

**Written Testimony of David Schell
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Before the U.S. House Committee on Government Reform

Subcommittee on Technology, Information Policy,
Intergovernmental Relations and the Census

Hearing on “Geospatial Information: Are we headed in the right direction or are we lost?”

June 23, 2004

Chairman Putnam, Ranking Member Clay, and distinguished Members of the Subcommittee,

Thank you for the opportunity to appear before you today at this oversight hearing on “*Geospatial Information: Are we headed in the right direction or are we lost?*” From my viewpoint, the answer to the question is that we are basically on the right track, but we need to make some mid-course corrections.

I am president of the Open GIS Consortium (OGC), a voluntary consensus standards organization. The OGC is a not-for-profit, global industry association founded in 1994 specifically to address the geospatial information sharing challenges that gave rise to this hearing. The OGC's worldwide membership, which totals 260 entities, includes geospatial software vendors, government integrators, information technology platform providers, US Federal Agencies, agencies of other national and local governments, and universities.

The network of public/private partnerships embodied by the OGC has accomplished for geospatial information what the US railroad companies had accomplished by 1886, when they achieved consensus on the adoption of a common rail gauge. By having a common gauge, they eliminated the excessive cost of transshipping freight and passengers across previously impassible junctions defined by differing and proprietary track designs. What the railroads did with track gauge, the OGC has done with standards that enable technology to “transship” geospatial information between and among “differing and proprietary” computer application systems, with similar immediate costs savings and even more dramatic financial benefits for long-term institutional and societal development.

Imagine that a road contractor uses one vendor's software to develop a plan for a street and then, directly over the Internet, updates a city highway department's street database, which the department holds in another vendor's software. Next, a policeman uses a third vendor's software on a handheld device to view a simplified map, generated from the highway department's street database, so he can route traffic around the scene of a fire. The multiple vendors' systems work together in real time, because they use the same open, standards-based software interfaces.

Due to the work of the OGC, ISO and other standards organizations, a framework of standard-based technologies now exists upon which government can build, at reasonable cost, capacity for inter-agency data sharing and decision support using geospatial information. Hundreds of commercial products now implement OGC member-defined standards. Major organizations now integrate "location intelligence" as a ubiquitous capability in their enterprise architectures by implementing the OGC's standards. With this acceptance in the market, we are at a critical point in the "spatial enablement" of government.

Your theme for this hearing is, "*Geospatial Information: Are we headed in the right direction or are we lost?*" We are on the right track in the sense that the Federal Geographic Data Committee (FGDC) and the OGC continue their decade-long projects to develop the complementary standards that are necessary for consolidating and improving utilization of the masses of geospatial data collected by departments and agencies across the federal government and by state and local governments. We are lost to the degree that in practice, policy makers have overlooked the importance of the OGC's interoperability standards effort and have not accepted and done what is necessary to reap the benefits of either the FGDC's or the OGC's work. A policy commitment to the development and deployment of both geospatial data content and geospatial interoperability standards is critical to a national strategy for geospatial information sharing.

There are two kinds of geospatial standards: data content standards and software interoperability standards.

To date, this Subcommittee's Geographic Information System (GIS) hearings and Geospatial One-Stop (GOS) itself have focused almost entirely on spatial data content standards. These standards involve the way that data is "written", that is, the way the data is collected and the way geographic features are represented. These standards help spatial data developers answer questions such as: How do you define a road in a digital database? How do you structure the data so it can be efficiently used with other systems? What is the common structure of the metadata, that is, the digital documents in which you describe and catalog the spatial datasets so one can search for and find data using automated methods? This is the kind of standards work the interagency FGDC does.

The OGC is the only organization that develops and promotes geoprocessing software interoperability standards. Interoperability involves different systems exchanging data and instructions in real time through open, consensus-defined interfaces. The OGC's geospatial software interoperability standards help software users and developers answer questions such as: How can my different Geographic Information Systems (GIS) and/or Computer-Aided Design (CAD) systems exchange geospatial data and geoprocessing instructions in real time? What open interfaces do I need to build a spatial data catalog, or "spatial search engine", that works as well as, or better than, Google and Yahoo work with text data? These software interface and encoding standards are called OpenGIS® Specifications. OpenGIS Specifications are free and publicly available software engineering specifications similar to those that underlie the Web. The OGC does the same kind of work the World Wide Web Consortium does, but our efforts are focused on

complex and diverse geospatial technologies. The OGC creates the spatial dimension of the Web. The OGC's standards make it possible for spatial information of all kinds to be easily communicated over the Web.

