

The Power to Learn

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Abstract. GeoMedia - Intergraph's leading-edge GIS family of products – is a popular classroom tool throughout the world. Distinguished users are expressing their enthusiasm for GeoMedia's contributions to the GIS environment. GeoMedia, the first truly open GIS system, combines power tools such as: seamless data integration with all major GIS vendor formats; a complete set of spatial analysis tools; map layout with award-winning technology and an open development platform for creating custom applications. This paper analyzes Intergraph's GeoMedia, looking at the technology itself and GeoMedia's architecture. Dealing with the fact that GIS applications are moving to the web and the importance of OPEN GIS. Investigating the implementation of GIS and Intergraph in the educational market.

1. Intergraph profile

Intergraph Corporation, a pioneer of high-performance visual computing technology, founded in 1969, is a worldwide provider of technical solutions, systems integration, and services. We offer a full range of software, consulting, services, and hardware for the open Microsoft Windows NT computing environment to technical, creative, and information technology professionals.

Intergraph operates in 65 countries throughout the Americas, Europe, Asia-Pacific, and the Middle East. The company's corporate headquarters and research and development facilities are located in Huntsville, Alabama. Intergraph currently employs approximately 6,000 professionals worldwide. In addition to a direct sales force, we also rely on our business partners around the world to promote and sell Intergraph products.

2. GeoMedia

Intergraph was the first company to develop a professional GIS platform based on the Windows NT operating system and the Intel Architecture, thus providing high-performance users with greater computing power at a much lower cost. By delivering our industry solutions on Windows NT, we enable professionals to work on the hardware platform of their choice, combining Intergraph GIS solutions with their favorite business and productivity software tools.

Intergraph Mapping/GIS, the leader in GIS worldwide with 38% market revenue share in 1999, develops, markets, and supports our GeoMedia products that address a wide range of

geospatial processes, including land management, road and rail transportation, water and wastewater infrastructure management, real estate, retailing, and agriculture, to name a few.

GeoMedia is a major brand portfolio within Intergraph's range of products. GeoMedia introduced the first truly open GIS environment, enabling organizations to combine datasets from multiple sources to form enterprise solutions for spatial data access and analysis. GeoMedia, an information integrator, serves as a visualization and analysis tool and as a platform for custom GIS solutions. GeoMedia gives access to the leading GIS formats, to view and analyze multiple data sources simultaneously, all in one environment.

With GeoMedia, Intergraph succeeded in engineering a brand new generation of GIS solutions from the ground up, removing the barriers to data interoperability and integration. Proprietary data formats are not a problem for GeoMedia.

Our approach followed from the observation that often each department in an organization controls and maintains its own data and stores it on separate physical drives across the network. And each department uses its datasets in different map projections. GeoMedia products integrate disparate data across platforms, convert map projections into one common projection on the fly, and perform analysis of these different datasets in relation to one another, no matter where the data resides. It can deliver real-time information over the web – across the enterprise or around the world. GeoMedia's data server is designed to allow live data access to any native geographic data, independent of storage format.

