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Title: **Geoprocessing Via Web Services**

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For readers of this magazine, the best technology news of the decade is "Web Services." This rapidly emerging paradigm for Web-based distributed computing is tailor-made for people and organizations that produce and use geospatial information. OGC's members are specifying the interoperability interfaces that enable software vendors to deliver geoprocessing services in the Internet's open, standards-based environment. This will – soon – make publishing, discovery, access, and use of geodata and geoprocessing resources much easier and less expensive than before.

Internet-based Geoprocessing Applications

Web Services make the Internet a platform for delivery of *services*, not just data. "Service" means software components that can be plugged together to build larger, more comprehensive services and/or applications. A service is a collection of operations accessible through an application program interface (API) that allows a user to run ("invoke") the service. A service might be a response to a simple request to create a map or it might be a complicated set of image processing operations running on several supercomputers. Examples of fundamental *geospatial services* are "get data" (vector or image), "portray data" (as a map), "locate a place" (e.g., a gazetteer or geocoder service), "transform coordinates", etc.

Web Services are self-contained, self-describing, modular applications that can be published, discovered, and invoked across the Web. Once a Web Service is deployed on a Web server and made discoverable in an online "registry" of services, other applications (including other Web Services) can "find" and "bind," that is, discover and invoke, the deployed service.

This scheme makes it unnecessary to have a software "package" that you buy on CD-ROM installation disks and install for use within the confines of your computer. (Though you could run such services from a CD that contains the framework and services!) It's a seemingly radical shift, and yet today when you use a search engine, you are using software that has found and indexed text resources on tens of thousands of servers. When you buy something online, you are using shopping cart software and credit card security software that is probably not located on the same server that showed you what you could buy.

Internet standards such as HTML and HTTP make search engines and other Internet services possible. OpenGIS® Specifications are the standards that make it possible for both browser-based ("thin") and desktop-deployed ("full-functioned") applications to draw on the resources of geoprocessing servers distributed across the Web.

Web Services Infrastructure Builders

Web Services applications are built upon an architecture, or software system design, that can be illustrated as a "stack" of processing layers. The software components in these layers are "loosely coupled" components that interact with one another via standard protocols or libraries of subroutines that have standard interfaces. At the core of the Web Services stack are the tried-and-true standards on which the Web is built today: TCP/IP, HTTP, HTML and XML.

In each layer of the Web Services stack, standards enable a Web Services client to speak to an Application Server, or Middleware component, such as Common Object Request Broker Architecture (CORBA), Java 2 Enterprise Edition (J2EE), or .NET. Clients must also have standard ways to discover what servers can do and how to communicate with them. Emerging Web Service technologies such as Web Service Description Language (WSDL), Universal Description, Discovery and Integration (UDDI), and ebXML will play increasingly important roles here.

Though it sounds complex, the Web Services revolution simplifies application development. The use of standard interfaces reduces complexity, reduces time to implementation, supports multi-vendor plug and play, and reduces product life cycle risk. It is also good for the market as it increases choice and reduces dependency on the more traditional single vendor, monolithic application approach.

OGC and our members have just completed the OGC Web Services Phase 1.1 Testbed (OWS-1.1), in which the workability of the OpenGIS framework and the underlying Web Services framework was proven. Geoprocessing components from commercial products played a key role.

Even though major IT companies like IBM, Microsoft, Sun, Oracle, and Hewlett-Packard promote competing Web Services framework implementations, many key standards are in place that allow these competing frameworks to interoperate. The IT industry is moving toward consensus on other key standards. Therefore, these companies' application server and middleware offerings can be proprietary, offering unique value of various kinds, and still work within the emerging overall interoperability framework. The chance of recurrence of a failure like OSI (a communications standard that lost out to TCP/IP) is slim, because the enterprise solutions revenue of the companies mentioned above depends on the existence of a global interoperability framework.

Despite the collapse of the speculator-inflated share value of many Internet companies, enterprises around the world continue to adopt Web-based information systems at a rapid pace. Stay tuned as Web Services and the use of OGC interfaces changes the way you access and use GIS technology!

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