THINK GLOBAL. ACT LOCAL. WHY PARTICIPATION IN AN INTERNATIONAL STANDARDS BODY MAKES A DIFFERENCE

Athina TRAKAS [1]

ABSTRACT

In an increasingly interdependent world, cross border sharing of geospatial information becomes increasingly important. Open, international technical standards are necessary to meet requirements for communicating geospatial information between organizations; between different vendors' software products; between desktop computers, mobile devices, online sensors and cloud computing resources; and between different communities who have different ways of describing, for example, water quality or transportation routes.

Open standards also help organizations extend the useful life of previously purchased spatial technology systems, because today virtually all commercial vendors of GIS and Earth imaging software implement open geospatial standards that enable new processing components to work with old ones. Standards empower governments to issue requests for quotes that specify that software offered for purchase must implement certain standards and/or provide certain types of interoperability. An open standards development process prevents a single, self-interested party from controlling a standard, which helps organizations avoid "lock in" to proprietary architectures. Standards encourage market competition, which increases opportunities for entrepreneurs and promotes variety and new value in the marketplace.

Participation in international standards development is important because different interoperability requirements come from different communities of interest in different regions, professions, industries and disciplines. Participants are able to leverage their expertise at an international level and likewise they benefit from contact with an international network of information technology experts who can provide early insight into user requirements for interoperability and technical approaches to interoperability. Participation also provides insight into standards that underpin European Directives like INSPIRE.([2])

Key words: OGC, geospatial, standards, data sharing, technical interoperability, semantic interoperability, INSPIRE

[1] **Athina TRAKAS**, atrakas@opengeospatial.org
Director of European Services, Open Geospatial Consortium (OGC), www.opengeospatial.org

([2]) See *OGC Market Report on Open Standards and INSPIRE* - http://www.opengeospatial.org/pressroom/marketreport/inspire

1. INTRODUCTION

At the time of OGC's founding in 1994, users of Geographical Information Systems were unable to easily share and exploit geospatial information between GIS software technologies from different vendors. The OGC was founded as a not for profit international industry consortium to develop publicly available interface and encoding standards for GIS. The OGC's scope soon expanded to include Earth imaging, location services, sensors and other technology domains. OGC Standards support interoperable solutions that "geo-enable" the Web, wireless and location-based services and mainstream information technology (IT). Membership and participation in the OGC are on a voluntary basis and the development of standards is based on a consensus process.

Currently the membership includes over 495 members from industry, public administration agencies, the academic sector and research as well as non-governmental organisations of various kinds. OGC members produce standards and best practices that allow different organizations and communities of interest to access and apply diverse geoinformation sources with technologies that enable decision-making.

