

# Co2.1

## Breaking down the barriers to Open Government

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### 1 Introduction

This paper examines current trends in providing access to geographical information. It considers the changing pattern of demand for geographical information in general. These patterns are illustrated by the specific experiences of Forth Valley GIS in providing leading edge GI services to local government in Scotland.

#### Business Drivers for GI Provision

Emerging demands for access to information mean that publishing geographical information is no longer the preserve of large mapping agencies. Almost any organisation can find that it has information with a geographical element that has value to others. Since geographical information is often expensive to collect there is a demand for that information to be shared and re-used, not re-collected.

Within an organisation a department may have built up a database to support its own activities and in doing so have created the definitive database for a particular subject. Best practice demands that that department should make its database available to other departments so that the whole organisation has the best available information at the lowest possible cost. Joined-up working means that business processes may cross and re-cross organisational boundaries. As a task moves between organisations the data needed to complete that task must move with it.

Government-led modernisation initiatives and legislation also place new demands for access to data on both public and private sector organisations. Initiatives which aim specifically at access to information and services include the following:

- Infrastructure for Spatial Information in Europe (INSPIRE) is an EC initiative to harmonize access to spatial data for policy makers, planners and managers at a European, national and local level.
- E-Government Interoperability Framework (eGIF) provides a technical framework for interoperation of systems in UK government. Standards for data content are specified in the govTalk schema library.
- Open Scotland Information Age Framework (OSIAF) provides a technical framework for Scottish government that incorporates and expands on eGIF.

Other legislation also creates requirements for data exchange. For example, the Traffic Management Act 2004 requires utilities, the Highways Agency and local authorities to exchange information about street works.

## Scottish Local Government – Drivers for Change

In the last 5 years local authorities have faced unprecedented pressures to modernise and improve service delivery. Driven by central government, the modernisation agenda presents a large scale and long term challenge to local authorities to innovate and efficiently deliver high quality, citizen-centred public services.

The business transformation strategy for Councils needs to be wide-ranging and includes improving citizen involvement and community engagement, joining up Council services, forming new alliances or partnerships and optimising the use of information technology to improve overall efficiency and effectiveness. The scale of business change for many Council's can be significant and, culturally, encourages a drive towards a more corporate, process-driven approach to service delivery underpinned by integrated technologies and improved information governance.

In Scotland, the "Customer First" programme is the cornerstone of the Scottish Executive's and Scottish Councils drive towards modernisation. Building on work initiated under the Modernising Government Fund and managed by the Improvement Service, the "Customer First" initiative provides a national framework that encourages Council's to develop and share good practice, adopt common methods, share development and contribute towards measurable service improvements for customers. The Programme will establish a national infrastructure built upon trusted data sources, such as Council's corporate address gazetteers and electronic customer records, to support secure data sharing that enables a consistent approach to managing customer contact via a number of local, regional and national channels.

Since devolution, Scottish Councils have also faced an increasing range of statutory, regulatory and policy initiatives which increase the pressure on local government service delivery to ensure the best value delivery of local services within a performance framework of continuous improvement. Authorities face a difficult balance between cost and quality while promoting an integrated approach to improving the economic, environmental and social well-being of a community – and all against a growing backdrop of increasing efficiency pressures from central government.

Increasingly, partnership working is becoming a key component of local authority modernisation – combining skills and resources from different organisations and encouraging new and innovative approaches as well as economies of scale, shared specialist skills, new investment, shared information and information systems. In Scotland, all local authorities have a statutory obligation to lead on Community Planning and the legislation obliges Health Boards, Police and Fire Services along with the local Enterprise companies to fully participate with Councils in delivering co-ordinated services to the citizen.

## The GI Access Requirement

As access to a database is opened up to a wider audience the range of uses to which the data is put increases. This leads to a demand to supply different 'flavours' of the data to different groups of users. This is reflected in the requirement to supply data in different data models.

For example, routing applications require road data with drive restriction information and network connectivity to allow route calculation whilst highways asset management applications require detailed geometries for the extent of road surfaces. The surface areas are irrelevant for routing applications, just as the route restriction information is irrelevant for asset management. These different applications therefore require different view of the road network even though they are clearly working with a common set of entities: the roads.

