



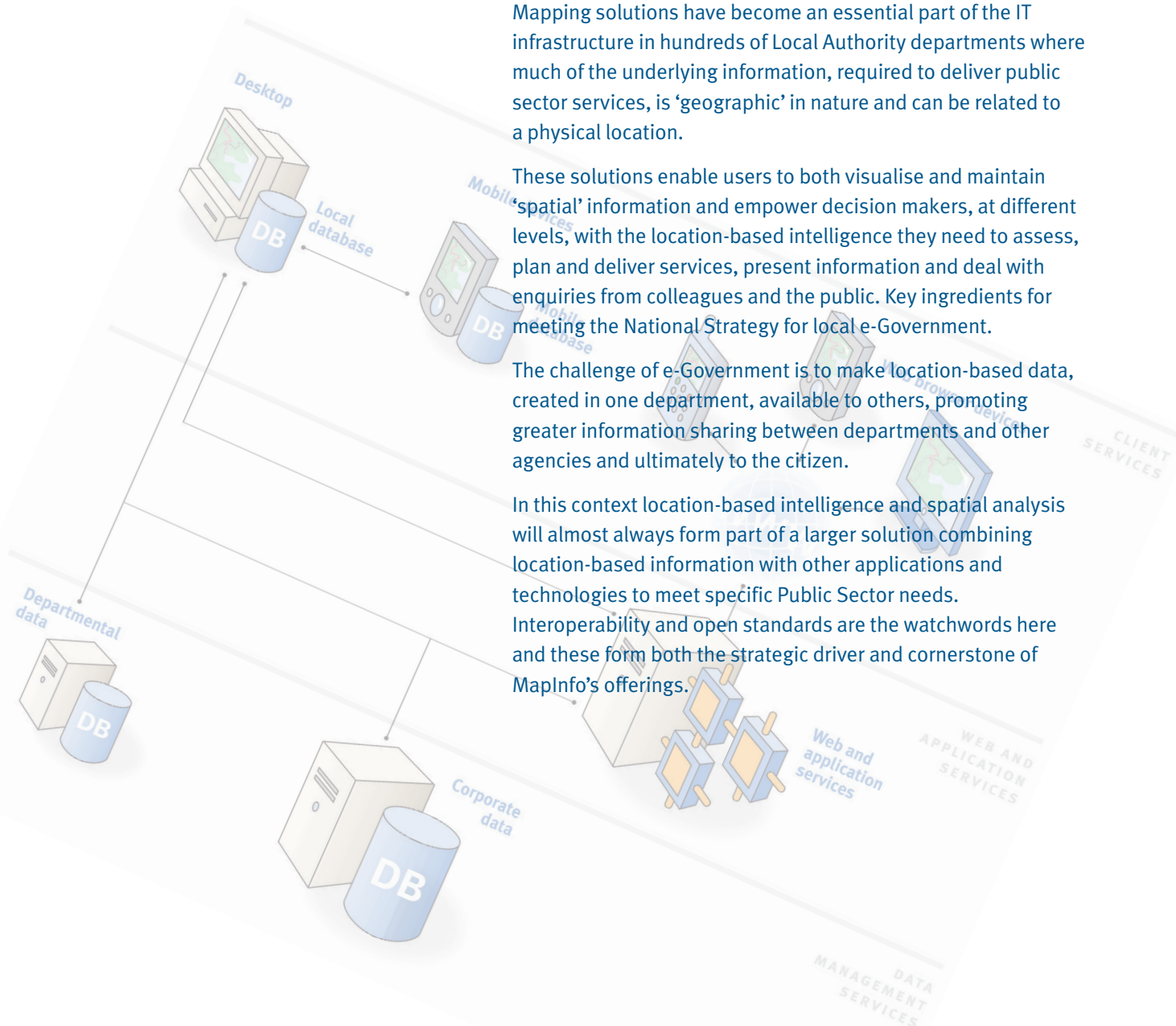
Bringing GIS to the enterprise: standards and interoperability

Mapping solutions have become an essential part of the IT infrastructure in hundreds of Local Authority departments where much of the underlying information, required to deliver public sector services, is 'geographic' in nature and can be related to a physical location.

