OGC Compliance Testing White Paper

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This white paper describes the OGC Compliance Testing Program. It provides information about:

- The need for compliance testing to enable interoperability
- How to obtain compliance certification
- The difference between implementing and being certified
- How compliance benefits providers and users of technology
- The proper use of the "Certified OGC Compliant" mark
- Suggested language for procurement documents
- Trademark licensing fees
- An example of an OGC compliance test

Important Definitions:

OGC compliance test: A procedure that evaluates a software product for proper implementation of an OGC standard. OGC compliance tests are available free and online for use by developers preparing for OGC certification of their products.

OGC implementing product: A software product that *uses* an OGC standard. The developer of this software product may *not* claim that their product is **compliant** with the standard, even if their product has passed an OGC compliance certification test.

OGC compliant product: A software product that has passed the compliance test, and that OGC has evaluated and approved as compliant. The compliance evaluation process includes the developer submitting proper documentation to OGC (Compliance Test Package), the developer paying the appropriate Trademark Licensing Fee, and the evaluation of the tests and documentation by OGC staff. The developer then has the right to use the "Certified OGC Compliant" service mark shown in Figure 1 and legally claim that a product is "OGC compliant".

Figure 1. Certified OGC Compliant service mark with OGC logo

OGC Registered Compliant products: *Many developers have implemented OGC standards and many of these products are "OGC compliant".* To inform buyers, most developers offering OGC compliant products and most developers offering OGC implementing products *register* their products on the OGC "Implementing" page (http://www.opengeospatial.org/resource/products).

Standards compliance and interoperability

When properly implemented by developers, OGC standards enable different location-enabled software systems to interoperate, or work together, for improved decision making. Widespread interoperability, a critical requirement in today's networked world, depends on users and providers having a way to know whether products and systems comply with the standards that enable interoperability.

Interoperability is not just a promise. Today, dissimilar geoprocessing systems on enterprise networks and on the Web interoperate for many purposes through common interfaces that implement OGC standards. The extent of interoperability enabled by OGC standards and implemented in products is growing rapidly. By Sept 2010 there were more than 600 Compliant or Implementing Products registered on the OGC web site (http://www.opengeospatial.org/resource/products).

The new paradigm of interoperability based on correctly implemented open interface and encoding standards offers communities of users many advantages over the old paradigm of software systems that were isolated by their proprietary interfaces and encodings:

- No single Geographic Information System (GIS), mapping tool, imaging solution, or spatial database answers every need. Also the functions previously offered only by such products are now, thanks in large part to standards, becoming available as services on the Web.

- Geodata is everywhere. Any database record with a description of location can become spatial data or geodata. Any text can be parsed against a gazetteer to capture location names and thus create geodata. Advances in remote sensing, location services, fast processors and broadband data pipes all contribute to a growing geodata cornucopia.

- The number of software developers offering components to deal with geographic information is growing, not shrinking.

- It is efficient to collect data, maintain it in one place and use it many times. This is particularly cost-effective if communities of users can find, access, and use this information online. In this case they don't need to access, retrieve and maintain whole files and databases of information that others are responsible for.

- The ability to seamlessly combine accurate, up-to-date data from multiple sources opens up new possibilities for improved decision-making and makes data more valuable.

- The ability for multiple users, including those who are not geospatial experts, to use data (perhaps at different levels with different permissions) also makes the data more valuable.

- Service Oriented Architectures (SOA), in which countless Web clients request and

can receive services from countless Web services, depend on open interfaces that enable this "loose coupling" paradigm. In the SOA world, it usually isn't enough to say that clients can communicate with certain servers via those servers' published interfaces. It is also necessary for the interfaces to be properly implemented according to standards. The Certified OGC Compliant service mark assures software buyers that a server's interfaces comply with OGC standards.

Forward-looking buyers of geospatial information systems who purchase products that comply with OGC standards look forward to:

- Establishment of shared information service options for their organizations and those they serve.

- Streamlining of operations through online geo-information resources and improvements in stewardship and sharing of those resources.

- Faster, better service delivery resulting from standards-based technology delivering the advantages of component approaches.

- Fiscal benefits and risk reduction. Co-investing with partners in open technology platforms and shared data reduces costs and improves information resource manageability.

