FirstImpressions

MapFusion
for GIS Interoperability

Michael Goodchild

T he good thing about standards is that there are so many to choose between." This quote, originally attributed to Andrew S. Tanenbaum, a professor of computer science at Vrije Universiteit in Amsterdam, The Netherlands, has become a common quip of IT and GIS professionals. As the GIS industry has evolved, it seems that the number of data formats has increased exponentially. The Federal Government's Spatial Data Transfer Standard (Federal Information Processing Standard 173 and now American National Standards Institute National Committee tor Information Technology Standards 320-1998; see http://mcmcweb.er.usgs.gov/sdts/) was intended to become the lingua franca of geospatial data sharing among federal agencies, but instead has become just one more data format that agencies try to support.

GIS vendors provide input and output conversions for many of the most common formats, but no vendor comes close to supporting all possible conversions. The Open GIS Consortium (www.opengis.org) has made great progress in the development of common specifications, but faces a legacy of innumerable existing formats, some of them proprietary. Clearly, we have a long way to go to achieve the goal of full GIS interoperability so that software developers

This column reviews and evaluates geospatial software and data.

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MapFusion from Global Geomatics (www.globalgeo.com) comprises a suite of products designed to enable GIS interoperability by relying on a peer-to-peer computing model. The products include MapFusion Workstation, MapFusion Server, and MapFusion extensions for several desktop GISs including ESRI's (www.esri.com) ArcView 3.x and MapInfo's (www.mapinfo.com) MapInfo Professional. MapFusion Server runs under Sun Solaris, Linux. or Microsoft (www.microsoft.com) Windows 98, ME, NT 4.0, and 2000. MapFusion Workstation requires Windows 95, 98, ME, NT 4.0, or 2000. I tested MapFusion on a Dell (www.dell.com) Dimension XPSR450 with 130-MB RAM, a 12-GB hard drive, CD-ROM, and Microsoft (www.microsoft.com) Windows NT 4.0.

don't have to pay a price to support conversions, and users won't have to deal with unnecessary complexity.

MapFusion from Global Geomatics bravely tackles the interoperability problem in a novel and powerful way, using a model of peer-to-peer computing that has strong resemblance to Napster's (www.napster.com) approach to sharing music. "Net Results" Columnist Jonathan W. Lowe gave an overview of MapFusion in the February issue of *Geospatial Solutions*. Now, in this review, I report on my experiences working with the MapFusion version 1.0b workstation product.

A need to fuse maps

GIS users often need to make, analyze, or create and edit maps and datasets using several data formats and GIS software products. However, it is either undesirable, too costly, too time-consuming, or impossible for users, data providers, and software companies to convert to common standards. Thus, the goal of the geospatial community is to instead use the power of information technology to overcome the lack of interoperability while avoiding the need for permanent data conversion and preventing format problems when importing data from outside the

community. MapFusion, which comprises several products — MapFusion Workstation, MapFusion Server, and MapFusion extensions for different GIS desktop software — is designed to support a community of GIS users in exactly this way. Figure 1 provides a schematic of the MapFusion components and how they interact.

MapFusion Workstation can be run on an isolated workstation, and in this mode, it gives the user the ability to identify and use GIS datasets located on the workstation's own drives. The software includes a set of adapters that recognize common GIS formats and allow the user to access them transparently. No permanent conversions of format or projection are involved; instead, the datasets are read in native formats and projections. MapFusion Workstation includes a basic set of mapping functions that allow the user to superimpose and symbolize datasets.

Because MapFusion Workstation is primarily oriented to map display, full GIS capabilities are available only by adding the second product — a MapFusion extension to your favorite GIS. For example, by adding MapFusion's extension to ArcView 3.x or MapInfo Professional, it is possible to use the full range of ArcView analysis and manipulation capabilities on any

dataset recognized by a MapFusion adapter. This approach can bring a standard GIS much closer to the goal of full interoperability.