Typically, small specialist communities need to share rich and complex data which carries the detail and nuances of meaning that they understand. However, the data which is useful to the specialist could also be valuable to a broader community if it is simplified and freed of specialist jargon. The distinctive feature of the emerging requirement for different data models is that not only do data providers need to supply data in a new data model, they need to supply the same data to many different data models at the same time.

A local authority could find that it has to exchange the same information with its neighbours, with central government and with European institutions for different reasons. Neighbouring authorities may use terms and content which are important at a regional level but irrelevant at the national level, and incomprehensible at the international level. These exchanges will all require variations to content and data structure to suit the context. The counterpoint to the requirement for a diversity of data model is the need to provide all users with the best available information. So, although different users may receive data in different data models they should all be receiving the most current, definitive information.

Not only do different communities of user need different views onto the data, they have different patterns of access to that data. Some users will require data on an ad-hoc basis for particular projects; others may require daily access to the most up to date information. Some users will carry out complex spatial analysis using high end GIS; others may want a simple map to inform a decision or enhance a report.

A range of delivery methods are needed to support the different access patterns of different users. The traditional supply methods of data files supplied on media or via FTP clearly meet the needs of some users and will continue to be appropriate. Web based access to information is well suited to occasional users since it does not require specialist software to be installed on their desktop. It also has the advantage of providing the best possible currency for data that is under continuous revision. Web Feature Servers (WFS) and Web Map Servers (WMS) provide an open standards based approach to providing these services and are increasingly seen as a normal way of providing access to geographical information.

Other applications may have particular service requirements that can only be met by customised databases. Location based services, for example, may require fast response times and high query volumes which require highly tuned databases to support them. In these cases it makes sense for the organisation with the specific performance requirement to hold a local copy of the data in a database which they can tune to the specific performance requirements of the application. That copy of the data will then require regular updates to synchronise it with the definitive copy supplied by the data provider.

The demand for access to data comes about because the data is valuable, and so the business processes that created and maintain that data are an essential part of the picture. In general there is no case for changing the applications which are used to maintain the data. Those applications and the business processes which they support have successfully created the valuable data which others now want access to and will continue to do so.

## The GIS Challenge for Local Government

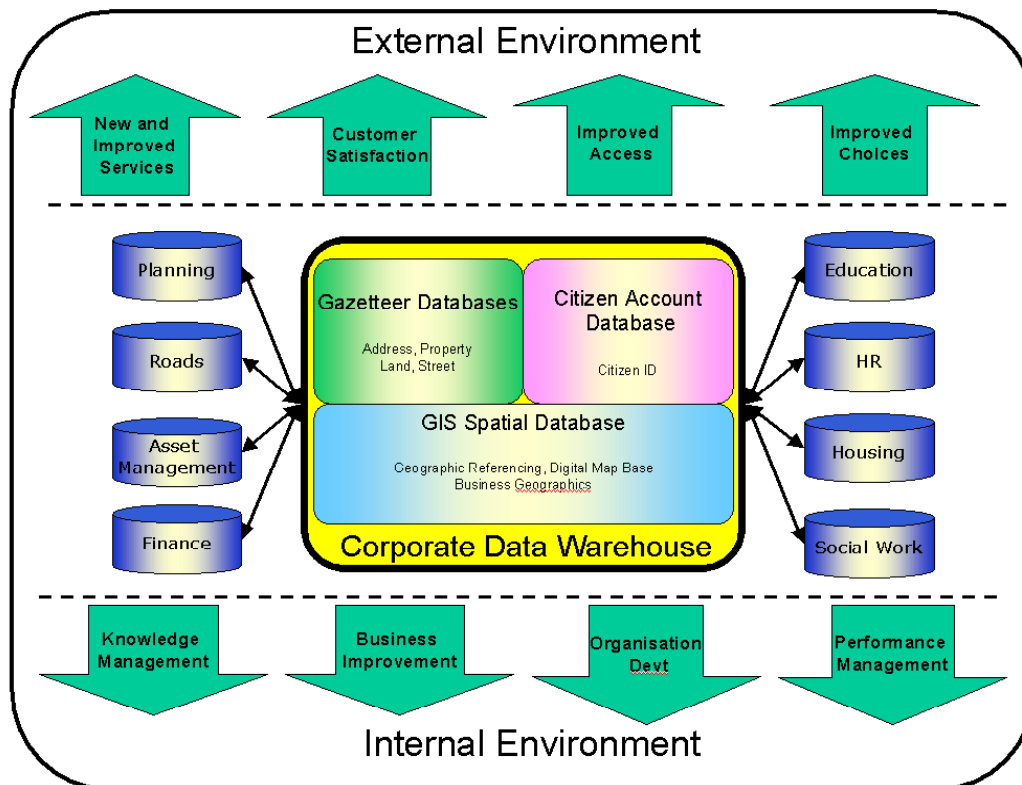
New technologies such as CRM, workflow and integration middleware are playing an increasingly important modernisation role in the context of joining up local government services and opening up new access channels. Significant levels of local authority investment are being made in solutions for “e-Government” and increasing recognition is being given to the importance of trusted corporate information resources to enable secure and confident transactions by service users.