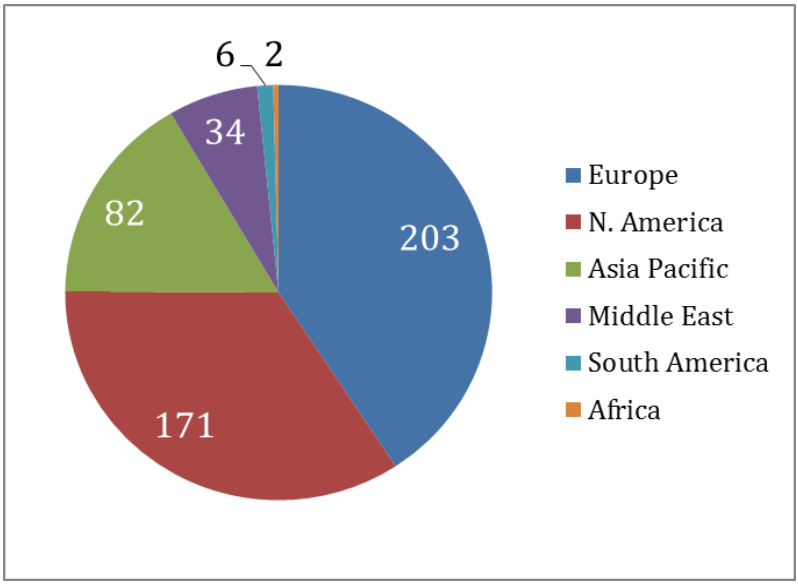

Figure 1: Representation of world regions in the OGC

David Schell, the OGC's co-founder and Chairman Emeritus of the OGC Board of Directors, says: "What the Open Geospatial Consortium is doing is facilitating a common picture of reality for different organisations which have different views of the reality, the disaster, the catastrophe, that they all have to deal with collectively."

Many of the OGC's members face interoperability issues like not being able to share maps on the Web or not being able to find and pull together data from their automated sensors. To address these issues they have joined the OGC to develop standards together with other organisations that face similar challenges.

OGC standards are developed and maintained in an inclusive and democratic process that the members have designed for both efficiency and fairness. The standards documents are freely available to everyone and implementable without concerns about intellectual property risks. Reference implementations are made available and a compliance certification program assures users that products labeled "OGC® compliant" correctly implement OGC standards. The quality of the standards is evident in the standards' wide use, and quality is maintained through a rigorous and open revision process. The OGC membership is dedicated to the long-term growth and consistency of the geospatial dimension of the Internet and Web.

Much of the value of membership derives from the fact that the OGC is a vital, non-adversarial, collegial networking hub that brings together perspectives from a host of disciplines and from people and organizations with different backgrounds, expertise, cultures and interests. Standards development is the key objective everyone shares, but members' higher order goals are to rapidly solve business issues, accelerate technological advancements and deployments, stimulate economic growth or desirable societal change, discover new business opportunities and enable new business models. Many lasting relationships have been formed in the OGC. The members have often stated that networking in the OGC has huge value in terms of meeting customer needs, forming open communication channels between buyers and sellers, and in establishing long-term partnerships.

In the World Wide Web that we are all actively using, http:// is the "dial tone". OGC standards provide the "dial tone" of the geospatial web. OGC standards and web services help users to better accomplish their work and to solve issues in a much more efficient and sustainable manner. This is also the reason why the OGC has a broad user community worldwide and why

many policy positions on geoinformation at local, national and international levels are underpinned by OGC standards.

The OGC does not want to re-invent the wheel and therefore it cooperates with other standards bodies, as described in Section 3 below.

2. ADVANTAGES FOR TECHNOLOGY CONSUMERS [3]

Technology consumers who are OGC members can:

- Voice their interoperability needs directly to a broad and global industry, academic and government community. In the OGC's Standards Program and Interoperability Program, vendors, integrators and platform providers build interoperability interfaces and encodings far faster than is possible with traditional system integration contracting. The benefits are shared globally.
- Pool both requirements and invested resources with other technology users. These investments bring a very high return on investment. Participants in OGC testbeds and pilot projects contribute more in in-kind contributions (labor, software, infrastructure, etc.) than is provided in Sponsor funding: at least 3:1 for every €1 invested in OGC Interoperability Program OGC Web Services (OWS) testbed projects. The downstream value is hard to calculate, but it is much more than 3:1, even if one compares a sponsor's contribution to the cost of only one integration project implemented without the benefit of the open standard(s) resulting from a testbed.
- Employ OGC programs as a form of technology risk reduction. The time and cost of participating in the development of standards that enable "loose coupling" of different vendors' products is far less than the cost of customized integration projects that lock users in to specific products and approaches. Small resource investments by technology users in the OGC's consensus processes often result in vendors' willingness to address and then broadly implement OGC standards in their products.
- Use the OGC process for procurement reform. Users benefit first by expressing their interoperability requirements in the OGC standards development process, and then by adopting procurement language

[3] This section adapted from OGC white paper, "The OGC – Value through Open Standards".

that calls for OGC standards in the geospatial and location-based services products to be considered for purchase and deployment.

