IBM

DB2. Information Management Software

IBM Informix Geodetic DataBlade Module

Highlights

■ **Provides the capability to manage geospatial information referenced by latitude-longitude coordinates**

■ **Supports global space- and time-based queries without the limitations inherent in map projections**

■ **Ensures precision and accuracy — engineered (from inception) to treat Earth as a globe, not a flat plane**

■ **Uses the R-tree index on integrated space, time and numeric dimensions for lightning performance**

■ **Includes database replication of geospatial data.**

Unique capabilities for storage and retrieval of geospatial data

Geographic Information Systems (GIS) applications are proliferating throughout organizations involved in natural resource and facilities management as well as general business enterprises. The need for managing the geographic data associated with these systems directly in enterprise database management systems has long been recognized. The object-relational database management system provided by IBM Informix® Dynamic Server (IDS) now makes this possible for applications such as:

• *Military command and control and asset management*

• *Meteorology and oceanography (scientific, government and commercial): storing, managing, and querying observations, images and model data*

• *Satellite imagery and digital map providers: systems supporting browsing, ordering and delivery of images and maps*

• *Any organization managing geospatial data for large regions or scattered around the world, where managing multiple projections in the database is impractical.*

The IBM Informix Geodetic DataBlade™ module is part of the overall IBM spatial offering, which also includes:

• *IBM Informix Spatial DataBlade module (works with IDS)*

• *IBM DB2® Spatial Extender (works with DB2).*

Informix Geodetic and Informix Spatial DataBlade modules manage spatial data using different GIS technologies. The Informix Geodetic DataBlade module is best used for global datasets and applications. The Informix Spatial DataBlade module is best used for regional and local datasets and applications.
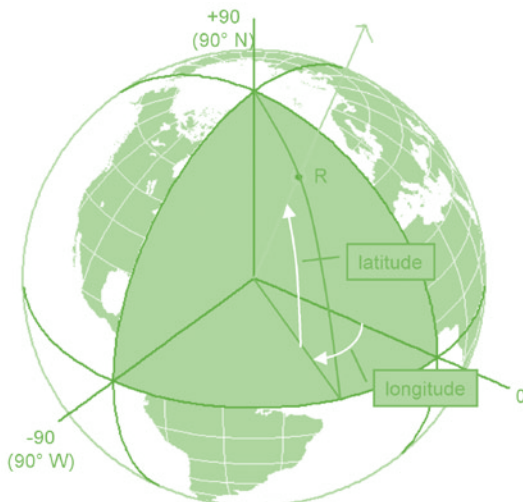
Combined with the IBM Informix Dynamic Server 9.30, the Informix Geodetic DataBlade module provides the capability to manage geospatial information referenced by latitude/longitude coordinates, to support global space- and time-based queries without the limitations inherent in map projections and to achieve high precision regardless of global location. This module is fundamentally different from the flat-plane-based IBM Informix Spatial DataBlade module and IBM DB2 Spatial Extender.

Why manage spatial data in an object-relational database?

As a server extension, a DataBlade module typically extends the server to manage a new data domain, such as geospatial data. DataBlade modules offer advantages of object-relational database management systems (ORDBMS), including:

- *Uses standard structured query language (SQL) – you won't need to learn a new language.*
- *Simplifies client applications – functions are callable from SQL. Client applications do not have to be relinked with new versions of the source code. If the client runs on one machine architecture and*

the database on another, the IBM Informix server automatically performs any required conversion for transporting data between architectures.
- *Manages complex data – complexity of processing new data is pushed into the server.*
- *Ensures data integrity – as part of the server, the DataBlade provides concurrency control and transaction management, backup and recovery, and any triggers that you create to enforce local rules.*
- *Improves performance – scales for multiple users far better than "fat client" applications do.*

The Informix Geodetic DataBlade module server extension offers capabilities not available with other products that support GIS applications. This module is best suited for whole-earth datasets and applications, such as military, imagery management and meteorological analysis.

Projections

For centuries we have relied on maps, pieces of parchment or paper that graphically depict the features of the Earth. Supporting that practice, many mathematical methods have been developed for representing shapes on the surface of a sphere as shapes on a flat plane. This process is called projection.

Just as you cannot flatten an orange peel without tearing it, you cannot project shapes without distorting them. Every projection distorts distances, shapes (angles) and areas; different methods may minimize the distortion of one of these, but at the expense of the other two. Look at a world map showing Greenland, for example; it is nearly the size of South America. In reality, Brazil's area alone is almost four times Greenland's. Worse, every projection has a limited area where it is valid; and every map has edges.

The computer can construct a virtual globe at any scale. Therefore, it is no longer necessary to tolerate the edges and distortions imposed by projected maps. Most new data is collected using worldwide systems such as global positioning satellite (GPS) and represented in latitude/longitude coordinates. Data management systems work better when they keep the data in this unprojected form, leaving projections where they belong: in the components that display and print maps.