Compliance testing

An OGC compliance test is a procedure that evaluates a software product for proper implementation of an OGC standard. OGC compliance tests are available free and online for use by developers preparing for OGC certification of their products.

Procedure to become legally "Certified OGC Compliant"

A product's advertising or packaging may legally carry the Certified OGC Compliant service mark for compliance (Figure 1) if the product has passed the compliance test, *and if it has been evaluated and approved by OGC to be compliant.* The compliance evaluation process includes the following steps:

1. The product developer tests a product and the product passes the online compliance test.
2. The developer submits proper documentation to OGC (Compliance Test Package). This includes a form with information about the passed online compliance test.
3. OGC staff evaluates the test results and creates proper documentation.
4. The developer agrees to the OGC Trademark License Agreement.
5. The developer pays the appropriate Trademark Licensing Fee.
6. OGC grants the compliance certificate.
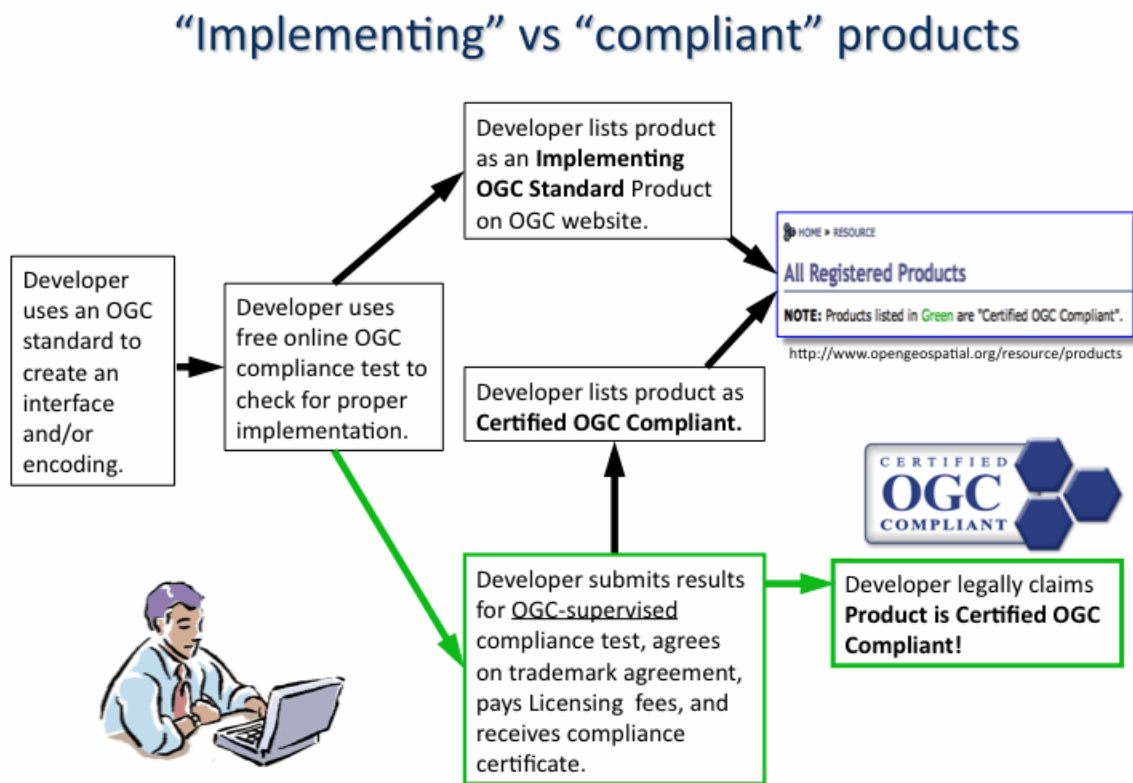
The mark will be valid for a particular version of a particular standard and it may only be used if the product developer has paid for the OGC-supervised compliance test and the right to use the mark.

Difference between implementing and being compliant

An OGC implementing product is a software product that *uses* an OGC standard. The developer of this software product may *not* claim that their product is **compliant** with the standard, even if their product has passed an OGC compliance certification test.