These solutions enable users to both visualise and maintain 'spatial' information and empower decision makers, at different levels, with the location-based intelligence they need to assess, plan and deliver services, present information and deal with enquiries from colleagues and the public. Key ingredients for meeting the National Strategy for local e-Government.

The challenge of e-Government is to make location-based data, created in one department, available to others, promoting greater information sharing between departments and other agencies and ultimately to the citizen.

In this context location-based intelligence and spatial analysis will almost always form part of a larger solution combining location-based information with other applications and technologies to meet specific Public Sector needs. Interoperability and open standards are the watchwords here and these form both the strategic driver and cornerstone of MapInfo's offerings.



GIS JOINS THE IT MAINSTREAM

Since GIS software first arrived on the desktop in the mid-1980s, it has proved its worth in every major European public sector organisation. It has given government a powerful means to manage resources and made it easier for citizens to access the services they need.



e-GIF

The e-GIF is one of a number of frameworks acting as the foundation of the UK e-Government strategy. It defines the technical policies and specifications governing information flows across government and the public sector. They cover interconnectivity, data integration, e-services access and content management.

Support for Spatial Databases

Facilitating better sharing, administrative control and management of GIS data, MapInfo offers native support for Oracle Spatial across its entire product line. With the addition of MapInfo SpatialWare, a geo-spatial server, similar support is offered for Microsoft SQL Server.

Recently MapInfo and other GIS vendors, all members of the OpenGIS Consortium, announced a landmark initiative to facilitate multi-vendor interoperability via Oracle Spatial® enabling users to 'mix and match' spatial tools and technologies. The companies are developing Interoperability Kits, based on Oracle Spatial, which will enable customers to more easily share data among the vendor's systems and take full advantage of the relative strengths of each vendor.

But, to realise its full potential, GIS data and technology must now move beyond the desktop and departmental space onto the centre stage of enterprise IT.

Managers, politicians and the public have seen the power of GIS to make best use of limited resources, and they want much more of the same. So the pressure is on IT departments to merge separate silos of data and technology so that GIS can drive up productivity across the whole organisation.

Interoperable systems will let people in different areas work together more efficiently, making better decisions and avoiding duplication of effort. This, in turn, will help managers meet joined up government targets, such as the UK's 2005 e-GIF (e-Government Interoperability Framework) deadline.

When bodies ranging from city councils to hospitals and police all use the same compatible GIS data and systems, technical barriers to collaboration will disappear. With a common view on the location of people and resources, employees in many different organisations can cooperate effectively to achieve shared objectives.

The biggest benefit of this will be faster, better public service. However, sharing data and technology has an added bonus. It also makes IT management and maintenance tasks easier, cutting costs and reducing the load on staff.

Standard Route to Interoperability

The starting point for interoperable GIS is a set of standards defining spatial data and the way it is stored, processed, presented and delivered. These standards can be divided into two categories: those that have already been developed in other branches of IT and ones specific to GIS.

In the first category, the W3C (World Wide Web Consortium) provides many standards for presentations and delivery of information across networks. These include SOAP (Simple Object Access Protocol) and WSDL (Web Services Definition Language). Similarly, de facto standards for data storage are provided by database systems, such as Oracle and SQL Server, which can now handle spatial data alongside other forms of data.

Essential standards, specific to interoperable GIS, are being developed by international bodies. The leader among these is the Open GIS Consortium (OGC), which is dedicated to publishing GIS standards, but the International Organisation for Standardisation (ISO) has also made important contributions, particularly in adding spatial capability to SQL.

Together, these and other standards organisations have provided foundations for Web-based GIS that can share data and software across intranets and the Internet. For instance, they open the way for the use of Web portals that are one-stop-shops for multiple services based on geographic data.

In the UK, such portals will play a key part in reaching the government target that 100% of its services will be electronically deliverable by 2005. Similar GIS portals, accessed via intranets, will let public sector bodies share geographic data and software across many sites to achieve joined up government.

As established GIS software adopts OGC standards, it will become easier to build new Web-based systems based on current departmental applications. Integrated systems with hundreds of users that once took months of custom programming will soon be achievable using standard software.