In the past, GISs and systems for earth imaging, location based services, navigation, surveying and mapping, facilities management, digital cartography and spatial databases were integrated into government solutions using proprietary interfaces. Integrators had few choices. But in today's interconnected, plug and play world, no new government software should ever depend on proprietary interfaces where similar open interfaces are available. And legacy systems should be upgraded with open interfaces so they can be part of larger networks. As DISA's chief technology officer, Dawn Meyerriecks, says, "We want to have standards applied to all important interfaces.... Being vendor-independent, vendor-neutral helps us protect our equity."

The FGDC and the OGC have complementary missions. The most visionary leaders in the FGDC have understood that the OGC's standards, implemented now in hundreds of products, are essential for the NSDI and for the enterprise architecture initiatives of organizations like DISA and the Dept. of Homeland Security. FGDC participates in the OGC at the highest level, as a Strategic Member. The OGC works closely with FGDC in those areas where data content standards and software interoperability standards must advance together to provide essential National Spatial Data Infrastructure capabilities, such as in catalogs. And both organizations have supported each other in their outreach and education activities.

Though FGDC's mission is important, perfection is impossible. Two road databases, for example, created by two different organizations with different missions and business objectives, will often not contain exactly the same kinds of details about roads. Some of the OGC's standards help people get around such data model mismatches by enabling automatic translation between data sets that use content models that are similar but not the same. The key standard involved here is the OGC's Geography Markup Language (GML), an XML encoding schema for spatial data. XML (eXtensible Markup Language) is a World Wide Web technology. Such translation is not perfect, but it enables people to make the best possible use of data that is not exactly what they would ideally like to have, data that would otherwise be unusable.

FGDC's Content Standard for Digital Geospatial Metadata is a standard schema for "data about data" that describe the content, quality, condition, and other characteristics of spatial data. Such a standard is essential in internet-based clearinghouses or catalogs that enable users – or automated services – to search for data sets that match certain criteria. The OGC's OpenGIS Catalog Services Specification defines software interfaces that enable construction of catalog services that respond to automated, network-based queries from any client application that structures its query to conform to the Catalog Services Specification. The OGC-defined services depend on data that conforms to the FGDC metadata content standard. This now-standard mechanism for automated search and discovery of spatial data is critically important for the NSDI. It is perhaps the single most important NSDI capability that requires both OGC and FGDC standards.

Other OGC standards address other interoperability problems that have little or nothing to do with data content standards or metadata. OpenGIS Specifications document industry consensus on how different vendors’ systems are to work together to provide capabilities like these:

- Perform coordinate transformation in such a way that all overlaying views of geodata (“maps”) from diverse sources automatically use the same spatial reference system.
- Provide uniform access by Web clients to maps rendered by diverse map servers on the Internet.
- Provide common ways for different raster-based systems to request and view satellite images, digital elevation models, and digital orthophotos and to request execution of certain kinds of analysis such as histogram calculation, image covariance and other statistical measurements.
- Enable companies in the Location Based Services value chain to “hook up” and provide seamless integration of their pieces of applications such as emergency response (E-911, for example), personal navigator, traffic information service, proximity service, location recall, mobile field service, travel directions, restaurant finder, corporate asset locator, concierge, routing, vector map portrayal and interaction, friend finder, and geography voice-graphics.
- Enable a client to instruct that a particular “view” be created of a geospatial feature collection, associating presentation rules (such as “black, 2 pixels wide”) with feature types (such as “secondary roads”).
- Enable one GIS to instruct another GIS to publish, store, access, and perform operations on features described using vector data elements such as points, lines and polygons.

OpenGIS Specifications are available for download free of charge at www.opengis.org.

The important concept for members of this Subcommittee is that the data content standards developed by FGDC, an interagency committee, and the interoperability standards developed by the OGC, a voluntary industry consensus standards organization, are the two essential parts of an effective GOS and an effective National Spatial Data Infrastructure (NSDI). Both are essential to the integration of spatial information in any public sector or private sector enterprise architecture. Both are useless unless they are deployed widely. The timing is very good – consensus has been reached on important elements in each organization’s standards portfolio. Both are increasingly being used.

