

State of the Art Modern Mapping Systems for Ireland

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SUMMARY

In 2005, the Irish Land Registry (ILR) embarked on a major programme to update the mapping systems which form an integral part of its Land Register. The paper based mapping systems have been in operation since 1892. This project was a further phase in its computerisation programme which will at the end of the project cover the entire land registration process in Ireland. The project has allowed ILR to review all aspects of its mapping flowline, including not only the technical aspects but also the necessary staff competencies, skills and work processes.

The project has included an ambitious programme to capture information from an archive of 32,000 paper maps covering 2.3 million land parcels held by ILR, each having manual additions of property registration boundaries. The information has been captured as a raster layer in a digital environment. It has then been matched to Ordnance Survey Ireland (OSi) vector mapping data to bring the property boundaries into the vector mapping layer. This has required innovative systems and working methods to be deployed, involving key contractors in Europe and India.

Within OSi, the requirements of the ILR project have required a review of the specification of the large-scales mapping data provided, to ensure that it fully meets the need of ILR as a key customer. This has included an upspecing of all of the data, and a validation of the various boundaries that are crucial within a non conclusive boundary environment. OSi has deployed new technology and systems to meet the needs, which have included the requirement for the data to have sufficient intelligence to support the updating of ILR's database only for features that have changed, and the unique identification of each feature and object. The change of coordinate reference system from a legacy to a GPS-compatible system is also being undertaken as part of the project, as the key element in implementing such a change for all Irish map users.

The project, undertaken in close collaboration between ILR and OSi, has shown the current capability of mapping and related systems to replace legacy paper mapping with a state of the art mapping system to support the Land Register and, as such, provides an experience of value to many other countries as they contemplate such a change.

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1. THE IRISH LAND REGISTRY AND REGISTRY OF DEEDS

In Ireland there are two registering systems that deal with property in Ireland:

1.1 The Registry of Deeds System

This organisation set up by the Registry of Deeds act, 1707, is one of recording notice of and the priority of deeds and conveyances as between themselves and other unrecorded deeds and documents. This process does not guarantee the effectiveness of a deed and it does not interpret a deed. It simply records its existence.

1.2 The Land Registration System

Set up by the Local registration of title (Ireland) act, 1891 and now operating under the Registration of title act, 1964. The Land Registration system records title to land and on registration *the state guarantees* the title as recorded in the register.

Both systems are under the control of the /Registrar of Deeds and Titles. For administrative purposes, both registries form part of the one organisation and are collectively referred to as “**the Registries**”. The recently enacted Registration of Deeds and Titles Bill 2004 has established a new **Property Registration Authority** under which the current registries will operate.

The core business of the organisation involves examining legal documents and related maps and recording their legal impact on the registers and maps. It includes the registration of title for the first time, the registration of subsequent transactions, the recording of deeds and the supply of evidence of title and a comprehensive range of associated services, including the provision of access to and certified copies of the Register.

A high standard of professional knowledge, integrity and informed decision making is necessary to safeguard property rights. Many of the decisions of the Land Registry in particular, affect the legal rights of individuals and organisations and are quasi-judicial in nature. In making such decisions therefore, Land Registry personnel are required to apply legislation, take cognisance of court decisions and adhere to principals of natural and constitutional justice.

The experience and expertise of its staff ensures that the Registries provide accurate registrations, related maps and support documentation.

The Land Registry developed a Strategic Information Systems Plan in 1990 which was developed to support the strategies and objectives of the organisation. That plan identified the

key role of technology would play in the future service delivery of the Registries and in the safeguarding of the Register. In that plan over 30 key technology supported projects were identified of which Digital Mapping was one. Many developments have occurred since which we will cover later in this paper.

2. ORDNANCE SURVEY IRELAND

This part of the paper concentrates on the Role of OSi, its responsibilities as a National Mapping Agency, its background, the Digital Products it produces. The paper also describes OSi's National Seamless Vector and Raster Large Scales Database, Large Scales Mapping Coverage, an address database (GeoDirectory), the infrastructure (coordinate reference system) on which the geographical database is constructed. The OSi data structure and its benefits to LR are also presented. The agreed delivery schedule to Land Registry (2005-2009) is outlined with details of OSi and LR partnership summarised.

