Spatial-it®, the new approach to Geo-IT

Spatial-it

Spatial Information Technology, or *Spatial-it,* yet an other buzzword to describing a new approach in the ever changing Information Technology. As in all IT area's we're witnessing dramatic changes in the Geo Information Technology (Geo-IT). New technologies, based on interesting new concepts. These changes justify the introduction of new words identifying and describing the next generation of systems utilising geographical, or broader defined, spatial data.

To appreciate the true benefits of this new approach to Geo-IT we need to look at IT strategies on an Enterprise level. Faced with the requirement to increase productivity by lowering overhead and raising efficiency, many organisations are pursuing IT policies which distribute information resources across the entire Enterprise. These Enterprise IT strategies are aimed at meeting the needs of new organisational structures, empowering employees, creating better communication channels and eliminating islands of duplicate information and incompatible technology.

Spatial information technology will more and more become part of this process. Within the next five years spatial information systems will merge with mainstream IT. This comes about because of the opening of spatial information systems to embrace modern IT concepts (such as openness, client/server) and the ability of mainstream IT to handle higher volumes and more complex data types.

This article is the first in a sequence that will focus on what is happening in the Geo-It arena. As an introduction we'll look at the various aspects of a new concept we call Spatial-it®

No future without a history…

In order to position this Spatial-it concept, it's relevant to look at the ground we covered over the past decades. The usage of graphical data in information systems is an ever increasing convergence of technologies, marked by a slow evolution. In time the various phases had their own characteristics:

The first generation:

- ✓ Supply driven market
- ✓ Strong emphasis on technology, requiring highly specialised operating personnel
- ✓ Automate established manual methods
- ✓ Focus on the graphics rather than the information
- ✓ Data model "apartheid" between vector, raster and image-based systems
- ✓ Lots of energy lost in datacapture and dataconversion programs
- ✓ Islands of technology, separated from the operations and financials

Later generation:

- ✓ Demand driven market
- ✓ More emphasis on user friendly, applications oriented technology
- ✓ Start to develop techniques and procedures with aided value to current procedures
- ✓ Focus on information quality, output, consistency
- ✓ Data model integration

- ✓ Recognition of required "team/partner" approach with the other disciplines.

We'll look beyond the latter generation with emphasis on the aided value the utilisation of Spatial Information technology has in supporting what generically can be called the "mainstream business processes".

Trends in Spatial Information Systems

A number of important trends stimulate the Geo-IT evolution into a next phase:

- ✓ Computers on the employees desktop are common these days, providing the "power" for more "demanding" applications.
- ✓ Spatial Data is available at affordable prices for larger groups of users
- ✓ Openness is accepted and adopted by a growing group of key-players:
  - ✓ Open Systems guiding the hard- and software providers
  - ✓ Open GIS defining standards for geodata-storage and -processing
- ✓ Databases have the power and functionality to store spatial data in industry standard databases alongside the alpha numeric and other datatypes.
- ✓ Uniform interfaces with predictable behaviours mainly as a result of the market dominance of the Microsoft Windows environment.

The users

One of the most rewarding results of these trends is the number of users that can benefit from Geo-IT. Adopting Intergraph's positioning of the various spatial-data-user we identify:

- ✓ "Doers"
  In general highly skilled employees who understand the complexities as data accuracy and consistency, geographic projections, design and maintenance rules. A "doer" tends to spend 80 to 90% of the time creating, maintaining and managing the geographic data. They require an extensive set of functionality.
- ✓ "Users"
  "Users" can be defined as professionals who can benefit from access to spatial data in their daily activities. They may work 10 to 20% of their time with such systems and don't want to be bothered with a complex "techy" environment. They require immediate access to the geographic information, familiar (easy-to-use) software and integration with the office software.
- ✓ "Viewers"
  Finally a large group that is searching for information for unlimited reasons. The usage of geographic data is on an ad-hoc basis. They want to assemble data as quickly (and easy) as possible, ideally via a "5-button-max" application. With the growing popularity of the internet their number grows rapidly.

Talking about numbers it's obviously that for the limited number of "doers" in organisations, a larger group of "users" can be identified. The "viewers" easily outnumber the others by factors. Where traditional Geo-It systems focused on the doer-society, today the emphasis is more and more on the user-viewer community.

Geo-IT Architecture

Graphic oriented systems traditionally formed a separate environment in the Enterprise it, in fact most of them still are. Typical for these systems are the specialised functionality, the different user interface and the proprietary datastorage (needed at the time to store and retrieve complex graphic data). On top of that organisations often have different graphic systems covering diverse disciplines as design (CAD), geographic information systems (GIS) and Asset & Facility management (AM/FM).

Figure 1 shows a typical architecture of an Enterprise IT.

