BIOGRAPHICAL INFORMATION

Peter Batty
Co-founder and Chief Technology Officer
Ten Sails

Specific Responsibilities

Peter Co-founded Ten Sails in 2002, a company focused on building businesses in the area of spatial and location related technologies. As Chief Technology Officer, he is involved in various areas including evaluation of new technologies and development of technology strategy.

Past Experience

Peter has 18 years of experience in the geospatial information technology industry.

He was Vice President of Technology at GE Network Solutions / Smallworld, and was the first person to move to the US when Smallworld started its operations there. He has successfully led a number of major spatial software development projects.

Before Smallworld he worked in the GIS field with IBM.

He has been a member of the GeoWorld magazine Editorial Advisory Board since 1996, has spoken at many conferences around the world, and has received a record six speaker awards from GITA. He has been involved with industry standards efforts including the Open GIS Consortium and IEC TC57 Working Group 14, and is a member of the GITA Board.

Educational information

B.A. in Mathematics (First Class), Oxford University

M.Sc. in Computing, Oxford University

Professional memberships

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TECHNOLOGY TRENDS IN THE SPATIAL INDUSTRY

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ABSTRACT

This paper takes a wide-ranging look at various technologies and trends that will impact the spatial industry over the next few years. Developments in wireless communications and mobile devices will have a major impact on IT overall – the paper summarizes these and looks at how they will impact geospatial applications. Web services is another broad technology which, together with other Internet-related developments, will have a major impact on the way that geospatial projects are implemented and how data is maintained and shared. Location tracking technologies, both global and local, combined with wireless communications, provide great scope for new real time spatial applications. As technology advances in general, offerings from non-traditional GIS vendors including Microsoft and various web mapping vendors are creeping up on the traditional GIS products, which could result in some significant changes in the industry over the next few years. These and other trends are reviewed in an exciting look at the direction of the industry over the next few years.

THE IMPACT OF THE INTERNET

The impact of the Internet on geospatial applications, as with all areas of IT, continues to accelerate. Increasingly sophisticated applications can be accessed via the web anywhere in the world, and more and more data is accessible online.

While many people think primarily of browser-based applications when the Internet is mentioned, it is much more than that. Much of its impact is as an all pervasive network connecting computers globally. In the spatial industry, a key impact of this is the ability to interactively access spatial databases anywhere in the world. This opens up many interesting opportunities. One example is the use of external databases of various types, including landbase, road databases with information relevant to routing, and demographic databases for marketing purposes. Another is the use of people in “low cost countries” for doing work such as data maintenance, working directly against the live database.

Web services

Web services are a mechanism for packaging functionality to be used across the Internet. Web services are both an important component of Microsoft’s .Net strategy, and a widely used technology on other platforms. It is interesting that Microsoft’s first .Net web service provided spatial services including maps, driving directions, distance calculations, proximity searches and other location intelligence. Many of these services can be utilized even by organizations that have already implemented an in house GIS. One example in

particular is routing of work crews. A number of organizations have implemented applications to do routing based on the street data in their GIS landbase. However, such internal data is typically not designed or optimized for routing, and will usually not contain important information such as one way streets, turn restrictions, and speed limits. It is far more appropriate to use an external commercial application dedicated to routing, with a detailed street database that is maintained by someone else, for such applications. This functionality can be easily called as a web service. Precise matching of the external landbase against that used by the utility is generally not an issue at the scale of a routing application – and in many cases addresses are used as the start and end point, which can be matched in either system if necessary. While web services may have been more commonly used in browser-based applications, there is also clear potential for using them from traditional client-server GIS applications, as in this example.

Functionality continues to be added to commercial routing applications, and one of the next big steps forward will be the incorporation of real time traffic information for calculating routes. Utilities using these external routing applications will be able to immediately take advantage of these new developments.