The challenge is now “uptake” or deployment, as well as refinement of existing specifications, completion of specifications in the development pipeline, and refinement of compliance and interoperability testing to provide a solid foundation for open procurements that extricate agencies from expensive stovepipes. Government is in a very effective position to

accelerate the wide deployment of data content and interoperability standards, with extraordinary near-term and long-term benefits.

This Subcommittee can take actions that will enable industry and government to solve the challenges described in this and previous hearings, with little delay. Success will be easy to see and easy to measure. The risk is minimal: hundreds of commercial and open source products and applications now implement the OGC's OpenGIS Specification standards. The cost is minimal. In fact, government's cost for software is already going down due to the new standards. The rewards, in monetary terms, are savings that will be tallied in the billions of dollars per year nationally. These savings are due to reduced redundancy in data collection, improved data sharing, and the ability to buy "plug and play", "loosely-coupled" component solutions rather than full-featured, vertically integrated "tightly-coupled" solutions.

Other rewards include: increased use of spatial capabilities by a much larger number of people; growth in the domestic and export markets for spatial software and spatial data; increased employment in the spatial market sector; growth in the number, quality and value of spatial data products and services; and increased efficiencies and capabilities wherever interoperable spatial software and services are introduced in government, business and daily life.

The way forward requires leadership and new policy.

Leadership and policies to promote uptake of both kinds of standards are the only way out of the GIS stovepipes that waste time and money and introduce risk in so many critical functions at all levels of government. Our recommendations are as follows:

1. The FGDC and other federal agencies need to continue to participate in the OGC to ensure that unfinished standards – such as those involving security, sensor webs, geospatial data pricing and ordering, operations on geospatial data, and geospatial digital rights management – reflect the needs of the public and the requirements of the government agencies entrusted to serve the public interest. Many of the Federal Government's geospatial information goals would be attained sooner and at less expense if there were stronger agency participation and support at all levels in the OGC's open, collaborative industry process, including strategic goal setting, specification development, interoperability testing, and outreach and uptake. Membership is not enough. Active participation is needed.
2. The FGDC needs support from GAO and OMB in its dealings with other federal agencies. As the Spatial Technologies Industry Association (STIA) recommended in these hearings last year and is recommending again this year, this Subcommittee should work to strengthen the management structure for geospatial programs by establishing a dedicated position in the White House Office of Management and Budget's (OMB) Office of Electronic Government responsible for administering and coordinating national geospatial policies and programs. As the Chair of this Subcommittee pointed out last year, developing a unified game plan is generally not technology-driven, but rather

management and people-driven. That is certainly true, and this recommendation would give us the possibility of having a strong and fair coach who could come up with a unified, standards-focused game-plan and assure that the many players execute it well. He or she must be dedicated to, and perhaps accountable for, fair and open procurements.

3. The FGDC needs support from GAO and OMB in mandating data standards and interoperability standards whenever federal money pays for spatial data or spatial technology purchased by federal, state or local agencies. Note that every physical infrastructure project, every environmental program, and many other programs require spatial data. FGDC needs to develop, establish federally, and promote nationally best practices for the development and procurement of both spatial data and spatial systems. That is, FGDC needs to be able to mandate federally and to promote nationally both data content standards and software interoperability standards as the two-part solution to spatial data sharing problems.
4. Much as STIA recommended last year, this Subcommittee ought to ask the OMB to write a business plan that includes a new grant funding program, possibly modeled on many aspects of the Federal-aid Highway Program, to form consistent and equitable partnerships with state, regional, local, and tribal governments as well as the private sector to build and maintain a market-driven and sustainable National Spatial Data Infrastructure (NSDI) with standards-based data, applications and systems that accomplish high priority functions of government such as homeland security and e-government.

In conclusion:

On behalf of the OGC, I thank Chairman Putnam, Ranking Member Clay, and distinguished Members of the Subcommittee for the opportunity to speak here today and to submit testimony for the written record. I hope this testimony has made it clear what needs to be done to get back on track. The good news is that we are ready to begin harvesting the fruit of many years of difficult but productive consensus work. Government just needs to organize the harvest, while also attending to unfinished standards such as those for sensor webs, geospatial data pricing and ordering, geospatial digital rights management, and geospatial data security on the OGC side and cadastre, wetlands and other framework content standards on the FGDC side. The OGC looks forward to working with this Subcommittee and the Government's executive-branch agencies to ensure that our nation obtains the geospatial standards it needs and then benefits from them to the fullest extent possible.

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