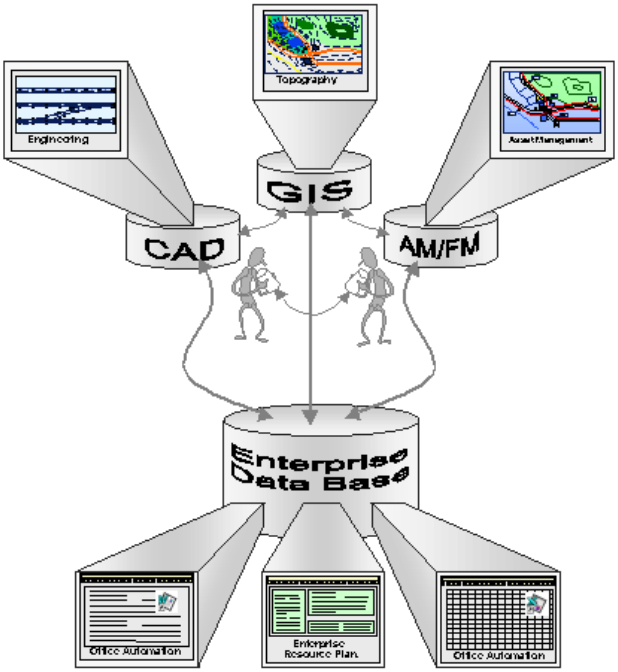

Figure 1

Clear disadvantages of this situation are:

- ✓ Problematic sharing of data, both among the graphic systems themselves as with the administrative applications of the Enterprise.
- ✓ Difficult integration of business processes, the graphic systems tend to have proprietary solutions for both datastorage and development requiring (expensive) specialists for system integration.
- ✓ A complex IT-environment, both for system management as for the database administrator. Separate back-up, recovery and authorisation procedures require additional training and result in extra costs for the organisation.

The new approach following the Spatial-it concept offers significant improvements. Figure 2 illustrates the Enterprise-it architecture in this situation:

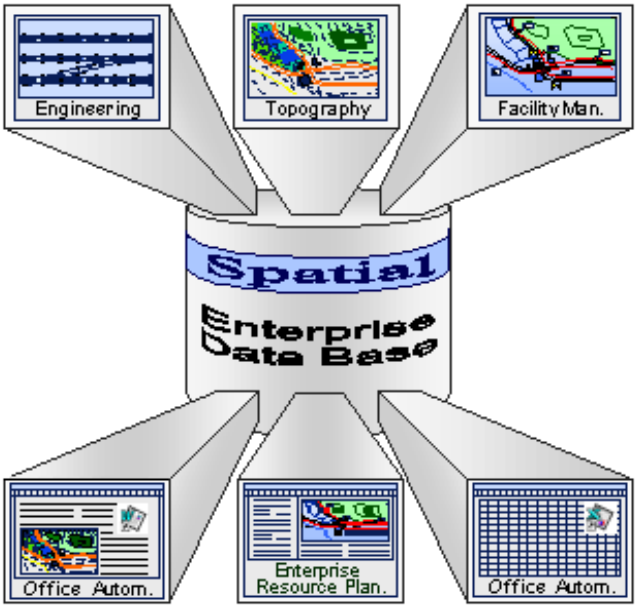

Figure 2

Main characteristics of the Spatial-it solution are:
- ✓ Central database for the whole enterprise. Spatial extensions to industry standard databases allow the storage of spatial-data alongside the alpha-numeric data.
- ✓ Better integration provided by open systems.
- ✓ Predictable, user-friendly and easy-to-learn applications as a result of Windows-dominance and the growing popularity of the Internet.
- ✓ "Ordinary" system management and database administration procedures as the Spatial-it concept transfers graphic systems into "just an other" application following normal rules.

An other aspect of this new architecture to notice is found in the bottom part of figure 2. The low threshold (both cost- and technology-wise) of implementing and integrating Spatial data allows us to extend existing "administrative" application with spatial info. That way thanks to the "picture" the user-viewer group benefits from better quality, more comprehensible and easier accessible information, allowing them to take decisions quicker and probably better.

Spatial-it part of the Enterprise it

With the opening of global markets and increasing deregulation, businesses everywhere are feeling the heat of competition. Many are attempting to face this increased competition by radical restructuring of the business process. This requires that different elements within the Enterprise operate together more closely than they may have in the past. As spatial information technology becomes more open, businesses will make better use of spatial information as part of their Enterprise IT strategy. One of the most interesting no-doubt is the utilisation of spatial data in Enterprise Resource Planning systems (Geo-ERP the next buzz-word in this context…..).
This need is found in businesses who currently use spatial information (like telecom, utilities, government and transportation), as well as other businesses who are relatively new to spatial information (e.g. banks, merchandisers).