2.1 Role of Ordnance Survey Ireland

Ordnance Survey Ireland (OSi) is the National Mapping agency for the Republic of Ireland and plays a central role in the economic development of the country as accurate and up-to-date geographical information is a vital part of the infrastructure of a modern economy. OSi has responsibility for the survey and updating within the Republic of Ireland, which consists of 26 Administrative Boundary areas, covering 6.9 million hectares, with a growing population in excess of 4 million people. It is a service business providing maps, atlases and geographical data in digital form to businesses and the general public. OSi has invested heavily in the implementation and use of developing mapping technology and is today one of the most technologically advanced organisations of its kind in the world. This has allowed it to play an increasingly sophisticated role in the information society of today. The geographical information industry is becoming increasingly important in the modern world: it is estimated that 80% of databases include geographical information.

2.2 Background

OSi has seen and overcome many challenges since its foundation in 1824, the latest being a move from an Office within the Department of Finance to a State Body in 2002 with a commercial mandate from Government. The challenges facing it today are greater than ever before as its customer base require a sophisticated range of products and services, particularly in the Large Scale product ranges. With open tendering legislation the organisation is facing increased competition, from within and outside Ireland.

OSi was established to survey the Republic of Ireland and its operation is based in Mountjoy House, Phoenix Park, Dublin with six regional offices, strategically placed around Ireland. The organisation employs 302 staff and has a budget of €23 million per annum, of which over €1.9million is invested in new technology every year. It generates revenues of over €18 million per annum from its activities and receives a Government subsidy for the balance, primarily to sustain its public service remit.

Its customer base spans all sectors of the economy and includes Government Departments and Offices, local authorities, utility companies and the construction industry, as well as the general public. It is increasingly working with Agents and Value Added Resellers to ensure that its data is available in the form and with the applications that its customers require.

OSi licenses the use of its data for a wide range of computer-based applications such as Computer Aided Design (CAD) and Geographic Information Systems (GIS).

2.3 Digital Products Available

OSi's primary product is mapping services. It produces urban, rural and tourist and leisure mapping at a variety of map scales. This mapping is produced in digital form as well as on paper. In addition, the base data used to create the map series is also used to produce other products such as rectified Aerial Photography and Digital Elevation Models.

2.4 National Seamless Vector Database

OSi's geographical database consists of a National seamless vector and raster data sets. Due to major infrastructure developments since the mid 1980s there is a high concentration of urban and suburban mapping around densely populated areas with a high degree of peri-urban mapping along road networks. Rural mapping is carried out in less densely populated areas of the country.

2.5 Large Scales Mapping Coverage

The complete range of Large and Small Scales database are available from OSi. The Land Registry requirement consists of:

- - 1:1000 (urban) Consists of 1800 map sheets covering an area of approximately 0.1 million hectares. These maps are very detailed and are produced for all cities and towns. They are updated on an annual cycle.
- - 1:2500 (suburban) Consists of 1500 maps covering an area of approximately 0.5 million hectares. These maps support the 1:1000 mapping, maintaining currency through a one year revision cycle.
- - 1:2500 (peri-urban) Consists of 5500 maps covering an area of approximately 1.7 million hectares. This mapping is updated on a three year revision cycle.
- - 1:5000 (rural) Consists of 5200 maps covering an area of approximately 4.6 million hectares. This mapping is updated on a five year revision cycle.
- Two complete datasets of ortho photography (1995 b/w and 2000 colour) are available. OSi is currently completing a further dataset from 2005/6 photography. Used by Land Registry to help identify land parcel folios.
- Dataset. A completed database of Administrative Boundaries (polygons with unique identifiers and names).
- Small Scales database. A raster and vector database, suitable for display at 1:10,000 to 1:500,000 scales. Particularly useful for visually zooming in and out of geographical databases.