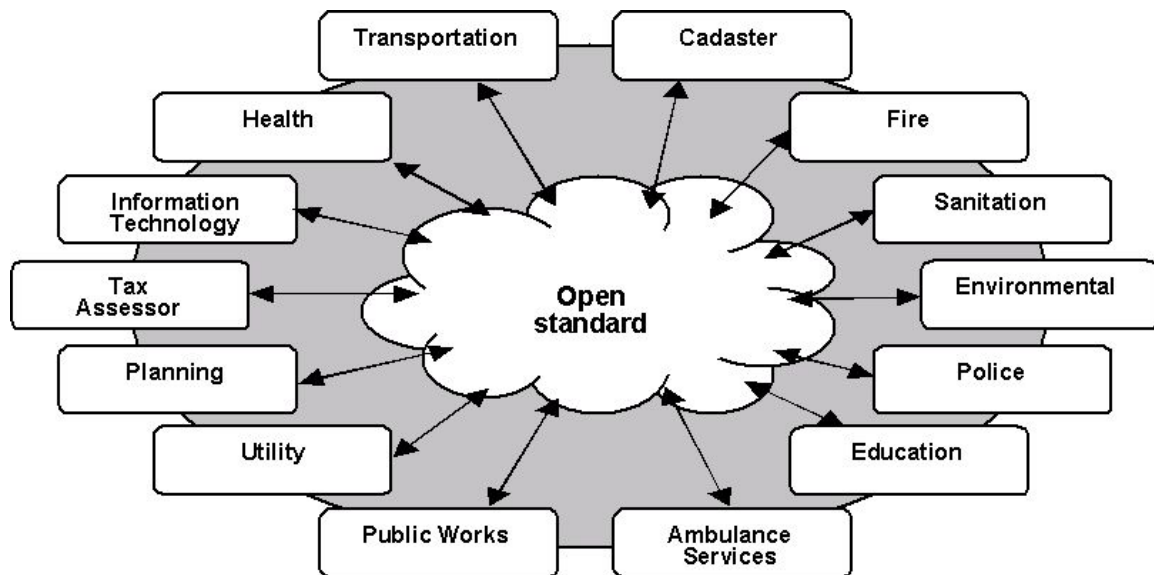


Figure 1 - Open standard Data Integration

GeoMedia's data servers provides live connections to data formats from the leading GIS products, including:

- MGE
- FRAMME
- MGE Segment Manager
- MapInfo®
- AutoCAD®
- Oracle® SC Relational
- MicroStation® CAD
- ARC/INFO
- ArcView Shape files
- Microsoft SQL Server
- MS Access
- Oracle8i™ Spatial
- ODBC

GeoMedia supports Oracle, including Oracle8i Spatial, as geospatial warehouse, to use standard relational database management tools to efficiently store, access, manage, and manipulate geographic information the same way as using non-spatial business data.

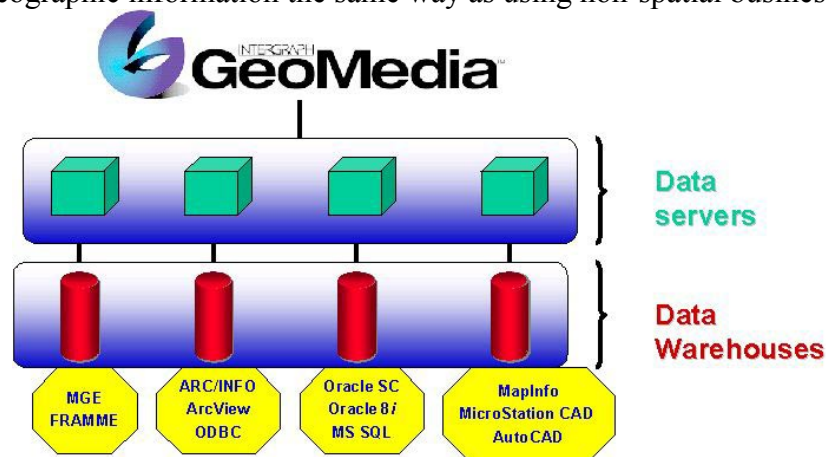


Figure 2 - GeoMedia's Architecture

Unlike many other desktop mapping applications, GeoMedia does not require a proprietary development language to change the user interface or develop specialized functionality. GeoMedia is compatible with standard Windows development tools. GeoMedia can be customized using OLE automation tools – such as Powersoft's Powerbuilder, Microsoft Excel (with VBA), Visual Basic®, and Visual C++® - for fast application prototyping.

GeoMedia's graphical user interface is easily customized to corporate standards to maintain departmental consistency by storing scripts, styles, projections, and other resources throughout the organization. You can simply drag and drop to quickly tailor GeoMedia to

your specifications, customizing toolbars, menus, and shortcuts the same way you tailor your Windows applications. Even non-technical users can customize the user interface.

