How the OpenGIS Specification Will Impact Surveying and Mapping

An Open GIS Consortium (OGC) White Paper

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Digital data is convertible, copyable, storable, analyzable, mixable, visualizable and transmittable beyond our imaginations. Generating digital survey records from total stations was a baby step. Digitizing paper maps was a baby step. Such data products and the people who painstakingly created them will soon be thrust headlong into a much larger world characterized by the following four technical and market advances:

1. By the year 2000 there will be more than twenty commercial Earth imaging and remote sensing satellite companies, and many more distributors and value-added suppliers. Similar sensor systems on airborne platforms can provide more time-specific coverage and better resolution, in three dimensions. Sophisticated software tools are being used to enable digital images to be accurately and automatically orthorectified, adjusted so that the image coordinates of a feature map directly to the Earth coordinates of that feature. This increases the value of the images because they can be used in more situations with other kinds of geodata, including vector-based digital maps. Other software advances are making it easier to automatically extract features and create thematic maps, such as maps of railroad tracks, topographical maps, or temperature distribution maps. The precision of remote sensing is not equal to that of conventional surveying techniques, but it is improving, and it is already sufficient, and superior in cost and product, for many uses.

2. GPS units are shrinking in size and cost. They are available now in laptop computers and will within a few years be available in cell phones and other small personal communications and computing devices. Many commercial vehicles now use GPS as a primary navigation device. The precision of GPS is not equal to that of conventional surveying techniques, but it is improving, and it is already sufficient, and superior in cost and service, for many uses.

3. General purpose database software products from companies like Oracle, Microsoft, IBM, and Informix are being enhanced so that they efficiently store geographic information. Previously, spatial databases were special purpose systems, each proprietarily linked to a particular GIS. Now, complex geospatial information can be stored with other kinds of information. Likewise, information of any kind that is linked to spatially distributed phenomena can be spatially analyzed, shared with other systems that manage spatial information, and graphed and displayed as maps of various kinds. All of these companies are refining their database products for serving data and services to Web users.

4. The geospatial technical and market advances listed above are happening in parallel with a revolution in data communications and distributed computing. Mobile computers, embedded in

vehicle control panels (and before long in "information appliances" such as binoculars, pilot's goggles, cameras, and compass units), will know where they are and connect wirelessly to the Internet and thus have access to and contribute to geodata and geoprocessing software resources on servers around the world.

Interoperability among network-resident geodata and geoprocessing resources is a key requirement if geographic information is to benefit from advances 3 and 4. *Geodata* interoperability depends on geodata-producing organizations learning to coordinate on data content standards and metadata standards. That is not the business of the OpenGIS Consortium, Inc. (OGC), except that OGC will provide standard ways for software to manage metadata, semantics, etc. OGC's business is *geoprocessing* interoperability, that is, helping geoprocessing software vendors reach consensus on software interfaces that enable their systems to communicate with each other. OGC brings together representatives from about 150 key geoprocessing technology providers, technology users (federal agencies and telcos, for example), geodata providers, and academics in bimonthly Technical Committee and Management Committee meetings. The work being done in OGC will enable the full integration of geospatial data and geoprocessing resources into mainstream computing and the widespread use of interoperable, commercial geoprocessing software throughout the global information infrastructure.

By specifying open interfaces which comprise a single geoprocessing "lingua franca," OGC's OpenGIS Specification largely eliminates the need for data exchange format standards and costly batch data conversion. The open interface approach enables geoprocessing to become an integral part of the new distributed computing paradigm in which applets, middleware, components, e-commerce tools, and object request brokers give any networked computing device real-time access to a huge universe of data and processing resources. Where is the 411 directory service provider? You don't care. Likewise, data source, coordinate transformation, conflation, proximity analysis, etc. will happen, but the user who wants a bit of geographic information won't care where or how.

Where does that leave the surveyor and mapmaker? Old money-making tasks will fall away and new ones will arise. It's an unstable situation which will reward those who can help their clients by combining an understanding of property records and laws, dig-safe, civil engineering, planning, environmental management, farming, forestry, etc. with a practical understanding of emerging geoinformation products, services, and technologies.