The real distance between two points on Earth

On the Earth's surface, the shortest path between two points is not a straight line; it is an arc, owing to the curvature of the Earth. Geospatial

search and manipulation engines that handle flat-plane geometry must approximate the round surface of the Earth by projecting the surface onto flat planes using various transformations. These projections introduce distortions, which can be kept within acceptable bounds only by limiting the area covered by each map.

You expect your database to compute accurate distances and areas, and do it efficiently. The Informix Geodetic DataBlade module is the only product that was originally designed and engineered to work with geodesics and calculate their length without resorting to special-case, computationally inefficient equations.

A spherical solution to model a spherical problem

To handle objects defined on the Earth's surface with precision, the Geodetic DataBlade module uses a latitude and longitude coordinate system on an ellipsoidal Earth model, or geodetic datum, rather than a planar, x- and y-coordinate system. This avoids the distortions, inaccuracies and imprecision that are inevitably introduced by projections.

The IBM Informix Geodetic DataBlade module provides a unique and cost-effective solution for global, spherical coordinate (latitude/longitude-based) problems. This particular DataBlade is unique to IBM and provides significantly reduced development cycles because it models a spherical problem with a spherical solution.

R-tree index

In a database, performance results from indexing. Spatial data cannot be indexed by the same methods used for traditional alphanumeric data. The R-tree is a widely accepted fast, flexible and robust indexing method for multidimensional data. The industry-leading Informix implementation is fully supported by the server's mechanisms for concurrency control, transaction isolation, rollback and recovery, and backup and restore. Best of all, it requires no tuning or decisions up front. The Informix Geodetic DataBlade module uses the R-tree to build indexes that support scanning for space, time and numeric ranges (up to five dimensions) in a single pass, with spectacular results.

Enterprise Replication

Many organizations have a requirement for distributing and replicating their data over multiple servers and databases throughout the enterprise. IDS Enterprise Replication is designed to fulfill this requirement, optimized for high speed, frugal network bandwidth usage, flexibility and robustness. The Geodetic DataBlade module fully supports this mechanism, so global enterprise spatial data can participate in this mechanism seamlessly.

Time and numeric ranges

In most geospatial applications, queries use other criteria in addition to spatial ones. Queries can read like this example, "Find all images that cover this particular area and were taken in the Fall of 2000," in a satellite image-browsing application in which each image is associated with a spatial "footprint" — a polygon delineating the area covered by the image — as well as the time period over which the image was collected.

Another query could be, "Retrieve all features that are visible in this map window and at the current scale," in a mapping application in which each spatial feature not only has a geometry but also a designated range of scales at which it should be drawn (because different levels of detail are appropriate at different map scales).

Note that each of these extra criteria are based on ranges, not single values, and therefore cannot be indexed like standard alphanumeric data but require the same methods as spatial data. The Geodetic DataBlade module makes these additional time and numeric ranges an integral part of the spatial value and lets a single index handle these additional dimensions. The result is a degree of performance on such combined queries that cannot be achieved by any other technique.

Server-side extensibility

For those organizations that require custom functionality not currently provided by the Geodetic DataBlade module, the DataBlade itself is extensible. A robust and well-crafted C application programming interface

(API) is provided with the product, so application developers can build new functions that use the same data structures and internal interfaces used by the SQL functions already provided. This opens up unlimited possibilities for taking advantage of proprietary algorithms, adding convenience functions to simplify application development, and more.

Software requirements

IBM Informix Geodetic DataBlade module V3.11 requires that the IBM Informix Dynamic Server version 9.30 and later, be installed on the same machine. It is available on the following platforms:

- Solaris 2.6 (32-bit)
- Solaris 2.7 (64-bit)
- Solaris 2.8 (64-bit)
- HP-UX 11.0 (32- and 64-bit)
- HP-UX 11.11 (32- and 64-bit)
- IBM AIX® 4.3.3 (32-bit)
- IBM AIX 5.1 (64-bit)
- SGI IRIX 6.5 (32-bit)
- Windows NT® 4.0 (32-bit)
- Windows® 2000 (32-bit)
- Linux (Intel®) 2.2.14/2.2.13 (32-bit)

For more information

Please contact your IBM Marketing Partner, or call 1 800 IBM CALL (1 800 426-2255) within the U.S. Also, go to our Web site at **ibm.com**/informix/

"BAE SYSTEMS Mission Solutions develops imagery information systems for numerous customers. A prime element in a number of those systems is the IBM Informix Geodetic DataBlade. The IBM Informix Geodetic DataBlade was selected for its functional capabilities and technical maturity. BAE SYSTEMS Mission Solutions views its relationship with IBM as essential for continuing to bring technology to its customer base."

−John Lee, Senior Engineering Specialist, BAE SYSTEMS Mission Solutions

For Position Only

e business software

GC18-7315-00