- Introduce their user perspectives and work with other users in the OGC process to demonstrate the need for and potential market appeal of new standards. This reduces technology risk because there are more stakeholders investing in the process and the eventual standard that is produced.
- Support the needs of community members, partners and stakeholders who want open standards but who may not have sufficient expertise to participate in standards development. This is sometimes the role for universities.

Once open standards have been developed and implemented in products and services, technology consumers can:

- Reuse their geospatial software or content in multiple projects and across multiple departments or across the enterprise. This means that they invest less overall and also less frequently, potentially saving costs for each new user or project. This is often cited as the single greatest benefit from deploying standards-compliant products or solutions.
- Leverage existing investments in legacy content and applications. Standards help companies and agencies leverage IT investments and create liquidity. Put another way, a critical benefit of using standards is revenue enhancement as opposed to direct cost savings. Standards provide a platform for realizing opportunities that would otherwise remain hidden.
- Mobilize new technology solutions quickly and adapt easily to the rapidly changing information technology world, policy changes, and new and emerging user requirements. With products that implement open standards, product choices made today don't limit the choices an organization can make in the future. Also, solutions can connect to internal departments and external partners that made different technology choices.
- Maximize the return on their current and future technology investments, while reducing the time and cost of integration. Solutions can involve multiple best-of-breed hardware and software components.

The OGC offers its standards free of charge to all developers and organizations worldwide and adheres to a rigorous process to ensure that the standards remain free of royalties for use. The OGC strongly supports

royalty-free standards, a position also taken by the World Wide Web Consortium (W3C)[4] and other major consensus standards organizations. The OGC's position is that these consortia and geoprocessing standards play a major role in maintaining a free and open Web.

3. COLLABORATION AMONG STANDARDS DEVELOPMENT ORGANIZATIONS (SDOs)

In working with other SDOs, the OGC brings 1) expertise and leadership on location to help the broader IT standards framework process any kind of location information consistently, and 2) expertise in innovative standards processes for development, testing and certification of standards. The OGC actively collaborates with numerous other standards organizations. For example, the OGC has a Class A Liaison relationship with ISO (International Organization for Standardization)[5]. The linkage with ISO is especially strong: OGC standards are often approved as ISO standards, e.g. OGC's Web Feature Service (WFS)[6], Web Map Service (WMS)[7] and Geographic Markup Language (GML)[8] are also ISO standards (ISO 19142, ISO 19128 and ISO 19136).

This liaison work is supported by the Joint Advisory Group (JAG)[9] that exists between ISO and the OGC. The JAG, which is currently chaired by the Joint Research Centre (JRC)[10], ensures co-ordination between OGC and ISO as an OGC standard moves through the ISO approval process. There are also examples of ISO standards providing the abstract model or foundation for OGC standards, e.g. for metadata with ISO 19115[11]. This work is carried out within ISO Technical Committee 211 (TC 211), a standards technical committee tasked with addressing the areas of digital geographic information (such as data used by geographic information systems) and geomatics. TC

[4] http://www.w3.org
[5] http://www.iso.org/
[6] http://www.opengeospatial.org/standards/wfs
[7] http://www.opengeospatial.org/standards/wms
[8] http://www.opengeospatial.org/standards/gml
[9] http://www.isotc211.org/organizn.htm - jag
[10] https://ec.europa.eu/jrc/
[11] http://www.iso.org/iso/home/store/catalogue_tc/catalogue_detail.htm?csnumber=53798

211 is responsible for preparation of the series of ISO International Standards and Technical Specifications numbered in the 19100 range.

While INSPIRE is not a standards organization, its goals depend on INSPIRE partners agreeing to use particular standards. Within the OGC there are many individuals involved with INSPIRE and this work tends to be specific to individual standards, e.g. Catalogue Services, GML, WMS, WFS. Other areas of collaboration can be seen in OGC members having taken an active role in the INSPIRE Thematic Working Groups (TWG) and in the INSPIRE Drafting Teams (DT). Today, many OGC members are engaged in the INSPIRE Maintenance and Implementation Group.

