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AN EVOLUTION FROM GEOSPATIAL TECHNOLOGY TO USEFUL GLOBAL SOLUTIONS

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All the technology in the world is of no use if it doesn't solve problems.

The occurrence of a national emergency, resulting from a cyclone, flood, tsunami, major fire, or earthquake is unfortunate. However, it is apparent that some damage from these sorts of events can be avoided and fewer people are likely to die, if a plan is quickly developed and implemented to address the catastrophe. Subsequent decision/support efforts when lives are at risk and seconds count, are aided by fast communications and the availability of accurate and up-to-date spatial and situational information. For example, it is now possible for all participants in rescue/recovery operations to know their location at all times through the use of satellite positioning. With modern communications technology, it is possible for the same location information to be readily available to all agencies coordinating and managing specific aspects of recovery efforts. The addition of current geospatial information, possibly including georeferenced, high-resolution digital imagery products, makes the local situation meaningful to the command-and-control center decision makers, who are commonly physically separated from the field operations.

It is apparent that geospatial data constitutes much of the information required for physical disaster planning, management and recovery work. Given that natural and man-caused disasters will continue to occur, a major issue is the ability of various users to share and access necessary information. Previously, digital geographic information was shared by sending large data files that had to be converted or translated if the data-sharing partners didn't have the same software brand. Now interfaces, based on OpenGIS Specifications created by the Open GIS Consortium, allow Internet data servers to be queried remotely by other vendors' clients, and subsequently extract only the query-specific information from those large data files.

Vendors no longer need to worry about standardizing data formats or updating data conversion routines when other vendors change formats. Users do not need to be held captive to proprietary formats and proprietary GIS systems because data servers can access and manipulate data in its native format. Legacy data no longer requires migration, translation, and conversion. The power of open architecture allows the user to bypass these functions. Sophisticated n-tier architecture allows organizations to provide a variety of data and access to groups across the enterprise, via an intranet, or the Internet. The result is live connections to real-time information - the heartbeat of any successful enterprise.

Clearly, it is time to stop thinking about platform, data format, and data type compatibility and instead to think about how to *integrate* legacy data with geoprocessing and geoengineering software to solve problems in specific applications.

Effective geospatial data sharing requires OpenGIS-conformant interfaces, but also requires coordination in naming and describing geographic features as well as consistent structuring of geographic metadata. For example, in the United States, the Federal Geographic Data Committee (FGDC) has been established as the center of federal coordination and standardization efforts, and the National Spatial Data Council (NSDC) is chartered to anchor national efforts.

Through maturing of Open Systems and coordination of local, regional and national spatial data infrastructures, the Internet and intranets will be populated with thousands of interoperable geodata sources. Soon, information concerning a particular region or theme will be indexed by spatial catalogs in a manner similar to the way text information is indexed by World Wide Web search engines. Little expertise will be required to quickly gather and overlay spatial data from diverse sources and merge them into the multi-agency, multi-contractor work flows that increasingly typify public - and private - sector projects. Internet commerce schemes, in which servers dispense data to users at rupees per access or kilobyte, will figure prominently in the GIS market as well as in the business models of government agencies. Thus, it can be seen that the combined efforts of vendors of GIS, desktop mapping, automated mapping/facilities management, Earth imaging, and data bases are causing significant progress towards interoperability.

Interoperability refers to the ability for software components to integrate even when modules are written by different software organizations or vendors. Over the past decade, several technologies have emerged which provide the infrastructure to enable interoperability; the Component Object Model (COM),

the Common Object Request Broker Architecture (CORBA) and Java technology are the most notable. Each of these technologies provides a certain degree of interoperability on its own, however, the goal of complete interoperability across platforms remains elusive.

Recently, Extensible Markup Language (XML) has emerged as the standard for the exchange of data between heterogeneous systems, primarily because of its simplicity, which allows users to design ways of describing information, usually for storage, transmission or processing by a program. As a text-based system to encode data, it is completely platform independent. Whenever an application receives an XML file, it also gets descriptions about how the data is structured. That way, a program can more easily determine how to process the data. This characteristic makes it especially suitable for use in the World Wide Web, where cooperation is required between large arrays of dissimilar software components.

The Open GIS Consortium is adopting XML as the means to communicate geographic information within heterogeneous data bases and software programs. It is well known that XML can be configured by nesting data elements to create a hierarchical data structure. Such a set of tags and nest structures provides a simple structure for communicating geospatial features on the Web and is known as Geographic Markup Language (GML). GML works to provide standardization to GIS and mapping users. It is critical for successful deployment of a variety of emerging markets, such as mobile location-based services.

Radical transitions occurring in geoprocessing technologies require strategic re-evaluation by both producers and users of geospatial data and technologies. Product transition toward interoperability and open architecture primarily is being driven by vendors of geoprocessing and database software. These vendors now offer products that work across the Internet by employing OpenGIS conformant interfaces. This enables their systems to communicate with others and share geospatial information in emerging Internet commerce environments. The power of the World Wide Web and wireless communication are essential technologies in making these geospatial information universally available.

With its GeoMedia technology, Intergraph succeeded in engineering a new generation of geospatial solutions, removing the barriers to data interoperability and integration. This was possible because the GeoMedia family of products initially was conceived as a universal data integrator and it is very closely parallels the prototype OpenGIS model for geodata access. This was done by intention, not by accident; the implementation model for

GeoMedia data access is an open architecture based upon OLE/COM concepts. Recently, in order to take advantage of the fast-developing OGIS-XML standards, a Geographic Data Objects (GDO) data Server for OGIS-GML was developed for GeoMedia. GDO is an open standard that data providers can use to expose data to GeoMedia clients. Data connectivity is tied to the existence of GDO data servers (data providers). This has proven to be extremely useful for maximizing data integration in organizations using disparate GIS systems while reducing or eliminating costly and time-consuming data translation.

To take advantage of the fast-developing OGC GML/XML standards, a GDO data server for the Web Map Server (WMS), Web Feature Server (WFS), and GML specifications was quickly implemented with GeoMedia's easily extensible architecture. Because the GML data server is implemented in the same way as every other GDO data server, GeoMedia users can access and manipulate WMS and WFS-enabled spatial data warehouses over the Web in exactly the same manner as other warehouse data resident on a local- or wide-area network.

The evolution of the enterprise database, with live connections to data enterprise-wide, has given implementing organizations the ability to capture and maintain data, view and analyze it on the Web, and use and apply it. Now, people don't have to go to the data - the data comes to them. For the enterprise, benefits of these developments are lower cost of ownership and deployment, steady progress from point to department to enterprise solutions, and creation of applications for non-GIS users. Other values to be gained are protection of investments in legacy systems, new choices in an open environment, integration into IT, and optimal return on enterprise GIS investments.

To have meaning, technological capabilities must meet human needs - understanding causes of drought and famine, predicting the spread of disease, tracking storms at sea, and allowing us to respond to natural catastrophes such as recently occurred around the world.

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PREETHA PULUSANI - During her 20-year career with Intergraph, Pulusani has been responsible for different aspects of the business, such as development, marketing, product planning, and product management - all in the geospatial field. As executive vice president of the Intergraph Mapping and GIS Solutions division (IMGS), the flagship product suites under her supervision are GeoMedia® and MGE. IMGS develops, markets, and supports core geospatial products that address a wide range of market

segments and is focused on worldwide delivery of end-to-end geospatial solutions and services at all levels of government and industry worldwide. The operations of Intergraph India at Hyderabad also are under her portfolio. Pulusani holds degrees in accounting and computer science.

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