

Geospatial Information Management with Autodesk MapGuide and Oracle9i

Introduction

This paper presents the value and benefits of the integrated Autodesk MapGuide®/Oracle9i™ Spatial Information Management Solution, which enables large organizations to easily integrate, analyze, and distribute large volumes of spatial and tabular data across the enterprise.

Since its inception, geospatial information management technology has promised great benefits for utilities, government agencies, and communication companies. AM/FM/GIS (automated mapping/facility management/ geographic information systems) technology is designed to help corporations manage their existing assets and facilities, optimize sales and marketing performance, and plan for future building and growth. Which are substantial benefits in an increasingly competitive business environment that has seen workflows streamlined and budgets slashed.

Harnessing the power of AM/FM/GIS, however, has not always been a winning proposition. For organizations to realize its benefits they had to overcome certain difficulties, many of which persisted to some degree throughout the 1980s and 1990s.

These difficulties include

- **Uncertain Return on Investment:** Many of the early versions of AM/FM/GIS solutions required significant investments in new technology, including hardware, software, services (project management, system design programming, and conversion), and training. Return on the investment was often questioned as one potential investors asked, “How do we measure that this is worth \$25 million?” or “How many

years before we can see this was \$25 million well spent?”

- **Extended Time to Implement:** Compounding the question of value was the time required to implement a fully functional AM/FM/GIS. Senior executives saw a very large investment being made in this technology, but they had to wait several years before seeing any tangible results or value being derived from this new way of managing their assets and data.
- **Proprietary Databases:** For many years, the data formats populating AM/FM/GIS systems was proprietary. It could be used only for a particular vendor’s own applications or for applications developed for that system and data type. This greatly limited geospatial data’s value because it could not be leveraged with other applications across the enterprise.
- **Staffing:** AM/FM/GIS required very specific skills in terms of programming, system administration, and data management. A secondary industry emerged for people with these skill sets, creating predictable industry-wide problems associated with high turnover, short supply, and high cost.
- **Limited Audience:** Getting AM/FM/GIS into the “mainstream” of the enterprise was virtually impossible given the specialized nature of working with the data sets and applications associated with the technology as well as the inability to integrate with broader business systems.

AM/FM/GIS rarely became more than a departmental system, limiting its value.

As these challenges become less intimidating and technologies become open and flexible, organizations are finding new ways to leverage the power of AM/FM/GIS across the enterprise. The integrated Autodesk MapGuide/ Oracle9i Spatial Information Management Solution removes many obstacles, as noted in Table 1.

	Traditional GIS	MapGuide/ Oracle9i
Return on Investment	Lengthy, difficult to measure	Immediate value and impact
Time to Implement	Measured in years	Measured in days or weeks; RAD platform
Databases	Proprietary, limited size, not integrated with tabular data	Open, seamless, fully integrated with tabular data
Staffing	Specialized DBAs and programmers	Corporate DBA and IT staff
Audience	Limited to engineering	Entire enterprise and planning

Table 1. Traditional GIS vs. Autodesk MapGuide/Oracle9i Spatial Information Management Solution

A Single Scalable Enterprise Database

A basic problem in implementing a geospatial information management solution is that of integrating, managing and maintaining the spatial data. Oracle9i is a major leap forward in spatial data management. The key benefit is that organizations can now include spatial and tabular data in a single relational database management system. This means that information as diverse as physical location, financial information, asset information, and many other data types can be easily incorporated into a single spatial querying process.

The key benefits for organizations to use Oracle to improve their business processes include

- **Open Standards–Based Access:** Oracle9i provides a completely open architecture for managing spatial data in a database management system and is completely integrated in the database server. An added benefit of this approach is in managing the spatial data. Specialized GIS DBAs (database administrators) are no longer required; with minimal training, corporate DBAs can manage both the spatial and tabular data. In addition, Oracle9i conforms to the OpenGIS Simple Features Specification for SQL standards.

- **Scalability:** Oracle is committed to providing enterprise database management solutions in all of its products and systems. For Oracle9i users, the capability of the Spatial database scales linearly with the growth of data storage requirements and users. For example, Oracle9i can support the millions of queries per day that are common in Internet and mobile location services. In addition, the DBMS can readily scale from gigabytes to terabytes of data storage.
- **Seamless Geospatial Data:** A corollary to Oracle9i’s scalability is that it provides a seamless geospatial database repository. This eliminates the need to create subsets of data or new databases or to recreate applications. The savings in database management and maintenance resulting from one seamless geospatial database make Oracle9i a compelling proposition.
- **Performance:** Organizations that use Oracle9i can store terabytes of spatial and tabular data all in one place. This streamlines the data management processes in terms of staffing, computing time, and applications development. It’s no surprise that Oracle is the preferred Spatial data engine for many of the world’s Internet location–enhanced portals.
- **Interoperability:** Virtually every type of geospatial data available today can be converted and stored in Oracle9i and queried using SQL. In addition, Oracle9i is fully supported by a variety of third-party development tools and applications
- **Ease of querying:** Users define and manipulate spatial data through SQL; there is no need for specialized or proprietary query languages or APIs.