While significant progress is being made, many local authorities still need to fully integrate geographic information in the day to day business processes which drive their multi-functional services to citizens and that very often involve many departments, service units and systems. As more than 80% of local government information has a geographic component, GIS solutions and services now present a major opportunity to improve the structuring, management, integration and dissemination of the large volumes of data held by local government.

The challenge facing local authorities is to fully capitalise on the opportunities presented by wider business transformation and to embed and integrate geographic information within their entire operating structure and within their mainstream information management mechanisms and enterprise systems. For those providing GIS services in local government the challenge is to increase the level of senior management awareness, understanding and appreciation of benefits offered by geographic information and to bridge the gap between mainstream information systems/technologies, niche suppliers and GIS such that the stigma of “specialism” still surrounding GIS is no longer an inhibitor to widespread adoption.

## The Information Management Challenge

Traditionally, local government has had a relatively poor track record of information management. However, the wide-ranging programme of modernisation will enforce new ways of working and encourage the development of an information and knowledge culture. With the predominance of geography within the information assets of Councils, spatial data and GIS has an influential role to play as a key part of the enterprise model for corporate data management.



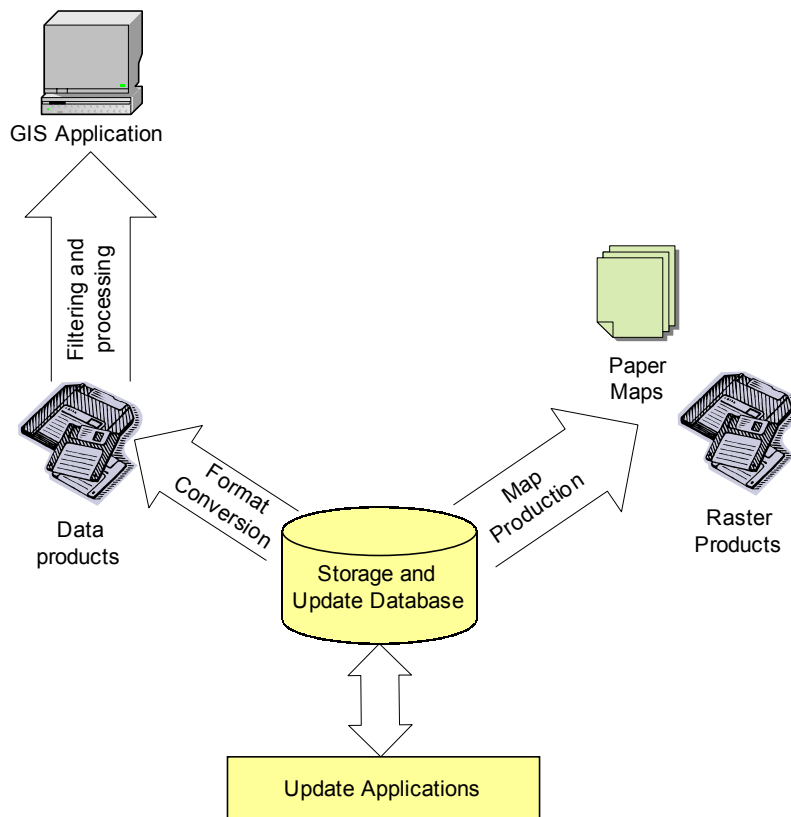
At a technical level, adhering to Government prescribed standards such as e-GIF and the OpenScotland Information Age Framework (OSIAF), adopting mainstream technologies, standardising interoperability methods and protocols such as XML, using common data standards and common web services are all essential aspects of the converging opportunities for improved geographic data service provision of the future.