3. GIS applications move to the web

Intergraph's focus is on providing technical software, systems integration, and a variety of services to industries in which Intergraph is a leading vendor. These include local and federal government, transportation, process plant design, mapping/GIS, utilities, communications, and public safety. In all of these industries, we have open, industry-standard products that enable our customers to acquire, share, and re-use design and mapping data over the Internet. In this new age of collaboration made possible by the Internet, Intergraph's products bring an unparalleled level of support to large, complex projects where sharing data among teams is critical.

GIS applications have traditionally been Client-Server based. These applications reside on the client machine and provide services to communicate with local and/or remote databases. As such, they are called desktop applications. In desktop applications, the dividing line between client and server can sometimes be blurred.

As GIS applications move to the Web, the Client-Server model progresses to the Consumer – Application Server – Database Provider model, a 3-tiered model. In the new model the task of GIS data processing is shared between the application server and database server while the application server generates the maps. Current and new technologies can further distribute the GIS processing load between the Consumer and the Application Server. The average computing power of desktops that are used for net surfing is also constantly increasing.

Keeping these changes in mind, it is essential to create interfaces that can be downloaded in their entirety on initial session startup. Then, processing on the application server can focus on the analysis of GIS data. By delegating all GUI control and any pre-processing to the client, and delegating database processing to the database server, the application server becomes a powerful GIS analysis engine.

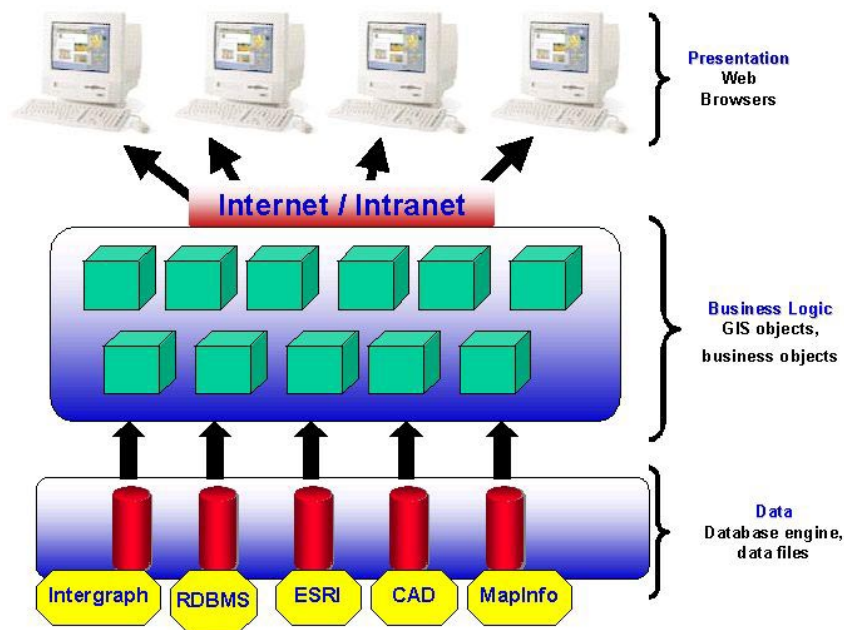
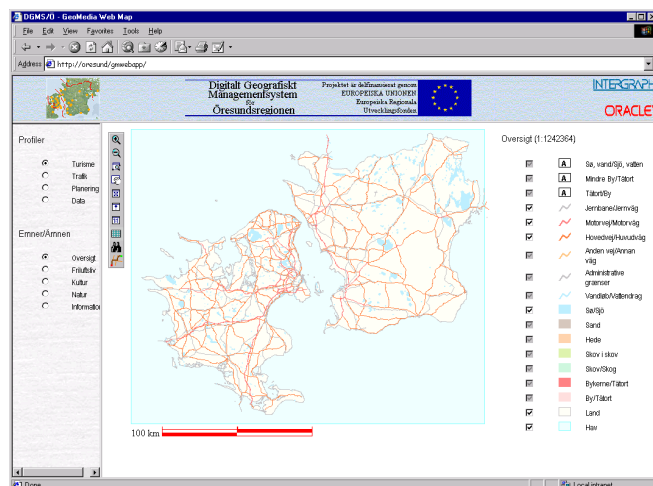