MapInfo and Open GIS Consortium

MapInfo has been an active principle member of the Open GIS Consortium (OGC) since 1995. The OGC mission is to promote the development and use of advanced open systems standards and techniques in the area of geo-processing and related information technologies. MapInfo recently led the way to unite OGC and the OMA Location Interoperability Forum (LIF) at the geometry level. This will give a common technology base for all products from standalone data creation, through Web GIS and on to mobile applications for phones and PDAs.

Providing Server Support for WMS

MapInfo's industry leading web-mapping server, MapXtreme, provides server support for OGC WMS version 1.1.1. This is an important step for local and central government agencies that need to share geo-spatial data across different departments, levels of government and jurisdictions to aid their e-Government and public safety efforts. Additional implementation of OGC standards such as WFS and GML are in development.

GIS over the Internet

Over several years, OGC has developed a conceptual model for sharing of GIS information across the World Wide Web. It now supports this with a set of standard specifications designed to ensure that conforming systems can always work together.

Central to these standards are WMS (Web Mapping Service) and the WFS (Web Feature Service) interface specifications. WMS can deliver images dynamically using HTTP (HyperText Transport Protocol) in standard formats such as GIF, JPEG and PNG.

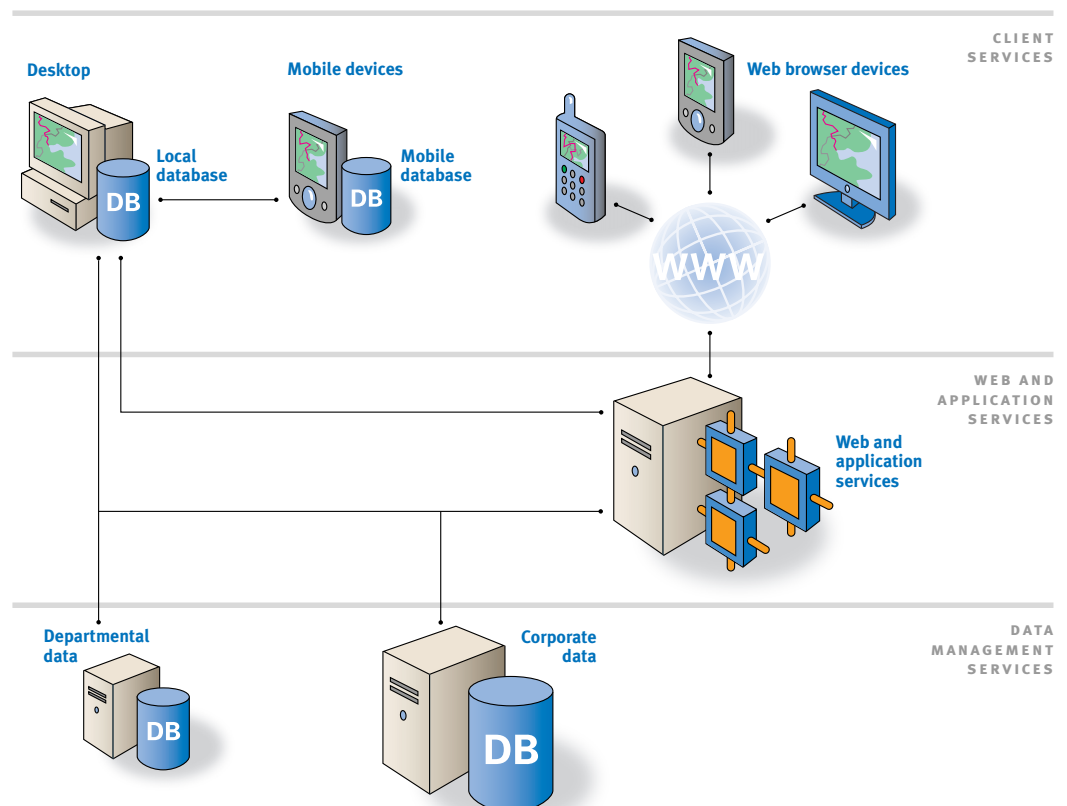
To combine maps from different, incompatible sources, WMS produces an array of pixels ready for display. In addition, it can handle basic queries about map content and tell other programs about the maps it can produce and which of these can be queried further – referred to as metadata.