ENTERPRISE INTEGRATION

Integration continues to be a major focus in most GIS projects in utilities. According to Aberdeen Group, on average 40% of IT budgets are spent on integration – and up to 70% in many cases. The bulk of the effort in this area within utilities is in integration between a spatial system and other non-spatial systems, such as work management, asset management or customer information, rather than integration between different spatial systems. Adoption of Enterprise Application Integration (EAI) software as an integration approach continues, though this approach requires a major corporate commitment so overall uptake is still relatively low in the industry (see Batty, 1998 for more details). Both the IEC TC57 Working Group 14 and the MultiSpeak initiative continue to do good work on integration standards for utilities

In the spatial arena, the new OpenGIS standards based on XML continue to have good momentum and support from the major vendors. This technology is now at a point where interaction with remote databases in different vendor formats across the Internet is very viable: the barriers to widespread use of this approach are now more business and organizational issues than technical ones.

WIRELESS COMMUNICATIONS

Wireless communications are rapidly making the transition from being a proprietary, complex and expensive technology to a pervasive and cheap commodity. In the next few years, we will get to the point where all mobile devices have a broadband connection to the Internet all the time, wherever they are. At the time of writing this paper (January 2004), T-mobile offers wireless Internet connectivity in the US, using GPRS, for a flat fee of $29.95 a month. This provides 56kbps connectivity, with broad coverage across most urban areas in the US. It can be used with phones or with a network card that plugs into a laptop. Ricochet offers wireless service at 200-300kbps for $24.95 a month – currently

only in Denver and San Diego, but they plan to expand to other cities soon. “3G” wireless technology which is starting to roll out in some places (mainly outside the US) will initially provide speeds up to 384kbps, and later up to 2Mbps. WiFi is an increasingly pervasive technology which provides localized wireless network access at up to 54Mbps.

As all these technologies mature, the differences between a mobile user and a desk-based user are largely eliminated (apart from hardware form factors and usability issues, which will be discussed below). This will completely change the paradigm for mobile GIS applications. No longer will it be necessary to worry about how much data can be stored on a local device and how often it should be updated – mobile users will just directly access corporate and Internet-based databases like any other user.

Today the major obstacle to widespread implementation of wireless applications for utilities is coverage rather than bandwidth. Current bandwidth is acceptable for most mobile spatial applications, but coverage in rural areas is sparse, which is an issue for many utilities. The dilemma for organizations implementing mobile applications in the short to medium term is to decide at what point to make the transition to a completely wireless approach. There are solutions today which use wireless communications and have mechanisms for storing data locally when a wireless connection is not available. This approach is workable for some applications, but adds complexity and has significant limitations compared to a situation where a wireless network is always available.

LOCATION TRACKING

Another key technology for field applications is of course location tracking, which is an area where significant advances are being made. GPS has been around for some time, but is now becoming much more of a commodity, with GPS receivers being found in cars, phones, watches, and cheap handheld units. Bluetooth enabled GPS receivers are now available, which can communicate wirelessly with laptops or PDAs over short distances, without needing to be physically connected.

Most new cell phones are beginning to be location enabled, either using GPS or other mechanisms such as E-OTD (Enhanced Observed Time Difference), which does not require special hardware in the handset, but uses a system based on triangulation from cell phone towers. In the United States, the move toward location-aware mobile phones has been driven by the E911 government mandate, which obliges phone companies to be able to locate people who make emergency calls. The original compliance deadlines have been moved back; the current mandate states (in overview) that most new mobile phones activated by the end of 2003 must be location aware, and by the end of 2005 the phone companies have to ensure that 95 percent of handsets in operation are location aware (full details are available at http://www.fcc.gov/911/enhanced/).

Location accuracy achieved by cell phones is generally less than that achieved by dedicated GPS units – the E911 mandate requires location accurate to 50 to 100 meters (150 to 300 feet) in most cases. This is obviously not sufficient for accurately locating facilities in the field, but it is good enough for many applications relating to tracking crews. Location enabled phones also open up many opportunities for more consumer oriented applications, or “Location Based Services” (LBS). LBS was very heavily hyped

ahead of its time, and the market has not developed as quickly as anticipated. It is still not clear whether there is lots of money to be made from consumer LBS applications. However, the technology has real benefits and there clearly will be a lot of applications being developed in this area over the next few years.