Many OGC standards have relevance to the development of other IT and networking standards and vice versa. The Internet Engineering Task Force (IETF)[12] location privacy working group (GeoPRIV)[13] recognises that many applications are emerging that require geographic and civic location information about resources and entities, and that the representation and transmission of that information has significant privacy and security implications. GeoPRIV uses OGC Geography Markup Language (GML) to describe the location element. The OGC works on open data and linked data initiatives with W3C, where OGC's GeoSPARQL[14] standards working group acts as an extension to the SPARQL recommendation from the W3C. In a similar vein, the Organization for the Advancement of Structured Information Standards (OASIS)[15] has defined XACML[16] for security and authentication in access control. The OGC defined and approved a spatial extension of this in the OGC GeoXACML[17] working group.

4. OGC PROGRAMS

OGC Standards Program[18]

The OGC Standards Program provides an effective and well-trusted industry consensus process to plan, review and officially adopt OGC standards for interfaces, encodings and protocols that enable interoperable geoprocessing

[12] https://www.ietf.org/
[13] http://datatracker.ietf.org/wg/geopriv/charter/
[14] http://www.opengeospatial.org/standards/geosparql
[15] https://www.oasis-open.org/
[16] https://www.oasis-open.org/committees/xacml/
[17] http://www.opengeospatial.org/standards/geoxacml
[18] http://www.opengeospatial.org/ogc/programs/spec

services, data, and applications. The Standards Program allows members from many industry segments worldwide to do this work together in a collaborative and collegial environment. The Standards Program consists of the OGC Technical Committee (TC) and the OGC Planning Committee (PC). The Technical Committee is where the formal standard consensus discussion and approval process occurs. The Planning Committee provides guidelines and a management structure for the Technical Committee and the Interoperability Program. The Planning Committee is charged with business planning and the management of the consortium's technology release process and strategic member programs.

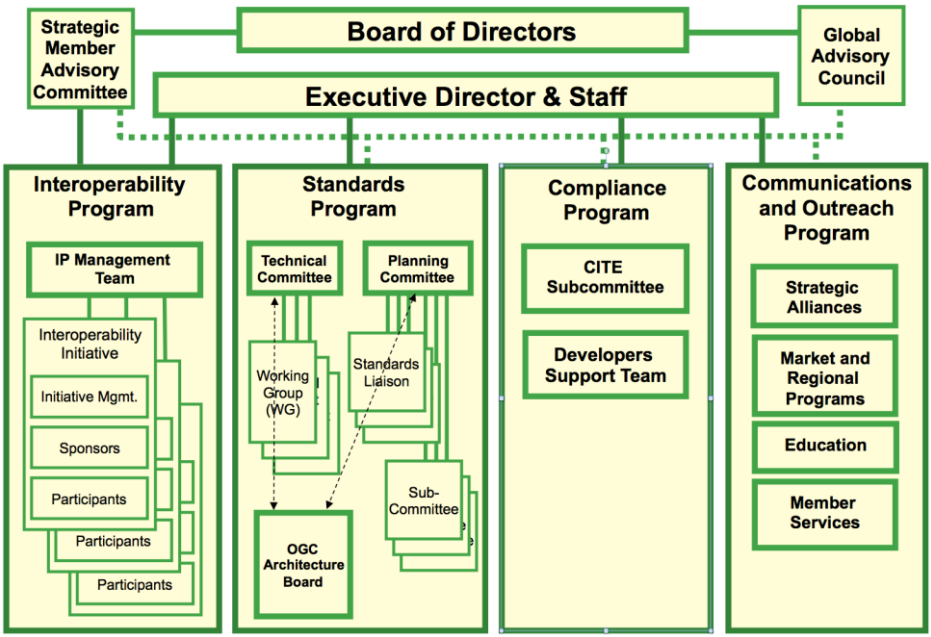

Figure 2: OGC Programs

OGC Interoperability Program[19]

The OGC Interoperability Program (IP) is a global, hands-on and collaborative prototyping program designed to rapidly develop, test and deliver proven candidate standards into OGC's Standard Program, where they are formalized for public release. OGC Interoperability Program Initiatives include testbeds, pilot projects, and interoperability experiments. All OGC Interoperability Initiatives are publicly announced, and a Request For Proposals/Call for Participation (RFP/CFP) is issued for every initiative.