Leveraging the Web for an Impact Across the Enterprise

A system for managing geospatial data is just one requirement for maximizing the return on an organization’s geospatial investment. The other key is the ability to deliver relevant information to a vari-

ety of users across the enterprise in the appropriate format for a variety of devices.

Autodesk MapGuide is web-based technology for delivering live geospatial and design data across the enterprise. It directly interfaces with the Oracle9i database through the Autodesk MapGuide Provider for Oracle9i Spatial. Designed as an Internet tool for distribution of and access to large data sets, it addresses the problems associated with web-based geospatial data distribution. Among its benefits are

- **Easy to use:** Autodesk MapGuide enables non-technical end-users to access and interact with intelligent maps through their web browsers or through custom applications.
- **Rapid application development and deployment:** Autodesk MapGuide is a proven platform for rapid application development. Customers speak for themselves:

"Not only is the visualization of data important, but business users also have to be able to query and select options from the map. From a developer's perspective, MapGuide is the only product out there that allows you to do that and still deliver an application in eight weeks."

Olivia Duane
Executive Vice President, SRC

- **Scalable solutions:** Autodesk MapGuide is a scalable, fault-tolerant, 32-bit, multithreaded architecture that runs as a service under Windows NT. The client—Autodesk MapGuide Viewer—uses both native application programming interfaces and standard CGI interfaces to integrate with a variety of web server products. This allows the service to be scaled up with computing power to support very large numbers of online users.
- **Create Live, Intelligent Maps:** Autodesk MapGuide, unlike other web-based GIS products, doesn't require you to write code for map display or GIS functionality. It's fast and easy to set map display properties, the level of interaction within the map, and links to external data sources.

- **Compatibility:** Autodesk MapGuide supports multiple geospatial file types and multiple RDBMSs.

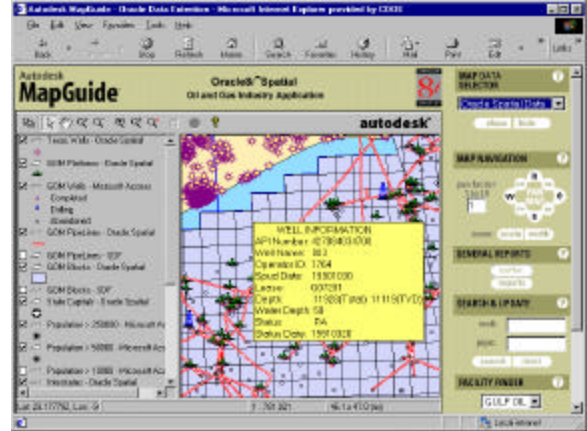


Figure 1. An asset management and tracking application powered by Autodesk MapGuide and Oracle

Autodesk MapGuide helps organizations publish their spatial AM/FM/GIS applications quickly with out-of-the-box features. In addition, a rich programming interface enables companies to customize their applications in their preferred application development environment.

An additional benefit of Autodesk MapGuide is that it serves as the spatial data server for Autodesk On-Site, Autodesk's mobile data solution, effectively expanding the enterprise beyond traditional boundaries and into the field.

The Integrated Solution

The Autodesk MapGuide/Oracle9i Integrated Geospatial Information Management Solution is the result of a collaborative effort between the Autodesk and Oracle development groups. The result is a scalable, easy to integrate and deploy geospatial management solution, capable of making the data available in environments ranging from the PDA or laptops in the field, to Windows or Unix-based desktop users.

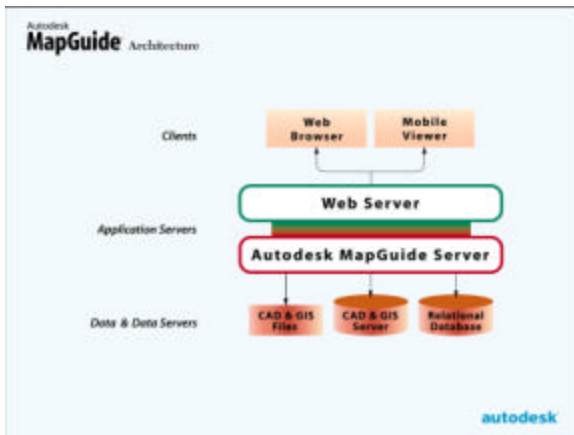


Figure 2. Spatial data access architecture. The Autodesk MapGuide Server acts as a broker and accesses data from many data sources, including Oracle9i.