There are also a number of interesting new location tracking technologies being developed. Many of these can be categorized as “Local Positioning Systems” or LPS – these systems use sensors to track “tags” within a localized area. A variety of sensing technologies are being used for this, including Ultra Wideband radio (UWB), microwave, and WiFi. These technologies are primarily of interest for accurately tracking location indoors, which is something that cannot be done by GPS. Accuracy of these systems can be as good as a few inches in real time (though accuracy characteristics of different technologies vary significantly). In addition to “micro GIS” like applications, such systems also provide a foundation for a whole new category of applications known as sentient computing, which have the ability to sense the real world around them, so that they can automatically interact with people or other systems.

One application area where LPS technology has significant potential is in tracking staff, patients and assets in hospitals. For example, when a doctor walks up to a patient, the patient's records could automatically appear on a screen of a tablet PC, and the system will record that the patient has been visited. This sort of streamlined workflow can provide huge benefits, particularly in a busy emergency room environment.

In utilities, improvements in tracking technologies open up the possibility of a future in which spatial databases are automatically updated in real time as facilities are installed in the field.

HARDWARE FORM FACTORS

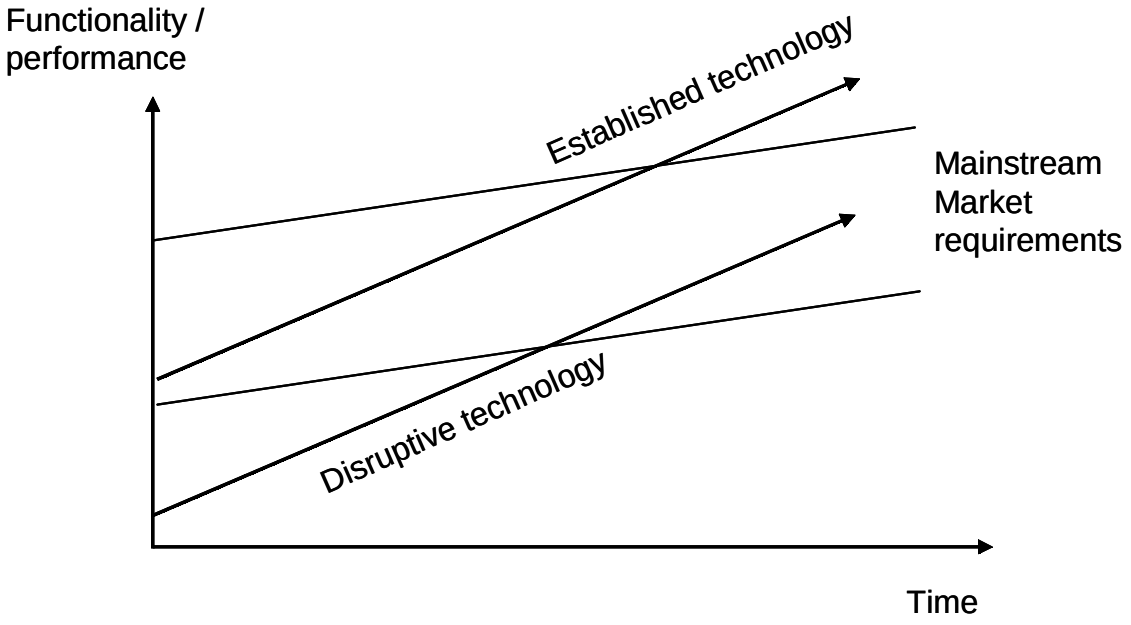
The IT industry is seeing a major diversification of hardware form factors, especially for mobile applications, which will have a significant impact on application design and user interaction with systems. In additional to traditional desktop and laptop PCs, there are now tablets, PDAs, smart phones, in car navigation systems and even intelligent GPS-enabled watches. New types of peripheral include wireless Bluetooth headsets and heads up displays, and new means of interaction such as voice recognition and voice synthesis are maturing.

Small displays on devices such as PDAs and smart phones are a reason to rethink when maps are really needed to answer a question. Just because maps have been used in the past to carry out a task, doesn’t necessarily mean that they always need to be used. Driving to a given address is a good example. A combination of voice instructions and direction arrows indicating when to turn is a much safer and more effective way of guiding a driver than them having to use a map. This is yet another reason to use commercially available navigation systems rather than applications developed in house for routing. In other situations, specialized on the fly schematics showing only items relevant to the task in hand can be a much more effective way of using limited screen real estate than traditional maps.