Implementing products *might* interoperate with other implementing products and with OGC compliant products, but interoperability between two products is much more likely when the products have both passed OGC-supervised compliance tests and carry the Certified OGC Compliant service mark. This is because <u>the Certified OGC Compliant service mark certifies that the standard has been implemented correctly</u>.

Figure 2 shows the process a developer goes through to implement and claim OGC compliance. A developer can run an OGC compliance test (available free and online) for a particular OGC standard to determine whether or not they have correctly implemented the standard. At this point the developer can claim that the software **implements** an OGC standard. The developer can then continue the process of seeking formal **OGC certification** of the product and the right to use the Certified OGC Compliant service mark.

Figure 2: "Implementing" products and "Compliant" products.

Benefits for providers of OGC Compliant technology

For technology providers, compliance testing and use of service marks are important because interoperability has become a high priority for users, who are increasingly

insisting on formal standards compliance when they purchase software. Customers want the Certified OGC Compliant service mark because it gives them assurance that their products and solutions will be able to interoperate with other systems that have properly implemented OGC standards. The Certified OGC Compliant service mark also gives integrators confidence that they will be able to efficiently integrate developers' products as components in the solutions the integrators provide.

The Certified OGC Compliant service mark gives software resellers a way to back up their claims about compliance. OGC standards have been an important contributing factor in the growth of the geospatial market because they have eliminated technology-imposed barriers to the wider use of geospatial data and processing. OGC compliance is increasingly necessary for technology providers to participate in this expanded market because more and more users understand what has happened and why it has happened, and the users see the logic in demanding the Certified OGC Compliant service mark. Ultimately independent software developers and resellers can increase their market reach by delivering OGC Compliant solutions.

Benefits for buyers of OGC Compliant technology

For buyers, the Certified OGC Compliant service mark can save money and it can also ensure user access to essential services and information. Making the user's experience as error-free as possible is important to maintaining the credibility of a business or agency. Accountability is also important: Who is responsible for a particular online service? The Certified OGC Compliant service mark will probably never be seen by the agency's or service provider's users, but those users will get more reliable service, they will spend less time and money manually converting between data formats, and they will benefit from the earlier arrival of new products and services. These improvements will provide them with more time to focus on other business-critical areas and improve productivity associated with geospatial data management.

Interoperability – and the Certified OGC Compliant service mark – should be a major consideration in an organization's technology procurement policy. It provides confidence, reduces risks, and increase systems interoperability.

Confidence in purchased products. An OGC service mark on a product gives buyers the confidence that a product will work with another product that carries the same OGC service mark, regardless of which company developed the product.

Reduction of technology risk. For purchasers of geospatial technology products and services, reducing "technology risk" is an important goal, and the Certified OGC Compliant service mark helps achieve that goal. Reducing technology risk is a software lifecycle management issue. Organizations whose significant investments in technology require rigorous product and system lifecycle management depend on OGC compliance to help them maintain business continuity and durability of their enterprise architectures. In short, procurement of Certified OGC Compliant products "future-proofs" IT investment.

Increase of Systems interoperability. Certified OGC Compliant products help diverse, distributed software components and systems to interoperate. The components may be elements of a new component-based solution, or they may be legacy systems that have been upgraded with interfaces that implement OGC standards. The components could

be components purchased in the future from different developers to add functionality to a system. Systems used by data sharing partners, now and in the future, interoperate more reliably if those partners' systems use Certified OGC Compliant products.

How does one know that a product is "Certified OGC Compliant"?

If a product legally carries the Certified OGC Mark in Figure 1 it is Certified OGC Compliant.

Registry of OGC implementing and compliance products

A buyer can confirm whether the product is an "implementing product" or is "Certified OGC compliant" by looking for the product name on the OGC Website at http://www.opengeospatial.org/resource/products.

Proper use of the OGC Service Mark

The OGC service mark in Figure 1 must be used in conjunction with one or more individual OGC standard service marks such as those shown in Figure 3.

Version numbers are important – while the OGC strives to preserve backwards compatibility, using the same version of a standard will optimize interoperability.

Figure 3. Certified OGC Compliant service marks for individual standards

Providers may use OGC service marks in product literature, on their web site, and in other sales and marketing materials to indicate that they have achieved official compliance with one or more OGC standards.