- Address Database: A database of geocoded addresses (GeoDirectory) for the entire country containing 1.8 million addresses.

2.6 Infrastructural Developments

All mapping is supplied on one coordinate reference system (Irish Transverse Mercator). OSi in close collaboration with Ordnance Survey Northern Ireland has designed and implemented this coordinate reference system for Ireland which is fully compatible with the new generation of positional technology (including GPS). This is underpinned by an Active GPS Network for Ireland with 16 continuously recording stations placed strategically across Ireland. A GEOID model also provides third order sea-level heighting with GPS throughout Ireland.

This provides a solution for Land Registry ensuring GPS compatibility, where no transformations are required as it takes full advantage of GPS technology. It also provides international compatibility, interoperability with GIS systems as it is compatible with ETRS 89 (European Terrestrial Reference system) and GRS 80 (Global reference System) refined by WGS 84 Ellipsoid (World Global System). This coordinate reference system minimises mapping distortions and optimises scale factor.

2.7 OSi Data Structure and its Benefits

OSi records and maintains its mapping (geographical records) in an Oracle 9i database. This database is constructed to maintain unique identifiers on all features in the database with time-stamping. Change processes at OSi maintain these identifiers. Each identifier has a number of attributes. Should any of these attributes be changed, the database records this change. This is an important development as Land Registry uses this information in streamlining their update processes. It is only necessary for LR to visit folios where change has occurred to ground features which affect a folio. Consistency in feature coding across 1:1000, 1:2500 and 1:5000 map scales allows effective use of the data by LR, as it has been able to take advantage of this in streamlining data collection and update processes. This consistency is being achieved through an up-specing process at OSi. The ITM provides stability to all coordinates as it allows the integration of geographical datasets from other sources into the LR database.

2.8 OSi Supply Schedule for Land Registry 2005- 2009

OSi and Land registry have agreed the schedule as follows based on Administrative Boundaries. It is as follows:

2005: Westmeath, Longford and Meath (1212 maps)

2006: Carlow, Kilkenny, Wexford, Clare and Louth (2207)

2007: Wicklow, Roscommon, Dublin South, Dublin North and Sligo

2008-9: Waterford, Limerick, Kildare, Cavan, Offaly, Laois, Cork, Donegal
Galway, Monaghan, Leitrim, Tipperary, Mayo and Kerry.

2.9 Business drivers to Land Registry Digital Mapping Project

As stated earlier the Digital mapping project was one of the 30+ projects identified within our IS strategy. It was to be delivered within the context of existing applications and would deliver application processing support to the registration process and assist in the enhanced delivery for customer services. There were a number of key external developments occurring in Ireland's public sector at that time. The Irish Government's Delivering Better Government programme, when launched in 1996, mandated Government departments and offices to consider how information technology could make "radical improvements" in the way their business is conducted. This was followed by the eGovernment initiative, "*Information Society Action Plan*"/'*Electronic Government*' programme, which gave a clear mandate to organisations like the Land Registry to advance the delivery of services to customers online.

In July 1999, following an extensive phase of analysis, planning and development a major advance in this regard was made in the Irish Land Registry with the introduction of its Integrated Title Registration Information system (ITRIS) a register storage and retrieval system and application processing system. In conjunction with the introduction of ITRIS, The Land Registry introduced its Electronic Access Service (EAS) for delivery of register related information online to customers..

In 2003 the Land Registry commenced its Digital Mapping project. The key business objectives underlying Digital mapping project can be described as aiming to:

- Enable an improved, more customer-focused service by
- reducing the turnaround time of applications
- providing direct access to map data via computer-based systems
- generating copy folios and filed plans electronically and automatically
- assisting with the electronic lodgement of some specific types of application
- Support the electronic storage and retrieval of mapping information and consequently,
- remove delays caused by the administration of paper-based maps
- allow multiple, concurrent access to maps
- Provide enhanced searching facilities including geographical and spatial-based searches
- Provide enhanced application tracking facilities on all lodged applications
- Enable the Land Registry to deliver its mandate under the '*Information Society Action Plan*'/'*Electronic Government*' programme. Details on this initiative are available in a number of documents published at the Department of the Taoiseach website at www.taoiseach.gov.ie
- Provide management information through caseload reporting and ad hoc querying tools
- Provide enhanced business continuity and disaster recovery capabilities
- Support the Land Registry in meeting its requirements under the Government's '*Strategic Management Initiative/Delivering Better Government*' initiative.
- Assist in the enforcement of more consistent work processes and uniform procedures across the workgroups
- Enable the Land Registry to meet its obligations arising from the Public Service Broker (PSB) initiative sponsored by Reach. See www.reach.ie and www.reachservices.ie for further information.

- Assist the Land Registry to fulfil its role as a core participant in the Irish Spatial Data Initiative (ISDI).
- Participate fully in international initiatives such as the European Land Information Service (EULIS). See www.eulis.org for details of this initiative

With this programme, the Land Registry is implementing a digital mapping system that is capable of efficiently loading, storing, updating and delivering OSi large scale data in combination with digitised land parcel information. This will provide the Land Registry with the necessary support and information for processing applications for registration and related services, in an effective manner, thereby resulting in significant efficiencies in the processing of casework, and reducing overall transaction and handling times.

The advances in the OSi in relation to the availability of their ITM vector data set gave the Land Registry an opportunity to move their paper based mapping system onto a GPS compatible framework. Also The Land Registry as part of the data capture of existing parcels would create a relationship between each parcel and any coincident OSi feature. This will be held as meta data identifying the OSi paper sheet reference on which the parcel was recorded and what coincidence with OSi features exist. It is also creating a specific link between the OSi feature ID and the Land Registry Boundary where there is coincidence. This will allow for a greater level of automation in future map maintenance processes. It is expected that in future the Land Registry will be able to deal in “change only” updates for the OSi by the use of feature ids and change dates.

2.10 Previous On- line electronic services

The EAS was one of the “flagship” projects of Electronic Government and indeed was the first such project to go live in Ireland. It provided Land Registry customers with on –line access to the organisation’s database of land ownership records. Users of the EAS, from the convenience of their own premises, could

- Conduct on- line searches of the electronically available indices and register
- View and print computerised ownership records
- Discover the applications pending in the Land Registry against registered a particular property
- Make on-line applications for copies of Land Registry records
- Track the progress of applications through their lifecycle

On the introduction of the new technology in August 1999, The Registry successfully transferred all the existing electronic ownership records to the new system. However, the bulk of the ownership records (known as “folios and filed plans”) some of which go as far back as 1892, continued to be held in paper format, a situation which clearly could not continue in the light of the organisation’s strategy to deliver an increasing range of its services electronically.

2.11 Moving from Paper to Electronic Records

To address this shortcoming, and with the financial assistance from the government's Information Society fund, the Land Registry undertook a major project to implement document imaging technology accompanied by a programme to have all its paper folios and filed plans systematically converted into electronic records and to make these available on-line to customers through the EAS.