Figure 3 - N-tier Architecture

In May 1999 Intergraph has introduced GeoMedia Web Map 3.0 and GeoMedia Web Enterprise 3.0, which already leverages the benefits of current web technology. GeoMedia Web Map resides on the application server and generates vector-based maps for the consumer. The consumer, a truly thin client, only requires a web browser to view intelligent maps. GeoMedia Web Enterprise extends the functionality provided by GeoMedia Web Map and allows the application server to perform spatial analysis. The combined power of GeoMedia Web Map and GeoMedia Enterprise can create smart and powerful applications.

GeoMedia Web Enterprise is a collection of GeoMedia objects, which allow spatial analysis of Geographic Information systems (GIS) data on the GeoMedia Web Map server. GeoMedia Web Map is a prerequisite for GeoMedia Web Enterprise. Hence GeoMedia Web Enterprise objects reside on the GeoMedia Web Map server. These objects work in conjunction with the GeoMedia Web Map Server and help to create intelligent vector maps.



Intergraph managed to master the GIS challenge of the Digital Geographic Management System to enhance the coexistence in the Öresundregion by providing a common Internet based geographical information system for the entire region. This was achieved by making use of Intergraph's GeoMedia WebMap and GeoMedia Web Enterprise, using an Oracle Spatial database as database.

The end-users (consumers) communicate with the GeoMedia Web Map server using standard web browsers such as Microsoft Internet Explorer and Netscape Navigator and/or thin client. This configuration uses very thin clients and provides the infrastructure for creating 3 tier and distributed applications.

4. OGC & Intergraph

The Open GIS Consortium, Inc. (OGC) is a not-for-profit membership organization founded in 1994 to address the lack of interoperability among systems that process georeferenced data, and between these systems and mainstream computing systems.

Intergraph Corporation is one of the principal members of OGC and is a major supporter and promoter of the OpenGIS process. The company's GeoMedia architecture and technology, by design, closely mirrors the architectural concepts for open geodata and geoprocessing, as promoted by the OGC. Intergraph actively participates and helps direct the geospatial interoperability specifications the OGC membership develops.

We are especially excited by the recent adoption of the Web Map Server Interfaces as an official OGC specification. The Web Server Specification directly meshes with our belief in open, interoperable sharing of geospatial data. The specification does not contradict or minimize the existing GeoMedia Web Map architecture. Instead, by adding the Web Map Server capability into GeoMedia Web Map, we can significantly enhance an already powerful offering. Intergraph participated in the Web Mapping Tested demonstration last September and we are committed to the release of Web Map Server conformant software later this year.

We are also watching and working with the other specifications that are "falling out" of the Web Mapping initiative. A key specification, which has just been adopted as an OGC recommendation paper, is the Geography Markup Language, or GML. GML implements OGC simple feature geometry within the XML framework. XML is rapidly becoming the lingua franca for the Internet. By providing several schemas for geometry, GML provides a common, well-modeled platform that will allow disparate, multi-vendor applications to effectively communicate geospatial content over the Web. Further, GML allows the provider to define coordinate systems and attribution, effective also for communicating context along with content.

From an Intergraph perspective this is a powerful capability, one that fits directly with our existing Web Map architecture. We will develop a GML data server in the near future. This server will allow GeoMedia clients to read a GML stream from any GML conformant server. It will also allow GeoMedia to service a GML stream of spatial data to any GML conformant client or server and allow any GML stream of spatial data to be stored in a GeoMedia warehouse. This is true openness and complete data interoperability - a vision that Intergraph has embraced and promoted for years.

As Intergraph strives to deliver superior technology, top quality, and the industry's best price/performance, it is very important for Intergraph to support the OpenGIS process. For 30 years, Intergraph has built partnerships with our customers by providing the most comprehensive product line, award-winning support and outstanding services for the life cycle of a project. We're proud to say leading analysts continue to rank us as the No. 1 total solution provider to the AEC and GIS markets.