Enforcing standards in procurement language

Software and system buyers help their organizations, their information-sharing partners and the larger industry when they insist on the Certified OGC Compliant service mark. But how does one do this? How does one communicate to bidders that they must offer OGC compliant products?

The best way to begin is to prepare a "notional architecture" document. One example of such a document is the 2005 "Spatial Interoperability Demonstration Project (SIDP) Notional Architecture Executive Summary" (http://portal.opengeospatial.org/files/?artifact_id=10687) prepared by the Open Geospatial consortium – Australasia (OGC-A). Another example is the 2006 slide set, "Enabling Framework - A Technical Architecture" by Martin Brewer, SLIP-EF Chief Technical Officer at the Western Australia Department of Land Information (https://www2.landgate.wa.gov.au/slip/portal/home/latest-news-files/02_EFTechnicalArchitecture.pps).

A notional architecture is, to quote from the SIDP document, "... an idealized description of the services and interfaces required to construct interoperable spatial infrastructure systems. The architecture is notional in that it makes no assumptions about physical implementation and the only assumption made about vendors and institutions is that they accept and support open, non-proprietary standards."

Such a document explains what kind of interoperability is necessary and which standards must be implemented to provide that interoperability. Bidders must show, and buyers must evaluate in their technical evaluations, whether or not the offerings implement and/or are compliant with the necessary standards.

It may happen that certain desirable products have not yet implemented necessary OGC standards, but the vendor claims that implementation and certification are pending. Or it may be that OGC has not yet provided compliance tests for certain necessary standards. In such cases, bidders may commit to providing the necessary implementations and certifications as soon as these actions become possible. Such commitments can be negotiated and set forth in service level agreements.

Open standards are a result of demand for interoperability and requirements for data and services to be shared across organizations and communities. The Certified OGC Compliant service mark represents a level of professionalism that puts software purchasers as well as solution providers on the most certain path to interoperability.

Suggested OGC Certification Language for Procurement texts

OGC compliance tests are available for many but not all OGC standards. The OGC is constantly increasing the number and percentage of standards for which tests are available. The important thing to remember is this:

Procurement language – the terms spelled out in tenders and requests for quotes (RFQs) – should require or strongly encourage vendors to offer Certified OGC Compliant products when tests exist for OGC standards that apply to the functionality of those products. When OGC compliance tests do not yet exist for a standard, procurement

language should require or strongly encourage vendors to offer products that <u>implement</u> OGC standards.

Digital nuts and bolts about compliance testing

To understand software compliance testing, it's necessary to understand software standards. Just as speakers and listeners of a human language must understand and agree to the same rules of vocabulary, grammar and pronunciation, computer systems that exchange data and instructions must have matching interfaces that send and receive data encoded according to strict rules. An OGC standard is a specification that describes the matching software interfaces and data encodings necessary for a particular kind of exchange of instructions or data. An OGC standard documents all the details a software developer needs to take into account when implementing software that will "speak the same geospatial language" as other software programs that implement that standard.

A compliance test determines whether a software program has correctly implemented a standard, in all its details.

Below is a brief example of a client request made to a server that implements an OGC standard. We chose this "http://www…." example because most people use software without ever seeing any actual software code other than that ever-present "http://www…", which is itself one of the key standards that enable the World Wide Web.

One of the interfaces defined by the OGC Web Map Service (WMS) Standard is GetMap, an interface to obtain a simple map image in a common image format (PNG, JPEG, PPM, or TIFF) that can be displayed easily on a website or inserted into a document. A standard Web browser can ask any developer's OGC compliant Web Map Service to provide a map simply by submitting a WMS request in the form of a URL (Uniform Resource Locator, a W3C standard, well known because of the public visibility of a URL's `http://` prefix.). Here is a GetMap request for a particular AVHRR (Advanced Very High Resolution Radiometer) image:

```
http://a-map-co.com/mapserver.cgi?VERSION=1.2.0&
REQUEST=GetMap&CRS=CRS:4326&BBOX=-97.105,24.913,-
78.794,36.358&WIDTH=560&HEIGHT=350&LAYERS=AVHRR-09-
27&STYLES=&FORMAT=image/png&EXCEPTIONS=INIMAGE
```

"BBOX" is one of 11 parameters in this request. The OGC WMS standard tells programmers that, in a WMS map request, "BBOX" means "bounding box" and that BBOX must be followed by "=" and then by two points (corners of the bounding box) expressed as latitude/longitude coordinate pairs. The WMS standard answers programmers' questions such as: Which corners of the bounding box do these points define? What's the order of the coordinate pair? Are those miles or kilometers? Will integers work or must the numbers be floating point numbers?