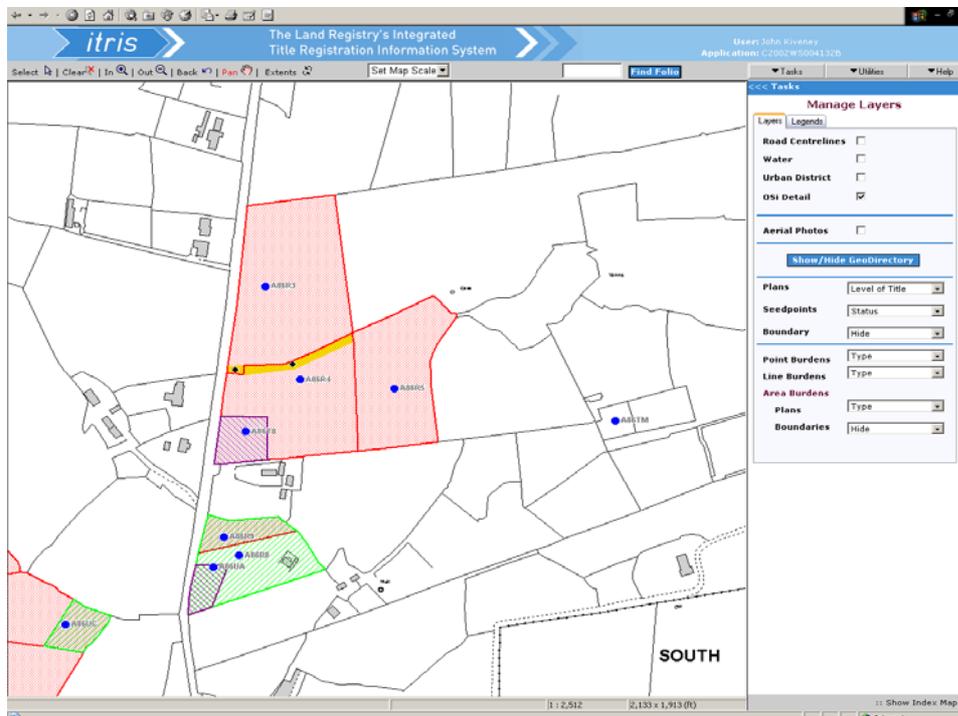
This challenging conversion programme which commenced in January 2002 was completed at the end of 2004. It resulted in the scanning and indexing of approximately 6.4 million pages of unique Land Registry records. As the electronic images were created they were loaded nightly onto the system, following a thorough quality assurance examination. Approximately 10,000 new pages were made available each day to internal staff to assist casework processing and on line to account holding customers.

3. DIGITAL MAPPING CONTRACTS

With development of the Digital Mapping project an EU procurement exercise was conducted and two contracts were awarded.