At a business level, developing robust business processes, documented data and quality management procedures, establishing policies for information security and data sharing will all become ever more critical in the creation of an effective and sustainable information culture within which geographic data can be fully exploited to widespread benefit.

## GI Access Patterns

In the past geographical information has usually been supplied in two ways: as paper plots or as extracts of the dataset in some GIS format. Paper mapping has been in use for hundreds of years and communicating information through cartography is a highly refined art. By comparison digital supply of geographical information is a very new practice. Digital supply has tended to consist of the extraction of parts of a database and converting the data into a file transfer format. The data model in the supplied data directly reflects the model of the source database. As a result the data is in a form which is suitable for the applications for which it is used when it is in the database but will often require a significant amount of processing to convert it for use in different applications. This tends to limit the use of geographical data to

users with a high level of skill and powerful software tools for manipulating data i.e. a GIS professional. Geographical data is usually beyond the reach of casual users.



*Figure 1 - At present many data producers export a single data model for all customers*

The simplicity and portability of paper mapping mean that plots will remain a valuable means of distributing information but for digital data the “one size fits all” approach to the data model and distribution mechanism is no longer appropriate. Each group of users needs access to information in a form suited and through a delivery mechanism appropriate to them. To achieve this, data must be translated from the model in which it is stored and maintained into models to suit each group of users. It must be supplied via a variety of methods including existing methods such as paper plots and data files sent on media, but also including more dynamic access methods such as Web Feature Servers and Web Map Servers.