The WMS standard "captures consensus" on such questions. The world's interested geospatial software experts agreed in OGC's consensus process that this is how a Web-based map request should work. As in all software programs, programmers need to get many small details exactly right. If the client request correctly implements the WMS

standard, and if the server correctly implements the standard, the client will get a map from the server and display it.

The OGC WMS Compliance Test tests implementations of the OGC WMS Standard to ensure that the implementers got all the details right.

Compliance testing program documentation

The Compliance Testing document on the OGC website (available as a pdf file downloadable from http://portal.opengeospatial.org/files/?artifact_id=7586) describes the OGC Compliance Testing Program in detail. The document defines the approach, including policies and procedures that the OGC uses for compliance testing of server side implementations of specific OGC standards.

After the developer obtains the trademark license, when a visitor to the OGC website's Products page (http://www.opengeospatial.org/resource/products) moves the cursor over the product name, a "Certified OGC Compliant" service mark appears. This service mark indicates that compliance with a particular OGC standard has been achieved, and this service mark provides an incentive for potential customers to preferentially purchase such products.

A fully executed OGC Trademark License Agreement, fully paid trademark license fees, and full compliance with the Trademark License Agreement terms are mandatory for an organization to use the "Certified OGC Compliant" mark with its product(s) in any way or to claim "compliance" with OGC Implementation Standards.

There are currently hundreds of organizations worldwide who use the "Certified OGC Compliant service mark as an integral part of their product marketing.

Trademark Licensing Fees

The OGC does not charge a fee for compliance testing under the Testing Procedure.

The OGC does charge a fee for trademark licensing for Candidate Products that successfully pass a compliance test under the Testing Procedure; this fee is called the Trademark Licensing Fee. This fee must be paid by providers that want to claim compliance with OGC Implementation Standards. This fee is not required to initiate and complete a test. The current fee structure is available at http://www.opengeospatial.org/compliance#trademark.

The governing information for Trademark Licensing Fees is available at http://www.opengeospatial.org/ogc/policies/trademark.

Caveats

ICT standards are the backbone of the ICT industry, but they are usually complex and need time to mature. OGC standards have matured to the point where they are widely implemented and largely uncontested as the standards that developers employ to build systems that can exchange geospatial data and geoprocessing commands with other systems. But compliance testing is also complex and takes time to mature. We list below a number of issues regarding compliance testing, because we believe that increased

understanding of OGC's compliance testing program, including an understanding of its limitations, will lead to more participation in the program and more demand for the Certified OGC Compliant service mark. The following are existing caveats as of September 2010.

- OGC compliance tests are available for some but not all OGC standards. The OGC is continually enhancing and expanding the Compliance Testing Program, and we encourage interested organizations to participate in this effort. If a software product includes an interface (or if a data product is based on an encoding) that implements a specific OGC standard, but the product has not passed a compliance test (perhaps because no test is yet available), the product's developer can label the product as "implementing" a specific OGC standard. For example: "This product implements the OGC Geography Markup Language (GML) Standard, version 2.1." The developer may also say: "This product will be submitted to OGC for compliance testing."

- Compliance testing addresses the degree to which a product has properly implemented the standard. Compliance testing does not ensure or test full interoperability between different software products. Applications that use compliant interfaces and encodings usually interoperate well. As a standard matures and as more organizations contribute requirements, comments and expertise, non-interoperability problems become less common. In the OGC, new compliance tests are constantly being developed, and the testing program continues to evolve to meet the needs of industry.

- OGC is exploring the next level of compliance – interoperability certification. The first step of this process is the conduct of plugfests where developers are invited to test their OGC Certified Compliant products with other certified products. OGC anticipates formalizing interoperability certification in the near future.

- Currently the CITE program only tests server products. In other words, the program can only test whether server products generate compliant responses to client-side products. The program does not presently offer capability to test compliance of client side products, although this capability is being considered for future compliance testing.