The third product in the suite, MapFusion Server, allows the basic MapFusion concept to be extended to a user community connected by a network. Each user can publish a dataset by making it sharable, just as Napster allowed users to mark music files on their own hard drives as sharable. With MapFusion Server, searches initiated by a MapFusion Workstation connected to the network can scan all of the hard drives in the community, allowing the user to access any discovered datasets as if they were already local. MapFusion Server can also facilitate access to data resources on the Internet outside the community, and it can prepare and serve maps to users of simple thin-client Web browsers.
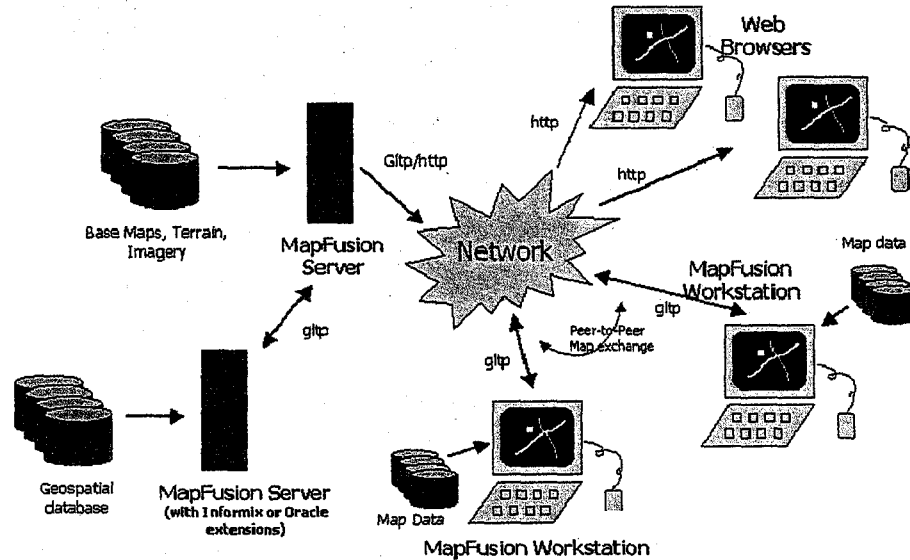
Interoperable operation
I tested MapFusion Workstation on my two-year-old desktop system, with 130-MB RAM and running Windows NT 4.0. I had no problems finding and opening the vendor's sample datasets, or several other datasets that happened to be lying around on my system. Figure 2 shows the results of MapFusion searching my desktop's hard drive and finding 161 datasets in various recognizable formats ranging from GeoTIFF images to ESRI shape-files to the National Imagery and Mapping Agency's VPF and DTED formats.

MapFusion's map display capability also worked well. In Figure 3 (on page 51), I've used MapFusion to make a map by combining two vector datasets (vegetation and water) with part of a DEM (digital elevation model) and defining appropriate symbolization. Importantly, MapFusion Workstation sets its display parameters from the first dataset, so if I had identified the DEM as the first dataset rather than the third, the map would have been clipped to a narrower bounding box.
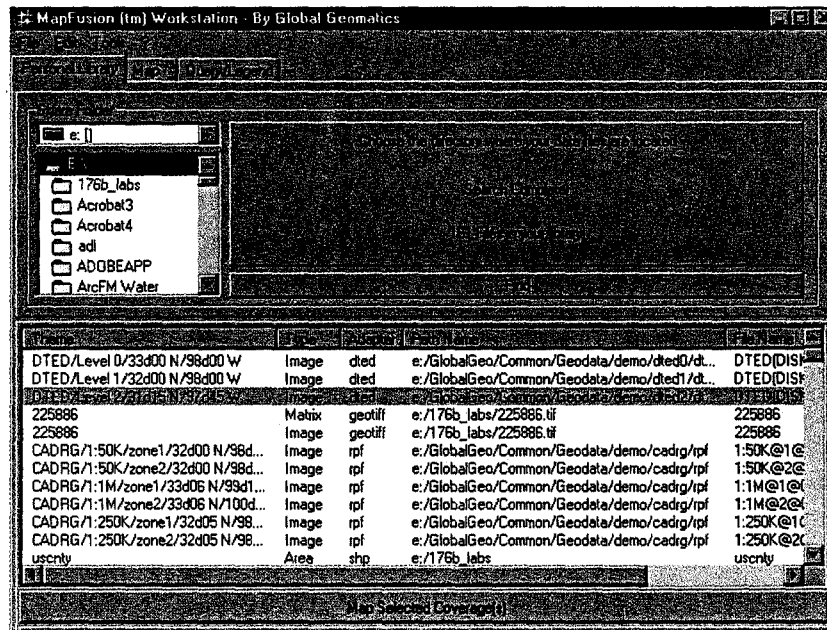

FIGURE 1 MapFusion comprises a suite of products designed to support a networked community of GIS users. This schematic shows the relationship between the different products, databases, servers, and clients.

FIGURE 2 To test MapFusion Workstation, I used the product to search my desktop computer's hard drive for spatial data. It returned 161 datasets in various formats and folders.

In general, the MapFusion concept is very powerful, but not surprisingly, the current version has some limitations in practice.

Coordinates. For now, datasets with latitude/longitude coordinates are most easily recognized. The search of my hard drive, however, found most of the datasets containing latitude/longitude coordinates, but not all. A latitude/longitude shapefile that was in the same folder as a shapefile in State Plane coordinates was missed. When I moved the file to its own folder, MapFusion found it.

