Pitney Bowes MapInfo

Spatial RDBMS:

A Key to Increased ROI

WHITE PAPER

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ABSTRACT

MAPINFO® SPATIALWARE® SOFTWARE ENHANCES THE VALUE OF YOUR SPATIAL DATA BY ENABLING IT TO BE STORED, MANAGED AND QUICKLY RETRIEVED FROM LEADING COMMERCIAL DATABASE MANAGEMENT SYSTEMS.

SPATIALWARE ENHANCES THE VALUE OF YOUR DATA BY EXTENDING THE STORAGE AND ANALYSIS CAPABILITIES OF YOUR DATABASE ENVIRONMENT. SPATIALWARE ENABLES LOCATION-BASED, OR SPATIAL DATA, TO BE EASILY INTEGRATED WITH NON-SPATIAL DATA BOTH ON THE DESKTOP AND ACROSS THE ENTERPRISE ENSURING DATA ACCESSIBILITY, SCALABILITY, INTEGRITY, RELIABILITY AND SECURITY. SIMPLY STATED, SPATIALWARE ALLOWS YOU TO ENHANCE KEY BUSINESS PROCESSES BY CONNECTING DATA AND LOCATION.

THIS WHITEPAPER EXPLORES THREE MYTHS ABOUT SPATIAL DATA:

MYTH #1: SPATIAL DATA NEEDS TO BE MANAGED SOLELY BY GIS EXPERT: DOING THIS LEADS TO DATA THAT IS STORED OUTSIDE ORGANIZATIONAL DATABASES AND POTENTIAL PROBLEMS WITH ACCESS CONTROL, POLICIES-BASED DATA MANAGEMENT, CONFLICT RESOLUTION AND MORE.

MYTH #2: RDBMS WILL GREATLY REDUCE THE MAP PERFORMANCE TO THE END USER: THERE ARE A NUMBER OF OPTIONS AVAILABLE FOR ENSURING THAT PERFORMANCE IS NOT DIMINISHED WITH THE USE OF A SPATIAL RDBMS.

MYTH #3: GIS USERS WILL BE NEGATIVELY AFFECTED BY THE LOSS OF CONTROL: IN FACT, REMOVING THE TASK OF DATA MANAGEMENT FROM ENABLES THEM TO CONCENTRATE ON THEIR CORE JOB AND BE MORE PRODUCTIVE.

WITH THE EXPLOSION OF DATA ACROSS THE ORGANIZATION HOW DO YOU KNOW IF THE DATA BEING ACCESSED BY A USER IS THE RIGHT DATA?

It is a commonly known fact that data (any data) needs to be managed. The proliferation of database management systems (RDBMS) is testament to that theory and recognises the value of managing organizational data. Spatial data is no exception and deserves the necessary attention.

Traditionally, however, spatial data has been kept outside the realm of organizational databases because of its proprietary formats. GIS users have ended up with the task of managing spatial data as a specialist, independent, data source.

Myth #1: Spatial data needs to be managed solely by GIS experts

A common misconception has been that spatial data, being of a proprietary format and unique structure, can only be understood and managed by GIS experts. The creation and management of spatial data outside the organizational databases has led to the following problems:

Data explosion: One of the most common problems with spatial data in most organizations is that too many copies exist in too many places across the network and individual desktops. For convenience, users tend to create local copies of spatial data and use that as their source.

Improper edits: To further complicate the matter, users undertake edits to local data and do not update those changes to the authoritative data source, creating some of the most fundamental problems plaguing effectiveness of spatial data—data duplication and inconsistency.

Loss of data integrity: With the explosion of data across the organization how do you know if the data being accessed by a user is the right data?

Poorly supported decision making: Loss of integrity means that decisions may be taken using the wrong data.

It is important to note that GIS users themselves use a professional framework for maintaining spatial data but problems tend to occur when non-GIS users are given access to spatial data without the strict framework to manage potential problems caused from editing that data.

The creation of attribute data within the GIS system has been a primary cause for giving non-GIS users edit access to GIS data. A small group of non-GIS users also tend to use GIS tools to make simple, yet repetitive, spatial edits.

It also comes as a surprise for many that traditional RDBMS have been upgraded, a few years ago, to deal with spatial data as yet another data type. Products like MapInfo SpatialWare for SQL Server or MapInfo SpatialWare for Informix or Oracle Spatial or IBM's Spatial Extender for DB2 are all examples of traditional databases becoming spatially aware.

The benefit of a RDBMS becoming spatially enabled is that it not only provides an effective data repository but it can also extend its core values, like accesscontrol, policies based data management, conflict resolution, etc. to managing spatial data. It does this by managing spatial (abstract) data types independently of other data types.

Centralise into an RDBMS

So the fact that an RDBMS understands spatial data means that all the spatial data management problems mentioned above can be addressed by centralising spatial data into an RDBMS.

This creates an authoritative source and respects spatial data as a corporate data asset. Guiding users to the single authoritative source assures data integrity and ensures that all users are basing decision making on the right information.

This also ensures that attribute editing can be undertaken through simple forms and removes the need to use spatial editing tools by non-spatial users to edit attributes.

