Building Spatial Portals: Key Issues and Lessons Learnt

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Developments in GIS technology now offer far greater opportunities for distributed geospatial computing. These include access and use of both spatial data and functional services, and their integration with other remote services or within traditional desktop environments. These developments significantly impact the GI industry, bringing new efficiencies and challenges, as well as altering system design, development and management strategies. Spatial portals, both within individual enterprises and for state, national and international data infrastructure initiatives (NSDI or GSDI) provide a means for ordering, managing, discovering and accessing distributed geospatial services, and as such are essential to the future of GIS.

Recently, spatial portals have generated considerable buzz within the GIS industry. We have seen the successful launch of a number of high profile spatial portals, and governments, industry bodies and corporations around the world working to establish more. Portals are the focus of academic conferences, industry meetings, papers and magazine articles. Driving this surge of interest is a strident call to improve sharing, integration and interoperability of spatial data and

functional services – a call that resonates throughout the world. In order to understand this trend and fully appreciate the factors involved in portal development, it is worth stepping back a little and placing this recent clamour in the broader context.

Calls to improve integration, standardisation and sharing of spatial data and functionality are not new. Indeed this has been the very *raison d'être* of GIS from its birth. GIS overcame the artificial separation between the graphic 'map' and related textual or gazetteer information – it 'integrated' attributes and graphical information. GIS made overlaying (or 'integrating') multiple map layers easier – more layers could be analysed more quickly and more effectively than when using paper maps. Mathematical transformation of digital map data allowed maps of different scales and projects to be standardised – brought into a common standard that enabled them to be viewed together and integrated. It was possible to transfer and share digital map data in new ways - taking maps and geographic analysis from the confines of map libraries and distributing them across networked computers or on tape or disk. The pioneers of GIS were right to be excited - GIS promised and delivered real changes in the way spatial data was managed, shared and used – and through this the opportunity for real efficiencies.

On this promise governments and other organisations started building large-scale GIS datasets and functionality. As GIS grew more accessible and easy to use, the number of organisations actively involved in creating spatial data grew dramatically. Organisations that had hitherto relied on others to produce spatial data embarked on their own data capture and analytical initiatives. However, as the digital datasets and applications emerged from this burst of activity, it became apparent that barriers to integration, sharing and interoperability remained. The shear number of organisations involved increased the potential for incompatibility and duplication between initiatives. Differences in data models and nomenclature, differences in technology, limitations of hardware and network infrastructure to support transfer and sharing, and the lack of common coding or transfer protocols all frustrated realising the full potential of these anticipated benefits. A series of probing reports and studies commissioned governments and organisations around the world in the late 1980s and early 1990s illustrated the extent of this problem (those of the Canadian Government (1986), United Kingdom (1987), United States (1990) and Netherlands (1995) for example). Though conducted entirely independently, these studies revealed similar conditions and came to similar conclusions. Considerable progress had been made in developing spatial databases and functionality. Great potential lay ahead. But lack of standards, lack of integration, lack of awareness of data or system availability, duplicated resources and so on was both costly and impeding development.

These studies led directly to a drive to establish national and international standards for spatial data and metadata formats, and a renewed focus on sharing geographic knowledge (both data and functionality) within and between organisations whether these operated on a local, state, national or international level. The result was the Spatial Data Infrastructure (SDI) initiatives, metadata inventories and data clearinghouses that began appearing towards the late 1990s. Moves in the wider information technology (IT) industry supported this development. Server technology capable of efficiently storing and hosting very large spatial and textual datasets became readily available, new programming paradigms stressed re-usability, componentisation and, increasingly interoperability between applications. Linked to and building from this, the evolution of Web technology from a simple and relatively slow presentation tool, to one capable of hosting very large datasets, integrated discrete services on-the-fly and running live search, interrogation, analyse and payment functions paved the way for spatial portals. This made spatial portals feasible. The Geography Network (www.geographynetowork.com) launched back in July 2000 was perhaps the first large-scale spatial portal and now been followed by many others such as the Geospatial OneStop (http://www.geodata.gov/gos) , Indian NSDI (http://gisserver.nic.in/nsdiportal/gotogos.jsp), European INSPIRE (http://eu-geoportal.jrc.it/) and others.

A number of lessons can be found in this story that are relevant for those embarking on portal development.

1. The aims of current spatial portal projects are remarkably similar to those that inspired GIS development since its inception. To increase the ease with which spatial data can be developed, maintained, accessed. To increase the ease with which spatial information can be distributed. To promote and facilitate usage and accessibility of spatial analysis. “Doing a spatial portals” should not be viewed as any new or radical. It is better viewed as simply another step along “doing GIS”.
2. The portals we see today are in fact the products of multiple long-term initiatives that have a long history. Though technology now permits the construction of portal sites within a matter of weeks, successful portals have long gestation periods. Behind the portal sit a network of inter-organisation relationships, shared standards, goals, metadata libraries, licensing and usage agreements and so on all of which must be in place before portals can function properly. Building this network can take time.
3. Many of the national and international standards now available provide useful points of reference for organisations settling out to establish spatial portals. However, this is an initial framework only. It is possible to adopt well-defined, recognised international

standards for data formats, metadata, harvesting routines and so on. However, these still need to be implemented within a unique environment. This process requires interpretation, education, compromise and change to align current practices and effectively utilise generic standards work in a specific environment.

4. Some significant issues remain, even today. Limited progress has been made on standardising data semantics (how real world features are modelled and classified by different organisations), and work on sharing complex code and data structures across multiple platforms is only just beginning. Generic models and classifications schemes are available; as are initial efforts on coding sharing, however much remains to be done in this area.
5. These issues accepted, a practical approach to portal development can yields high returns. The ideal system – complete interoperability, semantic standardisation and so on - may still be elusive, however portals now implemented within a particular department or organisation can address real, longstanding problems. These are problems that have been identified for some time – waiting for the ultimate solution merely prolongs and exacerbates them. Portals are simply another phase in the evolution of GIS – which has always evolved through the pragmatic application of available, practical solutions. If the early pioneers of GIS technology had waited until all the issues they sought to address were entirely resolved we would undoubtedly still be producing and working with paper maps.