Voice interaction is a technology which has been around for some time and which is now well established in a number of mainstream applications. The technology is under-used in mobile spatial applications, but it has excellent potential in this area. Field workers generally do not like typing: if a lineman can just say “transformer installed” and this is picked up by a wireless microphone attached to his helmet, this is much easier for him than having to type in information or select items from a tablet or PDA (and of course the GPS unit in his pocket reads his location as he is speaking).

USABILITY

Robert Dutkowsky, former CEO of J.D. Edwards, suggests that the “next big thing” for software companies is not adding more and more features, but focusing on ease of use and implementation. He feels that this is what customers really want and are willing to pay for. This applies very much to the spatial industry. It shouldn’t take years of effort from specially trained people to implement a GIS. The industry may be ripe for some disruptive technology, as described in Clayton Christensen’s book “The Innovator’s Dilemma”. He describes examples from many industries of how technologies which were initially regarded as too “low end” for mainstream users improve in functionality and performance, to the point where they can meet the needs of the mainstream, and they can take over from the previous generation of more complex solutions at a much lower price point.



Microsoft MapPoint has many characteristics of a disruptive technology, and while it has been under the radar of many traditional GIS users, it continues to increase in functionality and is getting to the point where it may offer an alternative to traditional products for many simpler applications. A very large percentage of users of products from traditional GIS vendors are using a very small subset of functionality – viewing, doing simple queries, printing, etc. For such users, MapPoint or similar products may be very

attractive options. Whether via Microsoft or others, the industry will see significant improvements in ease of use and implementation over the next few years.

One avenue for improving ease of implementation is the Application Service Provider (ASP) model, which was hyped ahead of its time (like LBS), but has seen some significant success recently in other fields, for example salesforce.com. There are a number of vendors now offering ASP services for spatial applications.

MOVING TO THE MAINSTREAM

There has been much talk about spatial technology moving into the mainstream in recent years. This has been happening gradually for a while, but has been accelerating recently, in particular as Microsoft and Oracle get more engaged in this space. Microsoft's efforts have already been mentioned. Oracle has had a presence in the traditional GIS industry for some time, but took a significant step with the announcement of Oracle 10G, which includes enhanced data modeling capabilities, including network modeling, topology, and raster handling; a variety of spatial analysis capabilities; and perhaps most interestingly, a Java map viewer. For some time now, all the major GIS vendors have incorporated Oracle Spatial into their solutions, though to varying extents – some have used it as an essential core piece of their system, others treat it as an optional component. Now with 10G, Oracle moves from being largely complementary to the major GIS vendors to being competitive with them for some applications. There are several possible consequences of this, some which may be good for the industry and some which may not.

With both Oracle and Microsoft moving in from different angles, we could see some significant changes in the vendors in the spatial industry in the next few years – it will be interesting to see how the current spatial vendors adapt to these changes.

A FOCUS ON BUSINESS APPLICATIONS

Another trend which has been ongoing for some time is a move from organizations looking for a generic "GIS", towards specific business applications which incorporate spatial technology – such as a utility design system, or an outage management system. Increasingly people just expect appropriate geographic information to appear in any application, where it is appropriate – for example most Internet applications which list addresses now provide the ability to display a map of the location with a single click, generate driving directions, etc. This is in many ways the essence of spatial technology becoming part of mainstream IT.

SUMMARY

In the short term, some of the major trends in the industry are a continued focus on specific business applications which incorporate spatial technologies; a focus on integration, which includes technology approaches such as XML and EAI and various standards initiatives including Working Group 14, MultiSpeak and the Open GIS Consortium; continuing to move more into the mainstream of information technology; and rapidly increasing use of the Internet. In the medium term we face the prospect of

wireless connection to the Internet wherever we go, which opens up many exciting new possibilities; highly accurate and pervasive location tracking technologies; and convergence of many technologies for a new generation of mobile applications. The continued move towards the mainstream also has the potential to result in some major changes in the players in the spatial industry.

REFERENCES

Batty, P.M., 1998, Beyond GIS – a new level of integration: Proceedings of AM/FM Conference XXI.