

Interoperability Opens the GIS Cocoon

Interoperability has become the universal mantra for opening GIS and extending its functionality across the enterprise. It looks to be a painful, but exciting rebirth for the technology.

by J.D. Wilson

David Schell may be the most influential individual in GIS today. As president of the Open GIS Consortium (OGC), Schell is leading the drive to develop open interface standards for geospatial information. He considers it his mission to help coax GIS out of its cocoon and into a larger IT world via interoperability.

Actually, some may find the metaphor of butterfly and cocoon a little too mild for GIS' current challenges and changes. But it does accurately describe two fundamental current trends. First, GIS is emerging into a much broader market, with new opportunities and new challenges. Second, the technology is undergoing a transformation that will result in something entirely different from its caterpillar beginnings.

Schell, and OGC, stand at the epicenter of this technical transformation, neither a simple nor a painless process. Not everyone agrees on how or even if the industry should embrace interoperability. But after more than four years, the number and caliber of members now in the consortium indicate the tide is turning toward Open GIS interface standards.

Late last year, OGC delivered its first OpenGIS Specification, for simple geographic features. GIS vendors have committed to incorporate this standard into their products.

Still, on the eve of this transformation, many questions remain:

- If the technology is changing, how will it work?
- If the market is changing, how will grow?
- How can vendors stay in step with the changes?
- What does all this change mean for the users?

Technology Marches

If GIS is to move into the mainstream, then it must adopt and comply with mainstream standards and protocols. Open GIS is not just about creating a means for sharing data between on GIS and another, it is keenly focused on making geospatial data types accessible to non-GIS systems as well. That's why OGC has developed its specifications to comply with other industry standards, including, CORBA, OLE/COM and SQL.

"Growth and maturity in the industry rely explicitly on interoperability based on common interfaces," Schell declares. He suggests that real progress can only be made in an open environment.

In fact, Schell asserts interoperability really is what separates the caterpillar from the butterfly. He points to mainstream technologies for examples. Those that have a high level of interoperability tend to flourish. Those that lack interoperability crawl on their bellies.

Relational database managers, for example, have achieved a high level of interoperability. The technology flies. The Internet—probably the most open and standardized technology of all—has profoundly impacted the computing world in just three years. Flying high.

"The parallel of relational databases hits you on the head," agrees Jean-Baptiste Monnier, vice president of geoengineering for Bentley Systems Inc. "You can't buy a database today that isn't SQL. Consequently, users make buying decisions, not on the data structure, but on the performance of the software. Organizations have more consistency in their applications, and they have a much larger pool of qualified programmers for support."

Schell asserts that open interface standards are the foundation for integrating GIS with other IT systems. They are the keys to all other technical advances that will break down the wall between IT and GIS.

Standard interfaces make it possible to deliver data and applications as components, rather than a totality. "It modularizes all of their components within a single

context. Then they have greater flexibility. It's all gravitating toward plug-and-play. Once you have certain interoperability problems solved, you can break out more specifically designed component modules in that context," Schell adds.

"We see GIS companies becoming more and more conscious of this componentization process—ESRI with MapObject; Intergraph with Geomedia," Schell says. He says GIS companies would begin to realign their product offerings on a component basis.

"What's important is how it impacts the business model. I no longer have to develop and support proprietary development tools or databases," says Intergraph President Eddie Boyle. "I can focus on the "G" in GIS, bring the end-price to the customer down and the value added by my products to a much higher level."

Growing Markets

Of course, technical changes don't occur in a vacuum. They're driven by market forces and user needs. Clearly the market for GIS products and services is changing—and growing. Big companies, like Oracle, IBM, Sun Microsystems and Microsoft are showing up regularly at industry events. The participation of these larger, mainstream companies reflects an emerging understanding of the potential of GIS to solve a number of important computing problems, based on the paradigm of location.

Each of these new players has its own reasons for entering the field. Oracle wants to extend its database functionality to deliver better broad-scale integration to its customers. Sun would leverage Java to develop Web- and Internet-mapping solutions. Microsoft wants to incorporate functionality at the operating system level to support consumer and business applications on its platforms.

"There has been an awakening to spatial information. Eight or 10 years ago we didn't think it was important at all," says Steve Smyth, lead geographer for Microsoft's geography business unit.

"We have come to realize that spatial applications use data to represent things on the planet surface and we want to understand how this is being used, how we can be

providing aspects of the operating system or other software that makes it even more enticing for people to use our products," he adds.