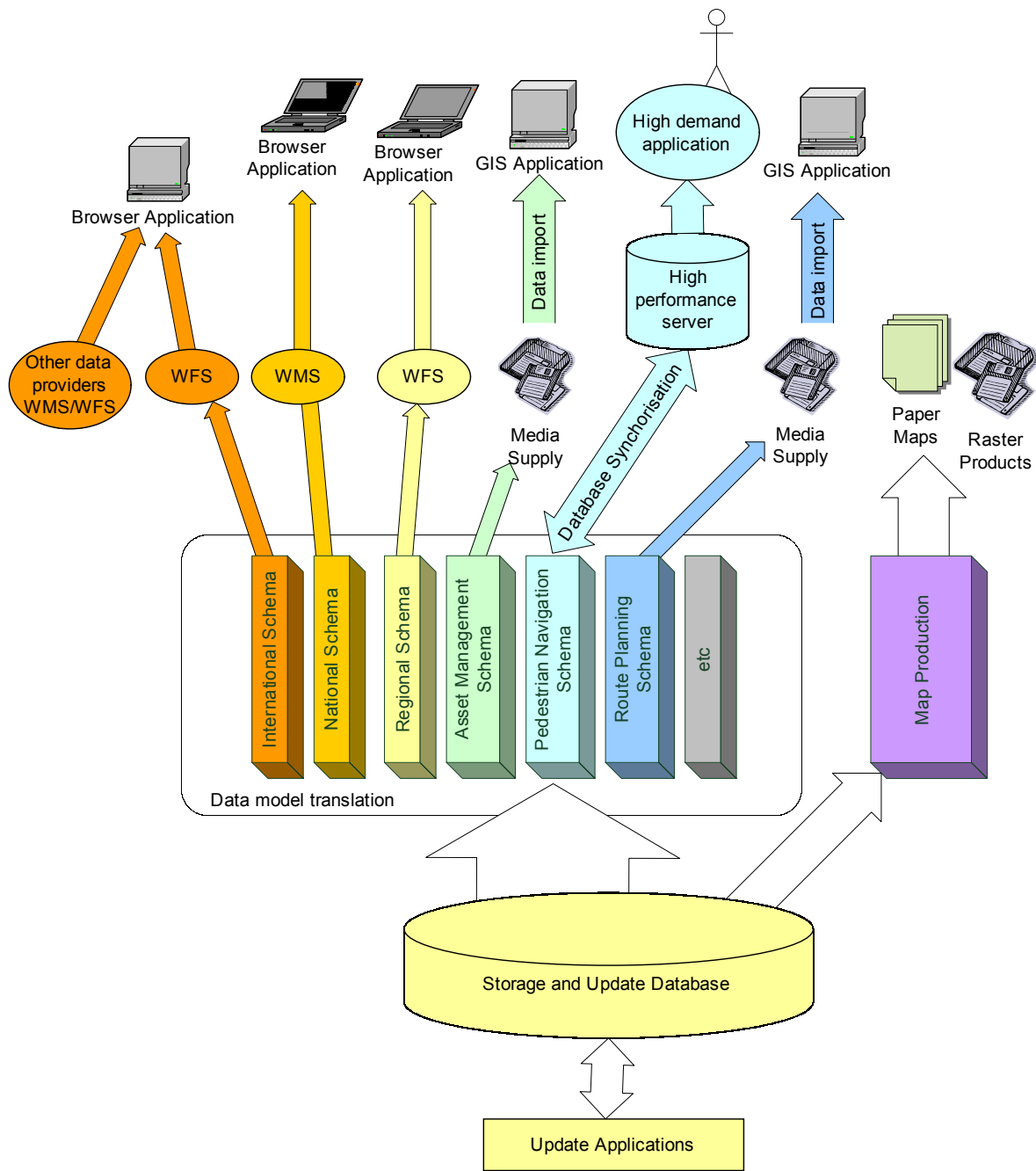


Figure 2 - Data providers operate in an environment where different users need data in different forms supplied through different delivery mechanisms.

By translating the data at the time of supply all users receive the most current view of the data. Since all users have a view onto the same underlying database they all receive consistent information. Even though each group of users are provided with a different set of information those views of the underlying database will never contradict one another. The users therefore receive the best available data with low barriers to their use of the data when they receive it. By adding a translation service on top of an existing database, rather than having to throw away the investments in data and database systems, the value of those assets is enhanced by providing wider access to the existing resources. Since existing applications can continue to operate without change there is no disruption to existing business processes and no loss of investment in user training.

## Forth Valley GIS

Forth Valley GIS is a highly respected joint unit that has been successfully providing leading edge corporate GIS services and solutions to the neighbouring local authorities of Clackmannanshire, Falkirk and Stirling Council since 1996. The unit operates under a unique and innovative partnership model as it is jointly funded by the three Councils and by revenue generated from the delivery of GIS services to a wide range of external public-sector customers.

The overall goal for Forth Valley GIS is “to maximise the potential of geographic information to innovate and support the cost effective delivery of public sector services” and the primary benefits of the approach include :

- extensive knowledge and experience of local government business drivers, requirements and opportunities for GIS
- effective joint working with equal shares in costs/benefits
- best value with economies of scale for specialist services
- development and sharing of best practice
- strong emphasis on knowledge sharing and skills transfer across the partnership and with external customers
- continuous improvement of quality and range of services
- not for profit external income stream supports resource dividend for partner Councils
- enhanced reputation of the partner Councils

The unique partnership approach to corporate GIS service delivery has realised significant benefits for the partner Councils and its customers over the last 9 years and the range of geographic information services has continually developed to ensure alignment with changing business requirements.

## Service Improvement

Although the unit had successfully delivered a wide range of innovative GIS applications, solutions and benefits to the partner Councils in its first 5 years of operation, overall progress was still characterised by a heavy investment in desktop GIS, multiple, duplicated GIS databases and a heavy reliance on technical specialists.