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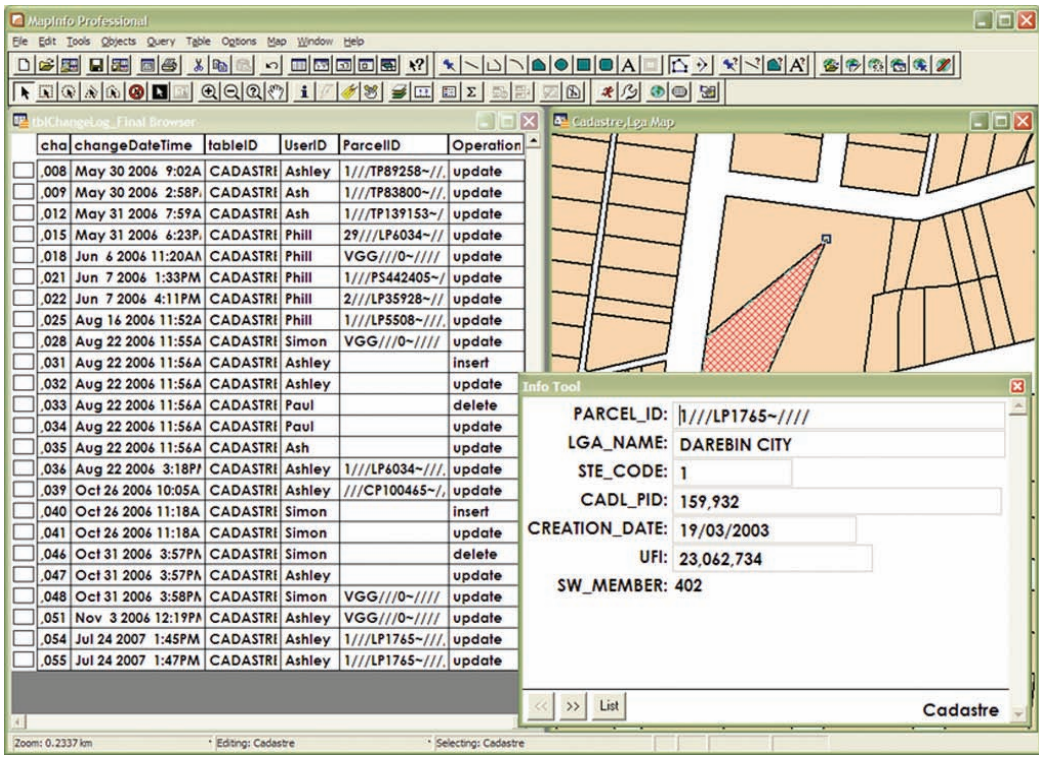


Use of a RDBMS for spatial data pulls disparate, proprietary databases into a centralized database that is easy to use and manage.

Myth #2: RDBMS will greatly reduce the map performance to the end user

One of the primary misconceptions about an RDBMS is that it will adversely affect speed/performance of mapping for the user. In order to adequately correct this misconception, let's consider the three broad user categories in any organization:

View-only users: Most users in an organization use spatial data as reference and do not need the capability to edit spatial data. Approximately, 80% of users fall in this category.

Power users: Distributed, but small groups users are primarily focused on maintaining all spatial data related to their business unit and need the ability to edit spatial and attribute data. Approximately, these constitute 5% of the total user population.

Attribute edit users: Typically there is a small group of users who only need to edit attribute data and do not have any need for editing spatial data. These users make up about 15% of the employee population. Traditionally, these users have been using spatial editing tools since attribute data resides in spatial systems.

GIS USERS TEND TO BE MORE PRODUCTIVE AS THEY NO LONGER NEED TO TROUBLESHOOT PROBLEMS CAUSED BY LOSS OF DATA INTEGRITY.

As is evident from the group of users mentioned above, the Power users (approx 5%) are the only ones that need to access live spatial data for the purpose of editing. In fact even Power users need only to edit a layer or two at any given time and tend to use all other layers as reference.

There are a number of options available for ensuring that performance is not diminished with the use of a spatialised RDBMS. For instance, access can be achieved in a Live mode or a Linked mode. For users who need spatial data for reference, the linked mode offers identical performance to getting data in its native format. In fact for users wanting to undertake attribute editing they can experience improved performance due to the RDBMS' indexing capabilities.

It is possible that an improperly architected solution can affect performance adversely and hence it is important that the data needs of each user are properly understood and incorporated in the solution. This ideally needs the involvement of spatial data experts.

It is important that any impact on performance is compared against overall gains to the business. For instance, assurance of data integrity, control over editing rights, proliferation of data across other business applications, etc, needs to be taken into consideration if there is degradation of performance for a small group of users.

Benefits of an RDBMS

There are a number of fundamental benefits of using an RDBMS for spatial data storage, such as:

Policies and Procedures: Central implementation of organizational policies and procedures to ensure that data access and update is according to rules

Access control: An effective method of formalising who gets access to which data

Conflict resolution: What happens when two or more people edit the same data? An RDBMS has the necessary functions available to either rollback or commit changes based on user profile and access rights.