[19] http://www.opengeospatial.org/ogc/programs/ip

Any organization – member or non-member – can respond to the RFP/CFP. However, in order to participate a selected organization must become a member.

OGC Compliance Program[20]

The OGC Compliance Program provides the resources, procedures, and policies for improving software implementations' compliance with OGC standards. The Compliance Program provides an online free testing facility, a process for certification and branding of compliant products, and coordination of a vibrant community that develops and supports test scripts. The Compliance Program also runs plugfests, which are short-term events for increasing interoperability among vendors' products.

OGC Communications and Outreach Program

The OGC Communications and Outreach Program provides publicity and community outreach to inform the general public about upcoming OGC initiatives and new standards. Also, the success of new standards depends on vendors implementing them and users using them, and this requires articles, web content, and conference presentations.

5. COMMUNITY EXAMPLE: THE METEOROLOGY AND OCEANOGRAPHY COMMUNITY IN THE OGC

The OGC Meteorology & Oceanography Domain Working Group[21] was established at the OGC Athens Technical Committee Meeting in March 2009 to ensure that OGC standards and profiles enable the meteorological community to develop effective interoperability for web services and content across the wider geospatial domain. This OGC Domain Working Group brings together OGC members in an open forum to work on oceanographic, meteorological and climatological data, metadata, and web services interoperability, greatly improving the way in which this information is described, shared and used.

The ability to easily exchange atmospheric meteorological and climatological information in a timely and useful fashion is becoming increasingly important. Further, oceanographic data is increasingly exchanged in near real time for operational purposes as well as through the more traditional research campaigns. Oceanographic data is used to force

[20] http://www.opengeospatial.org/compliance
[21] http://www.opengeospatial.org/projects/groups/metoceandwg

atmospheric models, for both weather forecasting and climate prediction, and to explicitly model the oceans, seas, tides, waves and swell. Meteorology and Oceanography have a long history of shared approaches and institutions, so a joint Domain Working Group is very natural.

The working group is co-chaired by a representative from the World Meteorological Organization's (WMO) Commission for Basic Systems (CBS)[22].

Meteorological and oceanographic data in general are multidimensional, continually evolving, highly spatial and highly temporal in nature. The OGC's standards in 2009 provided an attractive option for sharing such data, except that the standards as written did not address all of the needs of this community. Another standard, netCDF (network Common Data Form)[23], was already in wide use by atmospheric and oceanic scientists. NetCDF was developed by the Unidata Program Center at the University Corporation for Atmospheric Research (UCAR)[24] under sponsorship of the Atmospheric and Geoscience Division of the US Government National Science Foundation[25]. It has been formally recognized by the US Government's NASA and NOAA standards bodies and is in use internationally. UCAR and other OGC members introduced netCDF into the OGC as a candidate OGC standard to encourage broader international use and greater interoperability among clients and servers interchanging data in binary form. Among other benefits, this will make the large collections of environmental netCDF data more readily accessible and usable by non-experts.

EUROCONTROL[26] and other organizations have worked with the OGC to develop WXXM, an air transportation focused weather standard. Though designed for the air transportation industry, WXXM[27] is having an impact in other weather related industries because this GML based standard provides excellent interoperability with other spatial data encoded in GML.