Coupled with the overall drive for business change and service efficiency and growing changes in the external GIS technology and data market, a service review of Forth Valley GIS was conducted in 2002 to determine a strategic operating plan up to 2006. Working closely with key stakeholders in the partner Councils, an ambitious 3 year framework was agreed to target the necessary developments and improvements to widen the realisation of GIS benefits and to align GIS with the partner Council's core business objectives and priorities.

Recognising the key business drivers for GIS to underpin Modernising Government, Community Planning and an increasing number of multi-agency requirements in the future, the decision was taken to radically improve the core GIS application, system and data infrastructure in the region. The establishment of a high availability, regional spatial data infrastructure, based on industry standard database technologies, and the extensive use of a common web services application framework to provide intranet, extranet and internet GIS capabilities for the Councils, partner organisations, citizen, business and community provide the core of the new infrastructure.

## GeoStore – the Spatial Information Hub

The initial move to database management of spatial data was first made in 1999 to support delivery of emerging web GIS solutions. However, given the need to support a mixture of desktop and web GIS client technologies this resulted in 3 separate database servers and a range of file-based servers being used to deliver GIS data across the partner Councils.

Recognising the inherent operational inefficiencies and the restrictions on providing timely and widespread access to geographic data for all staff, initial research into a central data warehouse was initiated in 2002. Coupled with the advances in networking and database technologies, the increasing requirement to migrate to Ordnance Survey's MasterMap product and the growing requirements for improved information sharing architectures with core Community Planning partners, the business case to move to a fully centralised, regional spatial data warehouse, "GeoStore", was agreed in 2003.

Following detailed research, a thorough requirements analysis and technical appraisal, Oracle 9i was chosen to provide a robust, scalable and open solution for spatial data management. The decision to manage spatial data in Oracle and to use Oracle Spatial Data Option geometry format ensures that GeoStore can be accessed by a range of alternative GIS clients and most of the mainstream business systems used within the Councils. Working in partnership with key systems suppliers, the database was implemented on a new high availability clustered server environment in 2003.

To support the migration to OS MasterMap a thorough evaluation of software solutions against detailed business and technical requirements was undertaken. GoLoader from Snowflake Software was selected as it provided a flexible, intuitive solution, an open architecture for GML, high performance and minimal supplier dependency. GeoStore was fully populated with OS MasterMap (under monthly change update) and over 200 other geographic datasets and supporting metadata within a period of 4 months.

Considerable time and cost savings have been realised through the centralised storage of geographic data, the consolidation of data processing and data management activities. Significant improvements in the quality management of data, reduced duplication and currency of geographic data have also led to improved confidence and a widespread increase in the use of GIS.

As the single, trusted source for geographic data, data is served from GeoStore using web services to the intranet GIS portal, GeoLink, accessed by over 10,000 staff across the partner Councils. In addition, direct database connections support spatial data access by a range of GIS and CAD desktop clients. GeoStore has also been integrated with the UNIFORM business system that supports a range of council regulatory functions and online planning services with work now in development to extend integration using web services to the enterprise system used for roads asset management and maintenance in the partner Councils.

Forth Valley GIS have also recently established a number of web service components that interface with GeoStore. The web services repackage elements of the intranet GIS but also use the same data and map services to avoid any additional administration. Some services also use the spatial functionality available through Oracle Locator to minimise the load on the GIS web server. Three web services are currently available, including **address** which invokes a corporate address gazetteer search, **map** that returns a map centred on a location with a given size and scale and allows additional layers to be included and **spatial** that provides "where's my nearest" functionality. Web developers in the partner Councils are already integrating these new services on their external websites to spatially enable online access to Council services and related service information.

The next phase of development is underway. Over the next year, this will include the further integration of key business applications and corporate address gazetteers, extending the GeoStore content to include an anticipated further 200+ datasets, developing an approach to support disconnected editing and mobile GIS integration and developments to support data sharing with core Community Planning partners.

### Benefits Summary

Consolidation of database servers at three different locations into a single repository provides hardware/software cost savings and operating efficiencies.