Data repository: It also provides a solution to limitations that the proprietary system may have with data storage

Increased exposure: Making spatial data a part of the mainstream data repository increases awareness of spatial data across the IT groups and increases the exposure of spatial data across the organization

Closer integration: Upskilling IT on managing spatial data provides closer integration with all other applications used in the organization

Backup / Recovery: An RDBMS provides a number of functions and features that enhance data management including backup and recovery, etc.

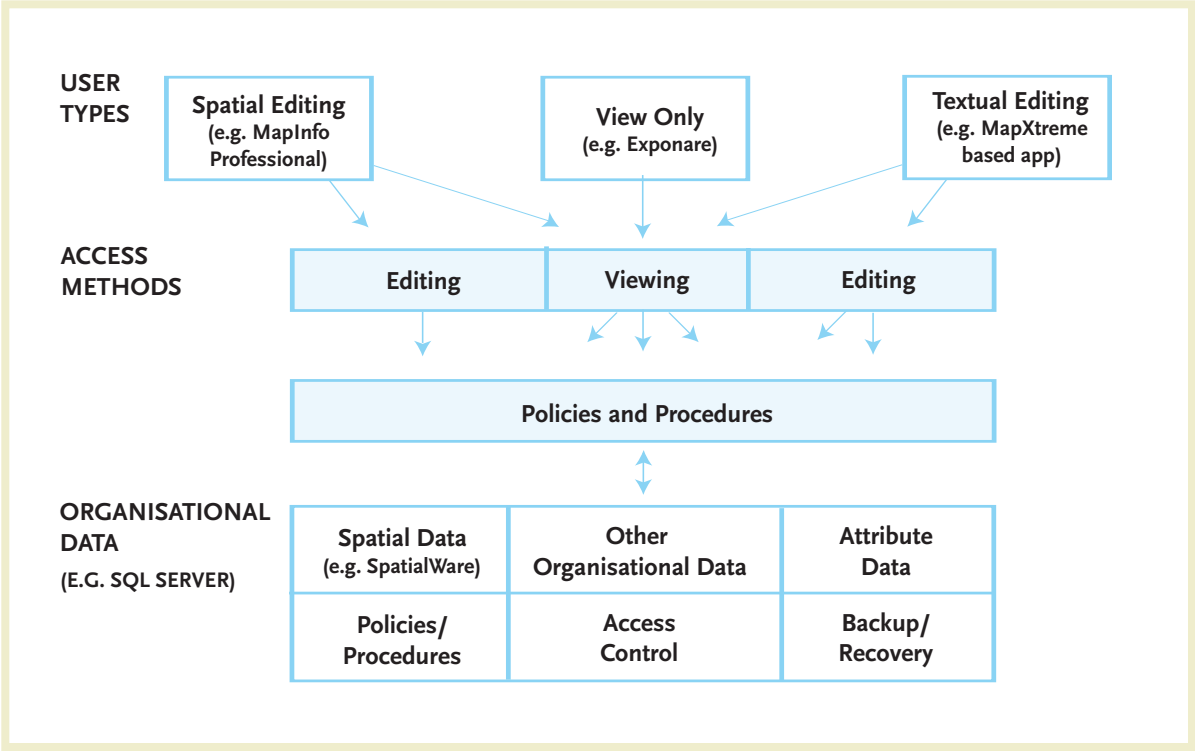
Myth #3: GIS users will be negatively affected by the loss of control

The outcome is exactly opposite. GIS users tend to be more productive as they no longer need to troubleshoot problems caused by loss of data integrity. GIS users get the time to focus solely on the task of managing GIS data rather than having to also take on database administration responsibilities for the proprietary GIS data.

GIS users are intimately involved in implementing the overall policies and procedures for the organization and don't need to take on the day-to-day data administration.

Broad guidelines for Spatial Data management

The following diagram conceptualises the usage types and the data access consideration needed for each.



A WELL ARCHITECTED SOLUTION WILL OPTIMISE THE VALUE OF SPATIAL DATA ACROSS THE ORGANIZATION

As can be seen from the diagram, the following factors need to be considered for creating the framework for managing spatial data:

Broad guidelines for Spatial Data management

The following diagram conceptualises the usage types and the data access consideration needed for each.

As can be seen from the diagram above, the following factors need to be considered for creating the framework for managing spatial data:

User classification: Classify users in the different user categories

Data needs: Formalise the exact spatial data needs of each user including access to live data

Access control: Confirm who needs edit access to which data (spatial or attribute)

Access Policy: Implement the policies to determine conflict resolution caused by concurrency

Topology management: Determine the rules for creating and editing spatial data

Authorization: Policies for accepting edits into the authoritative source

Meta data

Architecture: Under load, how will data be adequately served to all users

Software development: For creating the necessary forms to edit attribute data

It may be necessary to consider involving spatial data management experts in creating the framework for adopting spatial data management polices and procedures. A well architected solution will optimise the value of spatial data across the organization to provide quicker return on investment.

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