WFS is for accessing information on features such as land parcels and areas of wetland. It describes data manipulation of points, lines and polygons so that servers and clients can communicate on a feature level. In response to feature requests generated by client software, it returns sets of vector data and attributes.

So that WFS and other GIS servers can interact efficiently with clients, OGC has developed GML (Geography Markup Language), a version of XML (eXtensible Markup Language). GML encoding is optimised for transport and storage of geographic information including geometry and properties. It can also support spatial tasks ranging from portrayal to analysis, enabling independently developed applications to interoperate.

GML encoding separates content from presentation, so different maps or instructions can be produced from the same dataset. It can also be used with standard XML tools such as those for filtering (XSL) and visual presentation (XSLT). Using XSL tools, for instance, enables subsets of GML data, such as low definition or limited feature versions, to be extracted and published.

MapInfo e-Government Interoperability Architecture





INSPIRE

INSPIRE is a recent initiative launched by the European Commission. It aims to make available relevant, harmonised and quality geographic information to support formulation, implementation, monitoring and evaluation of Community policies with a territorial dimension or impact.

INSPIRE is a legal initiative of the EU that will address technical standards and protocols, organisational and co-ordination issues, data policy issues including data access and the creation and maintenance of spatial information.

INSPIRE is the first step of a broad multi-sectoral initiative, that will initially focus on spatial information needed for environmental policies and that will be open for the needs of other policy areas, such as agriculture and transport.

Applying Standards

The public sector is leading the way in large-scale standards-based GIS projects. In the UK, these include National Street and Land & Property Gazetteers that unify information previously held in a variety of formats and locations. Also under development in Britain are a National Land Information Service and Land Use Database.

These initiatives, designed to benefit authorities throughout the country, use OGC international standards together with national GIS standards. Among the UK standards used are e-GIF XML schemas for structuring geographic data and British Standard BS7666 for defining addresses.

In the UK the master dataset underpinning all these initiatives is Ordnance Survey's MasterMap. This seamless 1:1250 scale dataset with unique identifiers for every topological feature is delivered in GML format over the Internet. In this way, it provides a single, centrally updated repository that supplies consistent information to thousands of organisations across Britain.

Similar interoperability is supported at a European level by INSPIRE (INfrastructure for SPatial InfoRmation in Europe) an initiative to create an infrastructure for spatial information services. These will let users identify and access spatial or geographical information from a wide variety of sources, from local to the global level, free of geographic barriers.

To help both the public and private sectors benefit from new standards, OASIS (Organisation for the Advancement of Structured Information Standards) is developing interoperability specifications. These build on standards such as those from W3C, providing guidelines on how they can be used to build practical e-government and e-business applications.

Combining Resources

As GIS desktop and server products adopt the new standards, migration to web-based systems will become less expensive. In London, five borough councils, which make up the The London Central Partnership, are already taking advantage of this to consolidate data in GML format and use it to give citizens a seamless view of facilities across the city.

Through a project called LondonCABI (London Council Information from A to B), data from all the councils, including property and land gazetteers, is now stored on a central database. This is linked to a WMS server product supporting a Web site that allows visitors to find facilities, ranging from parks to recycling centres, across all five boroughs.

As the next step in development, the same level of multi-borough information will be made available via the boroughs' own Web sites. Staff in the boroughs can already access the central data through their desktop GIS software, and combine this in their own applications using WMS.

Derbyshire County Council is implementing a similar standards-based system to serve 30 of its own departments and partner organisations. It aims to provide all users with consistent GIS information while also cutting the overall cost of data and software maintenance.

At the heart of this system is a data warehouse acting as a unified, easily administered spatial data repository. Because data are in GML format, sharing them with partner organisations via an intranet is simple. It also means the system can handle OS MasterMap data alongside local land and property gazetteers, making information available via handheld devices as well as PCs.



LondonCABI

"The CABI project seeks to demonstrate that the combined information of 5 local authorities is more powerful and relevant to customers than an authority by authority view, particularly in large metropolitan areas like London. It aims to identify good data management practice and develop a consistent geographical interface for the public which will deliver Council information to citizens for the whole partnership area through each Borough's own web-site.