- Streamlined GIS data management through the provision of a definitive single storage platform for geographic data.
- Single, authoritative point of contact for information regarding all GIS datasets.
- A common platform for GIS data delivery providing connectivity to Back Office Systems via ODBC or other database connections.
- Single source of geographic data and quality management framework to support effective data dissemination and use.
- Increased user confidence in the source, currency and accuracy of geographic data.
- Improved data quality through the ability to control data flow and access via database security.
- Reduction in the duplicated effort to sustain multiple sources of geographic data throughout the partner Councils.
- Simplified process for data distribution and significant reduction in the time to respond to customer requests.
- Improved range of delivery methods to support different access needs of users via a powerful, fast and scalable database repository.
- Redirection of internal staff resources to improve data quality.
- Opportunities to share regional geographic data with other agencies through an open and interoperable infrastructure.

### GeoLink – the Web Portal

Forth Valley GIS began developing intranet GIS solutions using ESRI ArcIMS in 1999 when web mapping software was in its infancy. Coupled with significant technology and data advances, experience with these initial developments led to the decision in 2003 to consolidate the core GIS infrastructure for the three partner Councils around an innovative regional hosted web service comprising a single, scalable and fully integrated application and data framework for intranet, extranet and internet GIS delivery.

A scalable solution was defined at the outset to suit the longer-term requirements for extranet delivery to other organisations, internet web services, integration with business systems and integration with other GIS technologies. GeoLink, the intranet GIS portal, is based on industry standard web and database technologies (ESRI ArcIMS, Oracle and Macromedia ColdFusion) and built using a suite of common components.

As well as providing web mapping functions, data extraction tools, a sophisticated search engine and access to over 300 geographic datasets, GeoLink provides a comprehensive knowledge base which includes integrated access to comprehensive metadata, FAQ and other support resources, technical documentation, project documents, downloads, training programme and booking as well as an integrated on-line help desk and detailed news section.

Geographic datasets are all now “self-served” from GeoStore through a functionally rich, yet easy-to-use interface with integrated, accessible metadata to ensure the data is understood and used appropriately. Furthermore, the metadata, security, data copyright and content management features, also managed in the Oracle database, combine to make Geolink dynamically configurable to the specific needs of each Council, department, user and individual dataset.

Strong expressions of interest in accessing and enriching GeoLink have been expressed by the core Community Planning partners of each Council and this reflects the growing recognition of the important role that geographic information plays in planning and delivering effective public services. Forth Valley GIS are now taking these requirements forward as part of the next phase of developments for GeoLink/GeoStore and the wider development of joint GIS support services and data sharing initiatives with regional partners.

### Benefits Summary

- Central management of web GIS for all three councils reducing duplication of effort for the maintenance of data and intranet sites.
- Reduced overheads for web GIS development and support.
- Reduction in the number of installations of desktop GIS reducing licensing and support costs.
- Common data and support information made available through the portal, reducing the number of support calls.
- On-line submission of support calls, data requests and mapping requests reducing support overheads.
- Widened access, more intuitive design and improved performance make it quicker for users to find the information they need from the system, resulting in improved efficiency and therefore cost savings.
- A single point of access to a centrally managed, current and quality assured data resource. This is increasing user confidence and contributing to more informed business decisions across the three councils.
- Integrated and searchable metadata is increasing the visibility and use of the Councils' spatial data resource as well as ensuring that the data is understood and used appropriately
- Provides easy access to the Corporate Address Gazetteer for all staff, strengthening its role as the definitive source of address information in the 3 councils
- A structured, organised well documented framework that forms a robust basis for future web-GIS development
- Increased availability and sharing of information will lead to improvements in knowledge-based decision making which will increase efficiency in operational and strategic planning.

### Corporate Address Gazetteers

Through their previous award winning work on a Corporate Property Initiative with the partner Councils, Forth Valley GIS was integral to the establishment of a Scotland-wide Modernising Government Programme – Definitive National Addressing for Scotland (DNA(S)). As part of the Customer First programme in Scotland, DNA(S) seeks to establish BS7666 compliant corporate address gazetteers (CAG), within a sustainable and integrated business framework, in all 32 Scottish unitary authorities.