The Met Ocean DWG is open to participation by both non members and members and is intended to be a public forum for communication, and both

[22] http://www.wmo.int/pages/prog/www/BAS/CBS-info.html
[23] http://www.unidata.ucar.edu/software/netcdf/
[24] https://www2.ucar.edu/
[25] http://www.nsf.gov/dir/index.jsp?org=GEO
[26] https://www.eurocontrol.int
[27] http://www.wxxm.aero/public/subsite_homepage/homepage.html

the mailing list and the group Twiki are open to interested parties. There is a group Twiki and a mailing list that is available to all interested parties.

OGC standards are all based on the same OGC Reference Model[28] interoperability framework, which is based on standard object-oriented and Web-based distributed computing models as well as years of consensus work in the OGC.

Note that the OGC membership sometimes accepts contributed standards for potential adoption, such as KML[29], and some of these may not adhere to the OGC Reference Model. The rationale for doing this is that a previously proprietary interface or encoding or one developed by an organization that lacks the resources of the OGC is going to be more useful to the world community if it is maintained and evolved in a robust open consensus process.

6. CONCLUSION

OGC members – business, government and academic – join the OGC for numerous technical and business reasons. Regardless of who makes the decision to join the OGC and participate in OGC activities, they see in the OGC unique opportunities for learning about the state of the art with regard to interoperability, standards, and applications that implement OGC standards. They also see value in collaborating with their peers for exchanging knowledge across communities of practice. They understand that using standards saves time, money, energy, and sometimes, lives. In addition, government and business leaders are becoming increasingly aware that influencing and using standards contributes to national economic health.
The OGC consensus process provides members numerous opportunities to express interoperability requirements and work to shape the OGC standards to meet those requirements. Further, members take advantage of both the standards and the partnership opportunities to "connect the dots" between different information systems and application domains.
OGC membership offers an excellent way for government groups to liaise with industry and academia to stimulate economic activity. Open interfaces and encodings generated from OGC initiatives often spark new business successes, which aggregate into regional and national competitive

[28] http://www.opengeospatial.org/standards/orm
[29] www.opengeospatial.org/standards/kml

advantage. New products and services and more affordable offerings bring commerce, profit, employment and increased innovation.
Further, as more offices in government and businesses in the private sector begin producing and hosting data and as the open standards-based Web becomes the dominant delivery mechanism, Spatial Data Infrastructures (SDIs)[30] become increasingly useful to governments and commercial enterprises at all levels. The OGC's work in sensor webs, geospatial rights management, service chaining, geosemantics, data quality and other areas advances SDI development and deployment, which helps companies provide value and helps governments provide better services at lower cost.

REFERENCES

http://www.opengeospatial.org/pressroom/marketreport/inspire
http://www.w3.org
http://www.iso.org/
http://www.opengeospatial.org/standards/wfs
http://www.opengeospatial.org/standards/wms
http://www.opengeospatial.org/standards/gml
http://www.isotc211.org/organizn.htm - jag
https://ec.europa.eu/jrc/
http://www.iso.org/iso/home/store/catalogue_tc/catalogue_detail.htm?csnumber=53798
https://www.ietf.org/
http://datatracker.ietf.org/wg/geopriv/charter/
http://www.opengeospatial.org/standards/geosparql
https://www.oasis-open.org/
https://www.oasis-open.org/committees/xacml/
http://www.opengeospatial.org/standards/geoxacml
http://www.opengeospatial.org/ogc/programs/spec
http://www.opengeospatial.org/ogc/programs/ip
http://www.opengeospatial.org/compliance
http://www.opengeospatial.org/projects/groups/metoceandwg
http://www.wmo.int/pages/prog/www/BAS/CBS-info.html
http://www.unidata.ucar.edu/software/netcdf/
https://www2.ucar.edu/
http://www.nsf.gov/dir/index.jsp?org=GEO
https://www.eurocontrol.int/
http://www.wxxm.aero/public/subsite_homepage/homepage.html
http://www.opengeospatial.org/standards/orm
www.opengeospatial.org/standards/kml

[30] http://en.wikipedia.org/wiki/Spatial_data_infrastructure