Since GIS is based on a rapidly evolving technology it is very important for Intergraph to share knowledge with colleagues around the world. Sharing ideas, knowledge and information to review technology trends, an analysis of the business issues related to these trends, exploring the possible impacts on GIS in general, but also on GI education. Therefore Intergraph is keen on having good relationships with geoinformatics departments and research laboratories. It is Intergraph's objective to train students, post-graduate students and junior researchers to use GIS technologies, like GeoMedia.

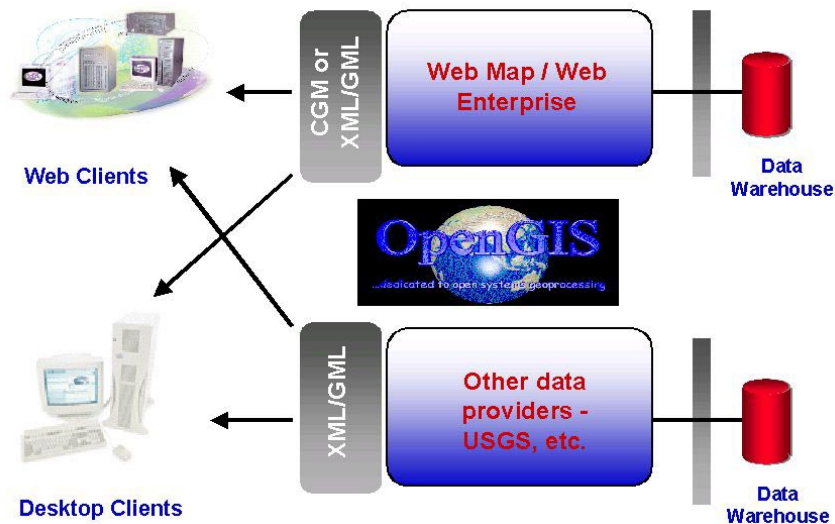


Figure 4 - GML and GeoMedia Web Map

Intergraph's GeoMedia is well suited for those organizations that are primarily focused on education & research. We can provide technologies that allows students to investigate the emerging issues of interoperability between multiple GI datasets; integration of the 'G' component into mainstream 'IS' applications via standard OLE automation tools; and the creation of Spatial Information Infrastructures using state-of-the-art web based technologies.

5. The Power to Learn

For a number of reasons, the opportunities for GIS education are now experiencing explosive growth. Intergraph looked at the implementation of GIS and of Intergraph in the educational

market, because we wanted to give students, teachers and researchers the opportunity to work with our leading-edge technology. After a throughout marketing research on the front end, by speaking with teachers, students and researchers we found out that they wanted a technology challenge. This research resulted in Intergraph's free GeoMedia Starter Kit, and its theme "The Power to Learn".

It is a worldwide program that offers tools to explore the physical, natural, and social sciences; investigate characteristics and locations related to historical or literary topics; and even present mathematical and engineering problems visually with tables and charts. Education professionals can bring geographic data, content information, multimedia, and popular office automation products together on one desktop.

Intergraph's free GIS Starter Kit now provides students, teachers and researchers the opportunity to explore new frontiers in technology with GeoMedia, the easy-to-learn, Microsoft Windows®, based GIS Solution. Intergraph's GIS Starter kit combines smart tools, allowing users to work with our leading-edge technology. The kit includes the following components:

- GeoMedia
- Learning GeoMedia Workbook for Schools
- GeoData for Schools CD-ROM
- GeoData for Schools User's Guide
- Technical Product Support for Schools

Next to the free GIS Starter Kit Intergraph offers many other Educational licenses (e.g. Internet Research License), for more information about Intergraph's Program for Schools, visit the following web site: <http://www.intergraph.com/schools/>. For more information about Intergraph's GeoMedia product family, link to: <http://www.intergraph.com/gis/products.asp>

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