The map is a logical and familiar way for people to understand and use information. As users become more aware of the possibility of map-based, or location-based, computing, more and more developers are exploring the how it may be applied to various business and consumer problems. That's where the real growth lies.

Daratech estimates demand for GIS products in traditional markets will grow at a respectable 15.5 percent rate. But new markets could grow even faster—not incrementally, but exponentially.

It's that potential for large new markets that entices the big players into the game. "Everyone's been talking for years about how GIS is going to explode in the market," Schell says. "Well, GIS itself will not explode anywhere, but applications that use location information to give people answers will do very well in the next generation."

He predicts these applications will be conveyed to market by OEM developers and manufacturers who are putting together devices, instruments, configurations and resources. The emphasis he insists is not on the technology itself, but on giving people the ability to ask questions and get answers.

"These applications won't be for GIS people," he emphasizes. "They'll be for you and me—Joe Citizen, who wants to find out how to get to the Interstate or how to find the nearest gas station."

"There are a wide range of applications outside of traditional GIS, now. That's a new thing," adds Microsoft's Smyth. "Overall the most difficult area is the data itself. People that own data have a hard time getting the true value out of that information. We're working hard to help people package that information so they can get more value out of it."

In these emerging applications, geospatial technology will likely take on much different forms compared to traditional GIS markets. The paradigm of managing data and processes based on geographic location is compelling in many arenas, but for most new applications, GIS part will be invisible, hidden deep within the back office systems.

Even in traditional GIS markets, like utilities and municipalities, expectations are changing. GIS users are shifting their emphasis from solving the basic geographic computing problems to building enterprise-level systems that satisfy broader business objectives.

"The big opportunity is to jump out of the GIS circle," agrees Jean-Baptiste Monnier, vice president of geoengineering for Bentley Systems Inc. "If the objective was just to continue to sell to existing GIS departments then I don't think interoperability would be that important. But if you look at the enterprise, you have to provide accessible data, built on standards like CORBA, SQL and, of course, the Internet."

Pressures Mounting

Traditional GIS vendors are feeling the pressure now on all fronts. Relational Database Management developers are working on geospatial database functionality to supplant the proprietary geospatial data stores; AEC/CAD vendors are extending the functionality of their products and working their way in from the data creation/data management space; developers of corollary systems, like work management and customer information are developing cross-over applications that intrude on GIS-centric functions and applications.

GIS vendors may not be sleeping well these days but there are reasons for optimism.

1. The change will not occur overnight. "Vendors shouldn't be threatened because it moves slowly. It's not as though we're launching a rocket here," Schell says. "Everything depends on the graceful evolution of the communications infrastructure. Everything depends on the development of the interoperability models in conjunction with the client/server architecture. Everything depends upon how fast organizations can absorb and deploy the emerging technology. I don't see this as a cataclysmic process."

2. Geospatial processing will play a more central role in IT. "We think ultimately the paradigm, the model for the enterprise, will be spatial in nature because it simply is a more efficient way to deal with information," Schell says. "Everyone's talking about

virtual reality right now, but in the end, you have to bring it all back down to earth. That means a physical location—an address."

3. With change comes opportunity. The adapters and innovators will find increased opportunities, despite giving up certain technologies, now considered core to their products.

"When you talk about the maturation of any industry, you're talking about exactly this process. The geospatial industry is beginning to mature," Schell explains. "As it matures it understands what it can do well and what other technologies provide that is more useful. The coexistence within the IT framework that they achieve over time is really what we're talking about."

He says GIS companies will do what they do best on a component basis. Components will enter the market and some of the things that GIS companies don't need to do themselves will be done by others.

"There's got to be a shift toward allowing GIS vendors to maintain their specialization and focus their efforts in very competitive markets," Schell adds. "Right now they spend so much expensive development time on the back-end development work—things that aren't really their business. We see this as giving GIS companies the ability to focus on what they do best."

He concludes that GIS developers will benefit to the degree they will be able to extend a greater variety of external data sources to their users. In that way, a lot of systems will become more robust and will be able to make better use of existing data sources.

4. Interoperability Leads to Collaboration. Just like users, who gain collaborative functionality from open systems, vendors, too, can increase their opportunities to collaborate. And partnering with big companies opens the door to new and bigger markets. Interoperability leads to collaboration. Collaboration leads to new opportunities, new markets and new revenues.