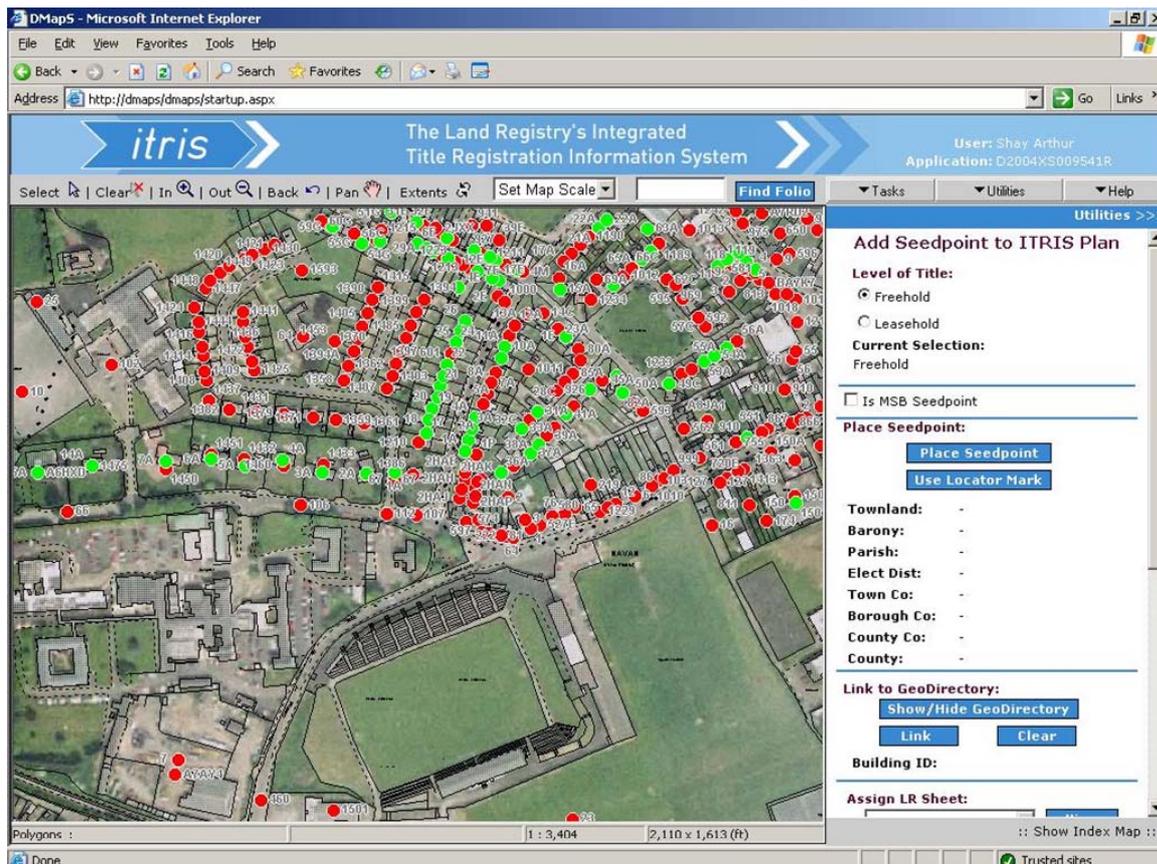
3.1 Contract No.1

This contract was to provide for Systems Development and Implementation. This contract was awarded to a consortium headed by LaserScan whose partners include Proteus Solutions, IME (UK) and Version [1] Software



3.2 Contract No. 2

This contract was for the creation of Seedpoints Data Conversion Seedpoints are the mechanism through which individual land parcels or plans are linked to their corresponding Folio/Register. With this significant achievement the organisation has further delivered on one of its major strategies of continuously improving customer services. This will be followed by the systematic creation of Land Registry parcel data on a county by county basis over the next five years. This contract was awarded to a consortium headed by Landmark Information Group whose partners include Proteus Solutions, RMSI and, Paper Dock



3.3 Current Landdirect.ie – successor to the EAS

The creation of the seedpoints has allowed the Land Registry launch a new version of The Electronic Access Service which is called **Landdirect.ie**. This is the new generation of online services from the Land Registry which enables account holders to avail of a number of new additional services online. Landdirect.ie went live on 28th April 2006.

- Search and locate property using our new digital Map.
- Use an index of addresses to view a map and locate a folio
- View and print folios and filed plans
- Obtain details of pending and completed applications

- Track the progress of applications through their lifecycle in the Land Registry
- Conduct names index searches
- Request official copies of folios, filed plans and filed plans showing special features
- Order official copies of Instruments.
- Submit a form 17 online and instantly receive the dealing number

3.4 Usage of Land Registry's On-line Services

The bulk of the Land Registry's customers are legal practitioners, professional law searching firms, financial institutions, local authorities and other public bodies. Since the EAS was launched in July 1999 the number of customers has grown steadily and the number of accounts now exceeds 10,000. This pattern is also reflected in the substantial increase in the number of transactions conducted through the on-line service. The number of on line transactions conducted per day at present is in the order of 4000 +.

3.5 OSi and LR Partnership

The multi-million euro project, commenced in 2004/2005 has enhanced the relationship between Ordnance Survey Ireland (OSi) and The Land Registry of Ireland (LR) two Public Sector organisations can be defined as B2B. Both organisations have recognised the key relationship that exists between them and influence the business and strategic objectives of each other. There is a constant communication process between both organisations in the development of the national asset that will result from this collaborative process.

BIOGRAPHICAL NOTES

Paul Brent is the Mapping Advisor in the Irish Land Registry and has over 30 years working experience in Land Registration. He is an honorary member of the Irish Institution of Surveyors.

Greg McDermott BA (Mgmt), MIT is the Software Services Manager in the Land Registration information systems.

He is the project manager for the Digital Map Project and has considerable experience in Land Registration.

Fred Finch MBA, MSC is the Senior Operations Manager in Ordnance Survey Ireland. He has 30+ years of experience working in mapping and is responsible for Spatial Database update and the Land Registry supply from OSi.

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