The project will act as a proof of concept that the partners can work together sharing geographical data using open standards, and creates a framework which other London boroughs could in time subscribe to", explains Dave Yarwood, GIS Project Manager at lead partner Royal Borough of Kensington & Chelsea.

PlanAccess, a web map server solution from MapInfo Partner, GDC, and built on MapInfo MapXtreme is being used to deliver mapping to each partner using either OGC WMS compliant calls, or direct calls to PlanAccess to provide feature rich mapping and functionality including NLPG Gazetteer searching. Partners will not need to install any software on their own web sites.

Envinsa™

MapInfo® Envinsa is an Enterprise Location Platform that provides geospatial Web services. Envinsa is chosen by enterprise users and service providers, because it is distributed, scalable, secure, and follows industry standards. Envinsa Web services follow the Web Services Standard and are fully compliant with SOAP, WSDL, and UDDI.

Envinsa geospatial Web services are all based on and extend the OpenGIS OpenLS specification and follow the Geography Markup Language (GML) specification. Some services provide additional location-based functionality to what is outlined in the OpenLS specification. Adherence to these specifications ensures that Envinsa Services can be combined with services from other organisations in order to create robust applications that solve unique problems.

WMS Client Capabilities in MapInfo Professional v7.5

The latest version of MapInfo Professional, the leading software for mapping and geographic analysis, already provides WMS client capabilities. This enables users to easily access remote data over the Internet from any WMS enabled server anywhere in the world.

Web Services

Central spatial databases are not the only route to sharing GIS facilities over the Internet. Web Services, built on platforms such as Microsoft .NET and Sun ONE (J2EE), can also offer the alternative of peer-to-peer interoperability.

XML Web Services using SOAP allow systems to share data and functionality via the Web, even if their software is incompatible. Using this approach it is possible to make maps and location capabilities in one GIS application available to users of software from a different supplier. With high-speed links between hardware, the local and remote GIS software will work together seamlessly, so users need not know a Web Service is in operation.

Since Web Services allow simple devices to interface with sophisticated applications, they are well suited to systems used with a wide variety of clients. These might include standard browsers on PCs, PDA and WAP phones used by home workers and staff in the field.

For IT managers with tight budgets and in-house skills shortages, a new generation of interoperable systems may seem out of reach. But, as XML Web Services developer tools optimised for GIS arrive on the market, integrating existing systems will become a practical option for many organisations. For instance, local authorities will be able to build Web Services to overlay their detailed maps showing local resources on larger maps maintained in a national database.

New Options

Web services also open the way for ASPs (Application Service Providers) to deliver 24x7, fully managed GIS applications over the Internet. These could range from fully functional departmental systems accessed via Web browsers to delivery of simple find-the-nearest map services for embedding within in-house applications.

As part of the normal upgrade cycle, existing GIS client and server applications can be upgraded to versions conforming to the latest standards. These can then be connected to central databases or peer systems via the web without major investment in new IT resources or user training. Users will still have a familiar interface, but their upgraded systems will incorporate a new dimension of information sharing and collaboration with colleagues.

Most leading suppliers of GIS software play an active part in the development of open standards through membership of the OGC and other bodies. The benefits of this are now being seen in their products. But only when suppliers are fully committed to the concept of open standards will users see the full benefits that interoperable systems offer.

The impact that interoperable GIS can have on efficiency across the organisation, and especially within the IT department, will be revolutionary. Advances in technology to achieve this, however, are logical evolutionary steps in a journey that began with the first desktop GIS software 20 years ago. The more powerful solutions now emerging will ensure that IT departments have the technology they need to meet the most ambitious government targets.



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Further reading and additional information is available
from the following web sources:

UK e-Government

<http://www.govtalk.gov.uk>
<http://www.odpm.gov.uk>
<http://www.localgov.gov.uk>

GIS and European Commission

<http://www.ec-gis.org/>

OpenGIS Consortium

<http://www.opengis.org/>

LondonCABI

<http://cabi.graphdata.co.uk/>

MapInfo Interoperability and Standards

<http://www.mapinfo.co.uk/interop>
<http://www.envinsa.com>

