develop candidate interface specifications in support of interoperable location services to be made available through mobile terminals and to develop multi-vendor, specification-based mobile demonstrations of these interfaces in action.

OWS 1.2 ("OWS Thread Set 2") began in May 2002, focusing on extending engineering specifications developed in OWS 1.1 and other initiatives including: OpenGIS® Specifications for OGC Common Architecture, Web Mapping, Imagery Exploitation and Sensor Web.

GML encoding extensions for topology, multidimensions, and coverages.

Service chaining (common expression and execution) and service metadata extensions for complex models (e.g., science models) with spatial components.

New technical standards approaches to dealing with semantic differences in geodata and its metadata.

An "e-commerce" architecture for image analysis that connects information providers, maintainers, and consumers in collaborating communities, enabling Web-based imagery exploitation.

Critical Infrastructure Protection Initiative (CIPI). Spring 2002. CIPI leverages the success of previous and ongoing OGC initiatives to improve interoperability across communities that need to collaborate to detect, prevent, plan for, respond to, and recover from natural and human threats to telecommunications, water resources, oil and gas, government, transportation, emergency response, electric power and health services infrastructure. A collaborative effort, CIPI is being conducted in coordination with federal, state, local government, commercial, and non-government Sponsors. CIPI will also identify requirements for new specifications to advance plug and play interoperability for critical infrastructure protection.

Geospatial Information for Sustainable Development Initial Capability Pilot (GISD-ICP). Summer and fall, 2002. GISD-ICP is the first of a series of projects to help make geographic information more accessible and useful to decision makers working on sustainable development problems. This initiative emphasizes the value of public-private partnerships and international and

industry standards to make geospatial information and interoperable technologies more accessible to researchers and practitioners. The GISD-ICP builds on the efforts of Spatial Data Infrastructure (SDI) programs being implemented at the local, national, regional and global levels to improve the ability of users to discover, share and apply geographic information for decision-making and education.

Conformance and Interoperability Test and Evaluation (CITE). As customers in the geospatial industry prepare to modernize their systems based on OGC Web Services, they will require proof of products' conformance to OpenGIS® Specifications in order to achieve interoperability. Validating conformance to an OpenGIS® Specification means verifying that a software product has implemented the specification correctly. Validation involves testing the software interface for response and behavior outlined in the specification. The Conformance and Interoperability Test and Evaluation (CITE) Initiative is intended to give the geospatial industry (customers and vendors) a methodology and tools that will test conformance to OGC Web Services specifications and determine whether products that conform are interoperable with one another.

Geospatial One-Stop - Transportation Pilot (GOS-TP). The Geospatial Data One-Stop service will provide citizens with geospatial data and will accelerate the development and implementation of the National Spatial Data Infrastructure (NSDI). It will develop data standards for seven key framework geospatial data layers. OGC is supporting this effort by participating in the development of the logical model for data content standards for Road and Air Transportation, by developing a mechanism to generate XML from the logical models, and by implementing prototypical Web Feature Servers at two or more pilot locations in local government.OWS-1 will be conducted as part of an integrated set of OGC Interoperability Initiatives that include the Military Pilot Project, Phase 1 (MPP-1), the Open Location Services Initiative, the Multi-hazard Mapping Initiative, Phase 1 (MMI-1) and other activities. OWS-1 Thread Set 1 will end in February 2002 with a demonstration of the capabilities that have been developed.

Your Participation in OGC's Interoperability Program

OGC seeks additional public sector and private sector sponsors to participate in current and planned Interoperability Initiatives. New proposals are welcomed. Contact:

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