Users can specify preferences for how MapFusion handles coordinate systems, but the coordinate system needs to be sufficiently described in a

dataset's metadata for the MapFusion adapter to figure it out. If a dataset's metadata don't specify the coordinate system (as can happen with ESRI shapefiles), Global Geomatics' documentation describes a workaround. The workaround, though, limits users to displaying maps in the "unprojected" projection, otherwise known as the Plate Carrée or the Cylindrical Equidistant. Global Geomatics has indicated that a new version of Map-Fusion, scheduled for release as this article goes to print, will provide greater projection and datum support.

Symbols. Another feature promised in future MapFusion versions will allow users to preview map symbols. A range of symbols and shading styles is available in the current version as CGM files, but it's impossible to preview them in MapFusion Workstation prior to creating a map.

MapFusion Workstation's mapping capabilities, which are geared for datasets that separate feature classes into separate layers, also use fairly limited ranges of symbolization. This is the result of MapFusion's military roots. The product is built on the Open Geospatial Datastore Interface, an object library initially developed by Global Geomatics for the Canadian Department of Defence and one of the engines behind GlobeXplorer's (www.globexplorer.com) imagery server.

MapFusion Workstation's symbolization works well for topographic maps that need to show every tower in a tower layer as a constant symbol, but not for thematic maps that need graduated circle symbols, complex line styles, or a full range of color fills. Users who need the symbolization capabilities of such GIS packages as MapInfo Professional or ArcView 3.x would be better served by acquiring MapFusion's extensions to those products, rather than trying to make complex maps using the current version of MapFusion Workstation. The same goes for users who need analysis functions in addition to simple map-
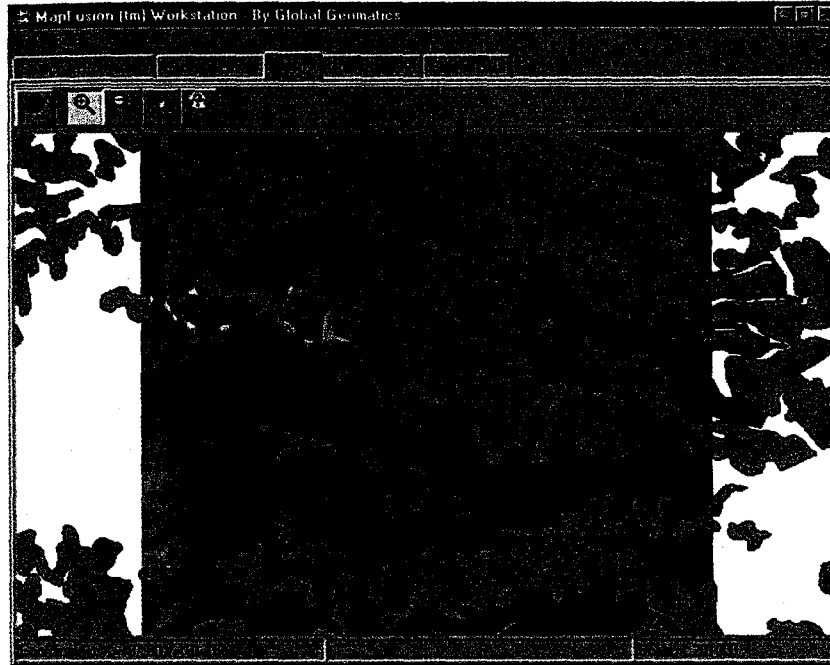

FIGURE 3 MapFusion Workstation includes a map display feature. This view shows the results of merging two vector datasets (vegetation and water) with part of a DEM. The product bases its display parameters on the first dataset, so if the DEM was the first dataset loaded, the map would have been clipped to a narrower bounding box.

ping, or for those who want to perform simple numerical operations on attributes before creating thematic maps (for example, computing one attribute as a percentage of another).

Formats. A final limitation of Map-Fusion hinges on formats. Though the product supports an impressive number of formats — about 80, according to the company's Web site — some of the more recent formats, such as ESRI's Geodatabase, are currently not accessible. In principle, the major limitation on the ability of MapFusion to open any dataset is the existence of metadata. Provided the dataset contains a bounding box, projection information, and definitions of attributes it should be possible for an adapter to be built. Thus, the list of MapFusion's supported formats will surely expand.

Making a big dent
Global Geomatics is making a bold entry into the general GIS market, with a set of products that should be of immediate benefit to many types of organizations. So much time is currently spent overcoming the lack of interoperability in GIS that any product that offers to put a significant dent in the interoperability problem is almost certain to be a winner, and MapFusion offers obvious advantages to organizations that must deal with heterogeneous datasets and GIS software on a regular basis. Some minor enhancements in upcoming versions should remove most of the current limitations. ⊕

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