A key piece of this solution is the Autodesk MapGuide Provider for Oracle9i Spatial, which provides the direct interface between Autodesk MapGuide and Oracle9i.

This data access provider enables users to create maps with the same intuitive authoring interface that Autodesk MapGuide revolutionized the web-based mapping industry with in previous releases. Autodesk MapGuide is able to take advantage of the power of spatial indexing in Oracle9i and provide high-performance map display and query on very large datasets. Map authoring using Autodesk MapGuide makes the complexity of data contained in an Oracle data warehouse invisible to the map builder.

With Oracle9i, users get the best data management, data warehousing, and Internet platform for geospatial data. Autodesk MapGuide provides the best Internet-based solution for the creation, editing, mapping, visualization, analysis, and browsing of spatial data across the enterprise. Combining the strengths of these two systems is a natural conclusion for any organization investing in a geospatial information management solution

Consider some examples of how powerful this integrated solution is for users in the utility and telecommunications industries and in state and local governments.

Utilities

The utility industry continues to go through profound change as it moves from a regulated industry to a competitive one. The needs for managing and using spatial and tabular data are evolving and becoming more demanding as well. Consider how utilities are now managing their distribution systems. The data now being gathered and analyzed by distribution operations staffs expands exponentially when distribution networks are viewed as profit centers. With intelligent electronic devices gathering data across these networks, this data is now part of the enterprise database and can be used to improve operations in areas as diverse as marketing, maintenance, outages management, accounting, and customer service. Having all the data from geographically dispersed assets in a centralized database promotes streamlined and accurate management and analysis. Likewise, being able to distribute this data via a secure corporate intranet yields significant improvements in speed, accuracy, and cost.

Telecommunications

Today many telecommunications providers are offering a multitude of products and services (local, long distance, wireless, Internet, and so on) to an expanding customer base. All of these products and services might be organized as separate business units, but how is the information from all of them to be managed across the enterprise? The obvious answer is an enterprise database management and distribution solution, such as the Autodesk MapGuide/Oracle integrated information management solution. For instance, if a crew is going to perform maintenance at a remote site that might affect the service for multiple product or service lines, the activity needs to be communicated to multiple business units. It could impact local, long distance, and Internet business units in terms of system maintenance, customer service, accounting, and work management. If all the information pertaining to this activity resides in a single place and is sent out to all the proper departments through the Internet, informing customers as well as internal staff is a manageable task.

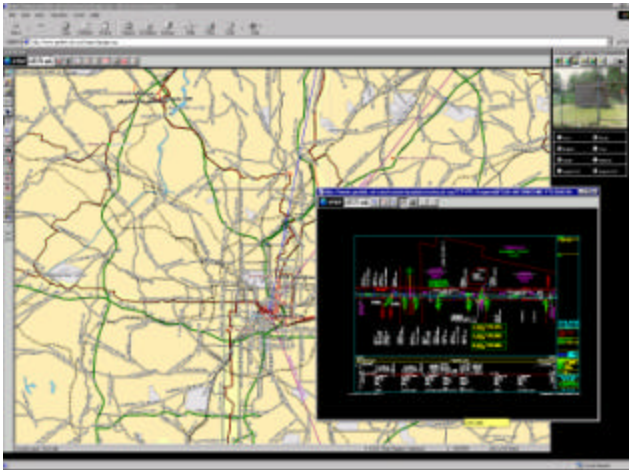


Figure 4. Sample screenshot from AT&T deployed Autodesk MapGuide/Oracle solution

“We are converting to Oracle to warehouse our mapping and design information, storing it all in a central database. We tested the Autodesk MapGuide Provider for Oracle9i Spatial and we are very pleased with the results. AT&T is now implementing an integrated Oracle and Autodesk solution.” – H. Jeffrey Stewart, AT&T

State/Local Government

Suppose a large city is considering whether to redevelop a major section of downtown. Analyzing and planning this kind of effort could require information as diverse as street maps, utility asset information, tax assessor data, crime reports, fire route mapping, and dozens of other types of information. Having all of this data, be it spatial or tabular, in one place not only saves time but also makes the information more complete and powerful. The data can come from multiple departments in multiple geospatial data formats, but it can all be stored, retrieved, manipulated, and analyzed in a single database using the Oracle9i technology.