Even those companies encroaching on traditional GIS space are clear about their desire to work closely with traditional GIS vendors.

Oracle, for example, clearly wants to extend its data base products to support spatial data, but its model is based on partnerships with GIS vendors, not direct competition. It has drawn a clear line between what it wants to provide in its products and what it wants to partner with others to provide.

"If it's a database function—storing managing and querying data—we want to provide an Oracle option," says Michael Fisher, director of spatial systems for Oracle. "We want to work closely with GIS vendors on everything else, like network modelling, geospatial analysis and application development."

Challenge Breeds Opportunity

The challenge for traditional vendors, will be how to differentiate their products and create a competitive advantage in an interoperable world.

"What's boiling at the center of the market is this issue of how quickly vendors want to open up their installed base," Schell explains. "They enfranchise their customers with greater data

accessability, but those customers are no longer locked into their systems."

So, according to Schell, vendors have to find new ways to attract and keep customers over the long term.

"The parameters of the market are changing," Schell explains. "That forces the GIS people to incorporate new approaches; to live with new realities. It has implications as to how they structure their products; the way they develop marketing channels and the kinds of customers they have."

They must also find ways to capture the mind share of IT managers and system integrators. In many ways, the systems integrators are driving the show. They are charged with making everything work together to squeeze out every last ounce of value in an organization's IT investments.

For organizations working on integration, GIS has been one of the most difficult systems to address. The fact is most large-scale GIS integration projects have not fared too well. "In most large organizations, you find large departments using different technologies and they're all faced with integrating data access on a corporate basis,"

Schell explains. "That's very difficult to do at the system level, but if you can do it at the data level using common interfaces, the integration path is much smoother."

He says open interface specifications could save companies millions of dollars in reengineering costs. "We've seen some real debacles over the years when people try to upgrade the whole software profile of a company. It's much easier in the near-term to develop more general data access models for the corporation and then upgrade the systems over time."

Schell points out that the big systems integrators, like Siemens-Nixdorf and Lockheed Martin—both OGC members—encourage heterogeneous technology environments, because they benefit the customers and make their job easier.

"Open interfaces provide a greater facility in terms of handling heterogeneous information, application by application. It means that if an application is confined with a particular data source because it has been compiled in that environment, it can now go to the network and look at different data sources that may be in other vendors' formats and use those as well." Schell says.

"If you look at the position of the integrators, they're not too concerned about which GIS they use, but they sure do want to make the customers happy," he adds. "They're enthusiastic that they don't have to have their integration scenarios held hostage to small GIS companies any more."

"GIS has to be promoted to the organization in very different ways now," agrees Bentley's Monnier. "You can't put a wall between GIS and IT. Every RFP we see now, has an IT component. They're more involved; they're on the project teams and they want to assure that any new geospatial system delivers integration value."

Moment of Truth

With the release of its first specification, Schell hopes to see OpenGIS-conformant products reaching market as early as this year. So this is the moment of truth. The next year will show how committed vendors are to interoperability; if they really believe it's good for their business or if they're just following the industry hype.

But he stresses that one specification is just the beginning, another will follow this year and about 14 more are in the plan. He believes the momentum will pick up now. With each step more vendors will commit more resources and the process will move forward quickly from here on out.

In addition, OGC has begun courting users from major industries as contributing members. Telecommunications, transportation, utilities and of course government (which remains the largest user of geospatial data and a driver for OGC from the start), among others, are invited to represent their specific needs and requirements to keep the consortium's efforts on track.

In the end, Schell is pleased, and sometimes amazed at how well the industry has come together. "It's interesting to see partnering lists," he says. "You see system integrators and GIS companies working closely together. They form teams, sometimes with multiple GIS companies, trying to solve very general problems and meet very comprehensive user needs. They are more or less driven into a state of real cooperation."

But that's the paradigm of business in the '90s. Competitors often must work together, like partners to advance their mutual interests.

"These companies will start working together in the sense they know they have to exchange data," Schell adds. "The first change will be in enterprise computing, not with a thunderclap but gracefully and modestly. People will start interoperating using the specifications the industry has agreed on.

"We succeed if what we're doing is relatively transparent," he concludes. "If a company can implement the interoperability product and then simply upgrade existing product in the field giving it additional capability, that means that this doesn't have to have a high impact on how people do applications right now. We can take it a step at a time."

And so, not with a bang, but carefully and methodically, the butterfly struggles free from its cocoon.

JD Wilson is a freelance journalist covering business and technology.