To illustrate the extended usage of spatial information technology in concrete business processes we name some typical examples:
- ✓ Better customer support, to enhance existing services and to identify new customers.
- ✓ Dispatch of mobile units for more efficient maintenance.
- ✓ Future planning by correlating infrastructure growth and demographic data.
- ✓ Monitoring of existing infrastructure in various applications.
- ✓ Rapid provision of up-to-date information for disaster recovery.
- ✓ Analyse markets for competitive positioning.
- ✓ Provide an underlying visualisation metaphor for any information systems with spatial attributes (e.g. a marketing or management information system).

Technology providers

Obviously the technology providers play an important role. An introduction to the Spatial-it concept wouldn't be complete without a (global) survey of the market.

<u>Traditional GIS suppliers</u>

From the spectrum of main GIS providers, as we knew it some years ago, some have disappeared from the scene, ESRI and Intergraph are still there as market-leaders. Other players that are still around are MapInfo, Laser-Scan, and if we also incorporate the AM/FM market Smallword and Siemens (SiCad). All of them have in one way or another adopted the new open vision. Most of them have extended their solution by incorporating new elements. They typically have introduced a middle-ware layer of (proprietary) software that governs the data access and storage of spatial-data in spatial-enabled databases.
Intergraph has taken a different route as it has reengineered its GIS product-suite based on completely new windows-based technology. The resulting GeoMedia technology differs in that it doesn't contain the middle-ware layer in its architecture but is fully based on "open" products, thus complying to the OpenGIS philosophy

Traditional CAD/Engineering products

The 2 widest spread CAD-systems, Autodesk's AutoCAD and Bentley's MicroStation both have extended their CAD system with GIS functions over the past few years. With solutions for both the "doers" and "user/viewers" they managed to win a share of the GIS market. Their market segment is predominantly found in the original CAD-customer-base.

Both products are adopting the new technology. If we look at utilising the Oracle Spatial extension as a benchmark, Bentley definitely moves at a quicker pace. Bentley provides functionality to store and retrieve spatial data using Oracle Spatial Cartridge. AutoDesk seems to wait for the right moment to include (and market) this functionality. An other product that has followed a similar path is Belgium based Star.

New products

Finally there are new players that use today's technology to build spatial tools. Ranging from complete GIS environments, modern look-a-likes of existing GIS products, to solutions with a specific focus like viewing spatial information in a 4GL environment. These products often are a collection of objects that can be incorporated in existing or new-to-build 4GL applications, that way fitting into the Spatial-it vision to broaden the usage of spatial data in the Enterprise. The Spatial Info System from Cad Corp is one of these new products that we at Vicrea Solutions have enjoyed using in Spatial-it projects. An other product worth mentioning is Caris ++ valuable as collection of integrateble spatial objects.

Implementation aspects

Although the Spatial-it concept definitely shows the way forward for Geo-it, implementing it the right way isn't all that straight forward. Defining the right migration/implementation path requires in-depth knowledge of the Enterprise and its future plans. Based on that know-how the offered technologies need to be examined thoroughly to select the one that best fits the corporates IT-vision.

Data-model Enterprise Spatial Database

Basis for a Spatial-it implementation is the way the Enterprise (Spatial) Database is structured and populated. Most of the products offered contain a complete migration-path from the existing CAD/GIS environment to a spatial enabled industry standard database (often Oracle's Spatial extension). The emphasis of this approach is on creating an environment in which the "traditional CAD/GIS" products can utilise the industry standard database as datastorage unit in stead of the proprietary files.

The major benefits from the Spatial-it concept can be found in using spatial data in "new" applications, typically an extension of existing administrative applications or newly build, fully integrated solutions. In this context the optimal structure of the Enterprise Database might be different from the CAD/GIS based solution we purchase "out-of-the-box". It will no-doubt be beneficial for an organisations to invest in defining the optimal data-model for the Enterprise requirements first and then see how the offered migration paths fit this model.

Doer-User-Viewer applications

As was outlined describing the various users the applications they require differ significantly. Although all applications potentially can benefit from the mentioned advantages of the Spatial-it concept implementing "user" and "viewer" applications will proof to be much easier than the complex "doer" applications. As the major benefits lie with the "user/viewer" community a useful approach is to primarily focus on finding creative ways that allow these users to benefit from the Enterprises investment in data-capturing and data-management. Ideally this is realised without having to invest enormously in a forced migration of the "doer-applications". This subject itself is worth a separate study, or in the context of this sequence, a separate article.

Conclusion

Spatial-it offers many interesting opportunities for Geo-IT professionals. In coming issues of GeoInformatics these topics will be looked at in more detail. We'll take a closer look at the various providers, the technical and organisational issues as well as at some concrete projects using the Spatial-it concept.

References

In this article information from the various websites of the mentioned technology providers, as well as the Open GIS site was consulted. In addition material from the Australian company Spatialinfo (www.spatialinfo.com) was used. On their site you can find interesting papers dealing with the subject of utilising spatial information in enterprise systems, particularly in utility and telecommunication environments.

2012 addition:

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