Now this information must go out to the city planners, utility engineers, and the chiefs of the police and fire departments, among others. Autodesk MapGuide will get this data to the desktops of all of the departments and individuals involved.

Were it not for the integrated solution, there would be problems in terms of converting data, overlapping or conflicting data, apples-to-oranges compar-

isons of data from different sources, and ultimately a decision-making process that is slower, less accurate, and less powerful in its message.

About Autodesk MapGuide and Oracle9i

Autodesk MapGuide

Autodesk is the global leader in CAD and GIS application software and has an installed base of more than 4 million customers in more than 150 countries. The company has a network of more than 6,000 business and consulting partners.

With Autodesk MapGuide software, you can increase the reach of live information—and deliver results.

Reduce Costs

By streamlining data distribution and decision support across the enterprise, you'll cut operational costs and deliver map and design data to more people who need it. More importantly, you'll reduce business expenses as employees make faster, safer, and more-informed decisions with up-to-date design and map information.

Improve Client and Customer Service

By cutting your decision and response times, you'll be better able to meet customer and client expectations. Whether you're dealing with a power outage or a facilities redesign, from your desktop or in the field, Autodesk MapGuide delivers the interactive maps and design data you need to make informed decisions and act on them quickly.

Increase Access to Maps and Data

Autodesk MapGuide software provides two flexible online viewing options. The first option does not require downloads or special plug-ins, so visitors to your website have immediate access to your interactive designs, maps, and other published data. And for more powerful viewing, the second viewing option offers robust display, query, and analytical features for a variety of platforms and browsers.

Leverage Your Data Investment

With Autodesk MapGuide you'll have direct access to a wide range of CAD and GIS file formats and to

spatial data stored in industry standard formats such as Autodesk DWG, ESRI SHP and information servers including Oracle9i and Autodesk GIS Design Server. There's no conversion necessary so you continue to benefit from previous data investments.

Develop Custom Applications

Use Autodesk MapGuide software's rich programming interface and powerful authoring tool to develop custom applications that meet your specific needs.

Autodesk MapGuide software is a complete solution, comprising all the tools you and your coworkers need to build, deploy, and access intelligent, map-driven websites.

Oracle9i

Oracle is the leading technology for spatial data management. It allows users and application developers to seamlessly integrate their spatial data into enterprise applications and fully leverage the scalability, reliability, and performance of the Oracle database.

Higher Productivity

By effectively managing spatial and attribute data in one physical database, Oracle9i reduces processing overhead and eliminates the complexity of coordinating and synchronizing disparate sets of data. The seamless information framework provided by Oracle9i results in lower training fees, improved learning curves, fewer design and programming iterations, and more efficient data administration.

Object Relational Type Support

With the release of Oracle9i, spatial data can be stored in relational tables or as objects—abstract data types (ADTs). This new object data type (SDO_GEOMETRY) is supported directly by the core Oracle9i. It enables you to store, access, and analyze spatial data quickly and efficiently in an Oracle9i database. This gives application developers the facility to store all location (geographically referenced) information in an industry standard database server without having to resort to custom-built middleware-based indexes and functions to get the performance they need. Users of spatial data

have access to standard Oracle9i features, plus enhanced features such as bigger database size, faster backup and recovery, and Java in the database. Users also define and manipulate spatial data through SQL and gain access to standard Oracle features, such as a flexible n-tier architecture, object capabilities, Java virtual machine, and robust data management utilities, ensuring data integrity, recovery, and security features.

Commitment to Standards

Like Autodesk, Oracle is committed to providing open standards-based information management applications and solutions. In spring 1999, Oracle8i Spatial (ver. 8.0 and 8i) became the first software to pass OpenGIS conformance testing for "Simple Features for SQL." Oracle's commitment to standards activities is demonstrated by its active principal-level membership in the Open GIS Consortium (OGC) during the past three years. Oracle has senior executive commitment to the OGC through its seat on the Board of Directors and participation on the management and technical committees. Oracle is also working with SQL3 standard to define SQL extensions for handling spatial data. Oracle and Autodesk are also working together to refine the emerging OpenGIS technical specification for Geographic Markup Language (GML).

Oracle is also an active member of the International Organization for Standardization Technical Committee, Geographic Information and Geomatics (ISO/TC 211), and the American National Standards Institute (ANSI) Technical Committee X3L1, Geographic Information Systems (GIS) standards groups. Oracle's implementation of technology for spatial information management is in line with the current direction of these standards, easing future migration. Oracle and Autodesk's broad commitment and participation in these initiatives will ensure consistency among the various standards groups and ensures that their respective product lines adhere to the standards and their direction.



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