The Spatial Data Browser within Registers of Scotland

Stuart Bailey
Solutions Architect – Public Facing Systems, RoS Programme, BT
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Abstract

The BT Partnership with Registers of Scotland (RoS) has delivered a Spatial Data Browser to more than 300 users across the Agency. The tool enables mapping staff and legal settlers to undertake their roles more quickly and efficiently with improved functionality.

This will eventually be rolled out across 1600 RoS staff and be linked with registered property information as part of a wider initiative. Once complete, legal settlers will be able to access the Spatial Data Browser within their business workflow, enabling them to search for maps and plans related to specific deeds, legal burdens and rights of way.

It is based on a web service architecture which will support all of the other RoS map-based systems. New data can be added as the system evolves, from internal or external systems, without changing the architecture. The system supports all RoS vector map layers and OS MasterMap for all of Scotland, stored in Oracle 10g and delivered via ArcIMS and ArcSDE version 9.1. Image data is incorporated, including aerial photography, historical maps back to the 1840’s, and current Ordnance Survey raster products. Once full aerial photo coverage is captured by OS, the total data volume will approach one terabyte.

This presentation will cover some background to the systems, a discussion of the services-based architecture deployed within the Spatial Data Browser and how it will be utilised in other systems as the Partnership develops, allowing the sharing of RoS mapping data outside the proprietary production environment.
Introduction – Who am I?

• RoS Public Facing System Solutions Architect
• “Northern” Beacon of BT GIS Focus Group
  – A skills-based grouping supporting BT activities in GIS
  – 90 members within BT (GIS Users, Developers and Consultants)
• Involved in GIS since 1994
  – Registers of Scotland Digital Mapping System
  – Land Registry Northern Ireland
  – Various consultancy activities
  – Registers of Scotland Partnership
Background – Who are RoS?

- Registers of Scotland
  - “Responsible for compiling and maintaining registers relating to property and other legal documents.”
  - Manage 4 registers
    - (Register of Deeds, Land Register, CAJR and RCIL)
  - Established in 1617, Land Register began in 1979
  - Partnership programme
    - Integrated Registration Project
    - Registers Direct
    - Automated Registration of Title to Land
    - eLodgement
Background – Legacy Systems

- Uses of spatial data within RoS prior to the Partnership:
  - Digital Mapping System
  - Registers Direct
  - GIS Team
  - RoS Map
Background – Legacy Systems

• Digital Mapping System
  – Developed in 1994 by BT
    • 16 user pilot, growing to more than 200 users
  – Initially UNIX workstation-based
    • Later shift to PC technology, piloted for Orkney and Shetland
  – TENET mapping technology
  – Informix Database(s)
  – Bespoke spatial indexing
    • Similar to Quad-tree, but based on 10 * 10 grids
Background – Legacy Systems

• Registers Direct
  – Developed in 1995 by Unisys
  – Used both in-house and externally
  – TENET mapping technology
  – Informix Database(s)
  – Data warehouse based on extracts from Production system
    • Data feeds
    • Informix replication
Background – Legacy Systems

• GIS Team
  – Around 5 individuals
  – Also includes some Mapbase Maintenance people
  – GIS analysis for internal and external consultancy work
  – ESRI technology
    • Primarily ArcGIS 9.x
  – Responsible for an OS MasterMap Pilot within the Agency
  – Shape and MapInfo Import, Link and Export (SMILEEx) tool
Background – RoSMap

• RoSMap
  – Pilot Intranet system to publish mapping throughout RoS
  – Based on Oracle Limited Licence and ESRI IMS on a Linux box
  – Presented to this group about 4 years ago by RoS
  – The direct predecessor for the Spatial Data Browser
    • Demonstrated the business benefits
    • Identified some of the challenges to overcome
    • Provided feedback on Land Intelligence proposals
Background – Spatial Data Browser

• A desire to provide all staff at RoS with:
  – Land Registration Maps
  – Aerial Photography
  – OS MasterMap Topography Layer
  – Registers Address Gazetteer
    • A centralised address gazetteer, created from OS MasterMap Address Layer plus all “addresses known by RoS”
  – “Other” Land Intelligence information
  – Aim to “enable map and legal settlers to undertake their roles more quickly and efficiently “
  – Went live to 300 users on 16/02/2007
SDB – Example screen shot
The Architecture – Vision

- **Strategic Vision**
  - Create a flexible mechanism to serve all GIS applications within RoS
    - Spatial Data Browser
    - Integrated Registration Project (IRP)
    - Registers Direct (RD)
    - GIS Team
    - eLodgement?
  - Be “vendor neutral”
  - Utilise Open Standards wherever possible
  - Support future data sources
  - Provide MetaData for all data
The Architecture – Solution

- **Web Service delivery of Spatial Data**
  - Web Map Service
  - Web Feature Service
  - Used for all data access when practical

- **Independent Data Stores**
  - Clear ownership for each dataset

- **Repository-based**
  - Virtual Managed Repository
  - MetaData managed for every dataset
  - eGIF compliant
The Architecture – Conceptual