In 2003 the partner Councils agreed that Forth Valley GIS should assume the overall project management role to create the gazetteers and to co-ordinate activities across the three Councils while working closely with key stakeholders in each organisation and with the national programme. This decision was driven by recognition of the :

- importance of the spatial dimension of the gazetteers and the integral links with GIS
- sharing the specialist technical and project management expertise available
- economies of scale and best practice deployment
- continued commitment to partnership working and information

The three corporate address gazetteers are now complete and, following extensive work on business process modelling and process improvement, this culminated in the establishment of a robust data management business model, detailed data management plan and operating procedures for sustainable maintenance and quality management in each of the partner Councils.

The gazetteers are also translated from each of the partner Councils management systems into a single gazetteer in GeoStore. This now provides a consistent, accurate and current address gazetteer for the entire region and opens up a wealth of business opportunities for address and spatial data integration within/between the Councils as well as the merging collaborative requirements with partner agencies.

In the future, Forth Valley GIS will be continuing to work in partnership with the Councils to develop and support the wider process, data and systems integration work to ensure that the gazetteers underpin core service delivery activities within the Councils and that the opportunities for wider deployment of the gazetteers, integrated with GIS, are developed with core Community Planning partners and other agencies involved with joint service delivery within the Forth Valley area.

### Benefits Summary

- Definitive and single source of address and street information to be used across the Councils.
- Reduction in duplicated effort to manage and maintain discrete address databases.
- Operating efficiencies arising from improved business processes.
- More responsive services through the ability to join-up service processes at the address level – within the Council and with other partners (e.g. Community Planning).
- Improved service delivery, more consistent services through the ability to access accurate, up to date and unified address information.
- More informed decision-making at operational and strategic levels through the ability to integrate data from various systems using a unique property reference.
- Ability to geographically represent and analyse address data held in multiple back office systems using GIS technologies.
- Direct contribution to improved corporate information management practices
- Supports the delivery of online services and transactions

### The Future

A continuing ambitious programme of development work lies ahead for Forth Valley GIS. The key priority will be to ensure that GIS and geographic information are fully deployed to support the modernising and efficient government aspirations of the partner Councils and their increasing need to work on a multi-agency basis with other public, private and voluntary sector partners. The work programme will include :

- Advancing the integration of corporate address gazetteers with priority front/back office systems and with CRM/Citizen Account records
- Establishing robust and integrated quality management framework for all geographic data and corporate address gazetteers
- Development and rollout of advanced web GIS application solutions on GeoLink and completion of the desktop GIS migration
- Further developing internet web services for council websites and business systems integration
- Developing opportunities for wider GeoStore integration and data exchange with partner Councils

- Working with core Community Planning partners to develop opportunities for joint GIS services, improved data sharing and increased GeoStore content
- Developing extranet version(s) of GeoLink for partner agencies
- Translating address and spatial data from GeoStore to schemas in support of national infrastructure and partner agency requirements.

## Conclusions

Many organizations have built up high value geographical data but the value of that data cannot be realised either within the organisation or between partner organisations because only a restricted number of people have access to the information. Management and distribution of that data is moving centre stage as best practice dictates that the best available information should be collected once and used by everyone.

Providing access to a diverse set of users means more than simply increasing the number of people who receive data by existing methods. Emerging patterns of data supply incorporate data model translation to ensure that users are presented with information in an accessible form. Supply methods must become more diverse ranging from paper plots to web services to support different requirements for currency, frequency of access and data processing needs.

Within the overall framework for modernisation of local government services, new patterns for supply and demand of information are rapidly emerging. It is evident that geographic information will form a key foundation by which public sector services and partner organisations can integrate, join up and improve the efficiency and effectiveness of service delivery to the customer. In order to fully service this “information market”, it is essential that the enterprise architecture and business processes embed geographic information in a sustainable and interoperable data infrastructure at the business core. Providing a range of mainstream access channels and services from the spatial repository optimize the use, sharing and dissemination of geographic data to suit multi-dimensional local, regional and national demands.