GIM INTERNATIONAL INTERVIEWS XAVIER LOPEZ

Making Sense of Endless Data Flow

With a pretty well endless flow of spatial data out there, the possibilities for urban planning, security, map production and other applications are equally infinite. Xavier Lopez is director of product management at Oracle Spatial, a spatial-database management platform that supports all geospatial data types and models. As leader of the group's efforts to incorporate spatial and semantic technologies across Oracle's database technologies, Lopez shares with GIM International some of the latest developments in geospatial data management and provides some insight into what lies ahead for the sector.

What are your responsibilities and what do you consider your successes?
I've been in my current position since 1998. I lead our efforts to incorporate spatial and semantic technologies across Oracle's software divisions: database, application server, and business applications. Oracle Spatial revenue currently exceeds $200 million per year. We have surpassed our competitor's market share to become the global market leader in spatial-database technology. We have also developed and maintained strategic partnerships with over a hundred software and services companies, involving technical integration, business development and channel sales. Added to that, we have executed a plan to integrate location capability across Oracle's software products, enhancing the overall value and differentiation of Oracle-based solutions.

In what kind of industries is the Oracle database used?
It's in just about every industry sector where a database is required that can support many simultaneous users, such as banking, communications, financial services, healthcare, insurance, retail, and many others. Oracle Spatial is an add-on component which we started developing thirteen years ago. It's a tool that provides a native way to store, index and query geospatial data. Over time we have broadened the types of spatial data that can be stored, as new positioning devices and mobile sensors are being developed all the time. Oracle Spatial continues to develop analytical and modelling capabilities as well, and to increase the performance of the platform as a whole.

A few years ago GIM asked you whether, if you kept on adding more and more information to your systems, Oracle would become a GIS. You replied "No". There have been quite a few developments since then.
I put that down to the progress of the web. We have leveraged IT advances to provide products that enable geospatial data management. But Oracle Spatial is not a GIS. As we have advanced, some people think that Oracle Spatial looks a lot like a GIS, but you still need tools to interpret the data.

How is Oracle Spatial addressing the issue of free data that is widely available on the internet?
More data is always good news for companies like Oracle. Geospatial data needs to be managed effectively and securely in a database, and queried through tools, whether commercial or free. The availability of new types of data places the burden on us to develop the ability to store this data so that it can be provided to any of our partner applications.

What functionality is Oracle Spatial developing towards the future?
The general direction we are taking is to continue to include new data types in the spatial-database management platform. Oracle Spatial 11g, the latest release, includes support for 3D data. It's important to bear in mind that 3D means different things to different people. Our 3D data model supports point-clouds, triangular irregular networks (TINs), and 3D vector models. The support for point-cloud enables efficient management of Lidar data used to describe the geometry of a physical object such as a building, or the surface of the Earth. The TIN, a surface model, provides accurate representations of terrain surfaces, o that you can determine whether a building site is sloped, for example, r whether there are changes in the shape of the surface. 3D vector models are used to represent objects such as large collections of buildings.

The level of support we offer for 3D data is targeted to meet the needs of advanced geospatial systems in critical areas such as urban planning, infrastructure management, defence and security, land management and utilities. This type of data is used by urban planners when reconstructing large areas of cities, planning events such as the Olympics, and mapping out emergency-response routes. For many planning applications it is possible to develop line-of-sight applications capable of determining, for example, whether a proposed new building will cast shadows that impact on neighbouring structures.

What is Oracle Spatial doing to facilitate the search and manipulation of very large 3D point-clouds?
With the latest release users can read large a 3D Lidar point-cloud consisting of millions of points as a single dataset, without the need for it to be split into multiple tiles. Application developers can readily load and index a seamless collection of point-clouds while enabling users

easily and quickly to query the data. What is important here is not just the ability to store data, but to index it as well. We provide the storage, indexing and querying capabilities of the central geospatial data repository, while our geospatial, mapping and location partners provide the front-end tools and applications.

The amount of data that has to be stored is growing rapidly. Does Oracle have ways of reducing data size storage?
Data management is bread and butter to Oracle- it's what we do very well. We have diversified into middleware and business applications over the past five years, but the database business is still important. Oracle Database 11g, the latest version of our software, can store and analyse vast amounts of information. Data compression has far more appealing benefits than simply saving on disk storage cost. Because data itself can be highly compressed, information can easily be fetched off the disk devices, improving query performance. The data does not have to be uncompressed before users can read it, so it stays in the compressed format even in the cache. As a result, this type of compression not only helps customers save disk space, but also helps increase cache efficiency, since more blocks can fit in the memory. Oracle Spatial leverages this compression functionality. It makes spatial and text data repositories easier to maintain and improves search and retrieval times.

Developments in data survey are proceeding very fast. With hydrographic surveys seeking more and more detailed information, the amounts of terabytes that need to be stored are increasing too. Hydrographic offices are often very internally focused, but users are demanding more and more data, and they want it fast. HOs normally use only processed data. But new users might be interested in the original datasets. What is Oracle Spatial doing to aid these users? How are you ensuring that raw data is preserved without people having to use major data space that they don't have?
It depends on the organisation that is using the datasets. Hydrographic agencies generally develop specialised workflows to manage different versions of their data and to produce different forms of information. This raw data usually comes from onboard or Lidar sensors; it's detailed, raw point-cloud data. Most applications do not work with raw data, which means that some level of processing generally takes place. This is where specialised maritime tools are applied. But, at each step of the way, different versions of the data (such as point-clouds, TIN models, grid models etc) can be stored in Oracle. Best practice often dictates that versions of the data be stored, starting with the original one, so users can refer to whichever one they are seeking. There are various techniques for storing data, and older data can be archived in files or on tape. There is a difference between archived data which is not used for analytical purposes and version data which can still be used for analytical purposes even though it may not be the most current. It's like the difference between a bank statement which shows you what funds you currently have available in your account, and a transaction record itemising the history of your account over the past six months.

Which developments are determining the direction of the industry?
First there is the large rate of growth in number and type of tracking devices and georeferenced sensors sensing the landscape. Lidar sensors are being placed everywhere; vehicles collecting corridor information in cities. We have moved away from the paradigm of maps solely created by cartographers towards sensor-driven and sensor-generated data which is can be faster, more accurate and cheaper. However, surveyors and cartographers will continue to play a key role in this transformation. This is leading literally to a flood of high-quality low-cost data that will itself give rise to a whole new generation of 3D and virtual world applications.

In addition, sensors are collecting realtime information. Operating from vehicles and trucks, they are sensing not only location, but also the condition of the vehicle, how fast it is travelling, how much petrol it is consuming. This is information that can be delivered to logistics centres, where analysts can use it to help with vehicle maintenance and efficiency. Air-traffic control systems are also important users of these tracking devices. A broad class of consumer-oriented mobile tracking devices are becoming mainstream.

As the availability of both sensors and wireless networks make positioning information ubiquitous, the challenge will remain in exploiting these advances though new and innovative applications.

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