GIS User Systems, Data Stores and External Interfaces

User Systems
- Registration Mapping
  - TENET MapLink

Data Stores
- TMF
  - Production Data
    - Title Plans
    - Indexes
    - P16s, etc
- Oracle
  - File
  - Open Topo
  - OS MM Topo Layer
- TENET
  - Registers Direct
  - TENET MapLink
  - TENET MapRite
    - (?) & Poss
    - Snowflake

External Interfaces
- GIS Browser
  - Poss ESRI
  - ArcIMS
- External Data Sources
  - Info Mgmt Group
  - Desktop GIS
  - Land Intelligence
    - LA Boundaries
    - PAI Map Tiles
    - SSSI Boundaries
    - etc
The Architecture - Details

• Storage
  – Oracle 10g for Vector Data
    • full, historic, OS MM for Scotland
    • Currently 300GB
    • Anticipating 10% per annum growth
  – ER Mapper Image Web Server for Raster Data
    • OS MasterMap Aerial Photography
    • Historical maps back to 1840s
    • Other OS Raster Products
    • Anticipating up to one TB of data
The Architecture - Details

• Delivery
  – BEA Weblogic 8.1 Application Server
  – ArcIMS and ArcSDE versions 9.1
  – ER Mapper Image Web Server using Web Map Services (WMS) and the ECWP streaming protocol
  – All datasets MUST have MetaData (held in Oracle)
The Architecture - Details

• Viewer
  – Current SDB
    • Standalone Intranet application
    • Uses the proprietary ER Mapper ActiveX plug-in internally
    • 300 users
  – Integrated viewer
    • Integrated into Agency Business Workflow
    • Re-implemented using AJAX (Backbase) using Web Services
    • 1600 users
The Architecture – Current

- Initial deployment
  - Serves only SDB
  - Shows SDB IMS using SDE on Oracle 10.1.4
  - Current deployment
The Architecture – Future

- Target deployment
  - Serves only SDB
  - Shows all applications using SDE on Oracle 10.2
  - Includes Read Only database instance “downstream” of Production and Mapbase Maintenance
  - Autumn 2007
The Architecture - Benefits

• Benefits
  – Centralised Management
  – Consistent Mapbase
  – Controlled updates
  – MetaData available for all datasets
  – Flexible sources of information
  – Potential for external sources
  – Potential for publication of service-based information
Current uses of Architecture

- **Spatial Data Browser**
  - Provides all data layers
  - Ensures consistent OS MasterMap Topography Layer
  - Optimises use of Image layers

- **GIS Team**
  - Provides all data
  - Provides mechanism to publish Land Intelligence Data
Future Plans - Immediate

• Registers Direct 2 (RD2)
  – Supplying similar data to Spatial Data Browser
  – Involves a “Registered” view from the Web Services

• SSSI Register
  – Backdrop data (OS MasterMap, Imagery, Raster data)
  – SSSI Register polygons become “another Web Service”

• Integrated Registration Project
  – Bespoke mapping application modifying data directly, then “published” to the Enterprise through Web Service interface
Future Plans – Longer Term

• eLodgement
  – More interactive production of Deeds from Registers of Scotland Data, including spatial data
  – Potential for end-user mapping interface

• Data Services
  – Ambitions to be a data provider, both spatial and textual/attributes
  – Potential for Web Service products
Interesting Facts

- **MasterMap Topo**
  - Used Snowflake to load Scottish National Coverage
    - 1 week to load
    - 2 days to index
  - 300GB of data, anticipating 10% per annum growth
    - TOPO_LINE is circa 300 million rows
  - Currently re-visiting default Snowflake schema
    - Partitioning and Indexing
  - Updates via Tenet application
    - PL/SQL update statements
    - Potential Index Degradation
Interesting Facts

• ESRI products
  – Managed as a stateless resource
  – Current deployment
    • IMS and SDE v9.1
    • Clustered Weblogic Application Server 8.1
  – Planned upgrade (Autumn)
    • IMS and SDE v9.2
    • Clustered Weblogic Application Server 9.2
Challenges

- **PAI**
  - RoS are one of the worst affected due to their National dataset

- **Volume of data**
  - RoS have a desire to keep “historic records” – this results in increased data volume
  - Imagery data is ever-improving in resolution and hence size

- **Performance**
  - Use of an open standard tends to result in verbose data
  - Data translation to open standard can be processor expensive
  - Performance of external sources is likely to be less predictable
Challenges

• **Access Control**
  – Web Services need to be built to allow control of update
  – Some historical data may not be desirable to publish to everyone
  – Need to protect the revenue associated with Information Services

• **Commercial Licensing**
  – Some data sets are licensed for internal only use
  – Some data sets may be licensed “per view” or “per user”
    • What constitutes “a user” within this architecture
    • What constitutes “a view” in a Web Service environment
Any Questions?
Thank you