OpenSource GIS guide

1 Implementation

Guide to implementing an OpenSource spatial data infrastructure

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Responsibility for this document

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The impacts of the process described in this document have been assessed and where appropriate, changed, in accordance with the requirements set out in Ordnance Survey's Equality Scheme.

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1 Introduction

The recent rise in development of OpenSource software has seen the introduction of solutions for the creation, storage and analysis of spatial data that are considered free at the point of use. Additionally, the government's transparency agenda has unlocked many data sets that can now be incorporated into analysis, aiding the interpretation of data and decision-making process.

This is the first of a series of white papers providing some details of OpenSource technologies. This paper describes a model for the implementation of an OpenSource geographic information (GI) environment. As there is a wide choice of OpenSource software, this document only highlights the most popular of these based on discussions with Public Sector Mapping Agreement/Ordnance survey Mapping Agreement (PSMA/OSMA) members who are using OpenSource technology. This paper is not intended to be a definitive guide but will help users who want to make a first step with OpenSource.

The implementation model is only intended as a guide and may be adapted to suit the need of an individual organisation. It is also possible to use OpenSource software alongside commercial software solutions.

2 Implementing an OpenSource environment

The model for implementation is only for guidance and the software discussed can be implemented with other applications. In many cases OpenSource applications can be used to compliment other GI systems and users may wish to discuss interoperability with their software vendors.

A typical geographic information system (GIS) comprises of a number of elements which can be broken down into the following components:

- Data input – as data may not be available in a format that can be read by a particular GI application a translator may required to read data and convert it into a compatible format.
- Data capture and maintenance – tools are required to enable users to capture and maintain their own data sets.
- Data storage – this may be either as simple files in a directory or in a spatially enabled database.
- Data analysis – either using tools within a GIS or a spatial database.
- Publishing mapping – either for viewing in a GIS or via a web browser.

The requirements of each of these can be served by either a commercial (licensed) software solution or an OpenSource solution. The users’ final solution may involve a mix of commercial and OpenSource applications.

2.1 Software

The diagram shows a simple GI set-up for each element. OpenSource and commercial solutions are available to cover each element.
The potential OpenSource solutions for each element include:

- **Data input:**
  - Astun Technology has created OpenSource code which can be downloaded from github. This includes an OS MasterMap® loader for use with PostgreSQL.
  - Rolta – provides translation software for use with OS VectorMap® Local, translating the data into MapInfo TAB and ESRI Shape formats.
  - Edonica – provide tools for importing Ordnance Survey data, including OS MasterMap into a variety of formats
  - Bodleian Library Geography room provides a number of data conversion tools which include a GML translator for OS MasterMap.

- **Data capture and maintenance:**
  - Geospatial Data Abstraction Library (GDAL) is a library of translation utilities for use with raster data.
  - FWTools is a set of open source GI tools created by Frank Wamerdam for both Windows and Linux.

- **Data storage:**
  - PostgreSQL is an OpenSource SQL database and has powerful spatial functionality when the PostGIS spatial extension is loaded. Connecting PostgreSQL is supported by a number of GIS including ArcGIS, MapInfo, CadCorp and QGIS.
  - MySQL is an Oracle OpenSource data which has some spatial functions but is not yet fully supported by GIS software.

- **Data analysis**
  - QGIS is probably the most popular OpenSource desktop GI application with a range of tools for use in analysing spatial data.
  - MapWindow is a GIS created by Idaho University.
  - Geographic Resources Analysis Support System referred to as GRASS was originally created by the US Army. It has a wider range functions for spatial analytics.
• Publishing mapping:
  • As well as analysing your data with the GIS software mentioned above these can also be used to publish the results of your analysis in a graphical format.
  • Geoserver is an OpenSource server for sharing geospatial data across the web.
  • OpenLayers a JavaScript library of tools for the display of spatial data in a web browser.
  • GeoExt uses OpenLayers for the creation of powerful GIS apps.

2.2 Data

Ordnance Survey has made a number of data sets available as free to use through OS OpenData™. In addition to this the PSMA/OSMA offers commercial data sets to Government organisations as free at the point of use. OS OpenData can be downloaded directly from the Ordnance Survey website – http://www.ordnancesurvey.co.uk/oswebsite/products/os-opendata.html. It includes a range of both raster and vector products at a variety of scales for use as back drop mapping and in data analytics. In addition to these OS OpenSpace® is a free to use API which can be used as part of a public-facing web environment.

The OS OpenData products are:
• Miniscale – a small scale raster back drop.
• 1:250 000 Scale Colour Raster – small scale raster data giving a regional context.
• OS Street View® – 1:10 000 scale raster data set giving street level detail.
• Boundary Line™ – Vector data set of GB administrative boundaries.
• Code-Point® Open – Postcode Unit data for Great Britain including a geographic coordinate.
• 1:50 000 Scale Gazetteer – reference tool for finding locations.
• Strategi® – Small scale vector data set at 1:250 000.
• Meridian™ 2 – Mid scale vector data set at 1:50 000.
• OS Locator™ – National gazetteer of road names.
• Land-Form® PANORAMA – Contours and digital terrain model for use in 3D mapping.
• OS VectorMap District – Both raster and vector data set at a scale of 1:25 000.

2.3 Why implement OpenSource software?

The main reason for choosing to implement an OpenSource GI environment is cost. However, there are implications when choosing free software which must be taken into consideration. In the case of a commercial application technical support can be paid for as part of the software package. However, with OpenSource the user is dependent on the growing web community and developers. As a lot of OpenSource software is relatively new, long established commercial software has a well developed user community which in turn is supported and championed by the provider. This means that with commercial software someone has probably ‘done it before’. In the case of OpenSource the user may well be trying these applications for the first time.

Furthermore where commercial software will have a well developed Graphical User Interface (GUI), in the case of some OpenSource applications, it may well be that unless a developer has seen the need to develop a GUI then none will exist. This could mean that using some OpenSource applications may require some detailed technical knowledge for users to be able to perform tasks which may be considered straight forward.
3 What do I need?

To implement an OpenSource GIS the user will need to decide which elements will help achieve tasks required to be carried out. There are a number of questions to consider:

1. How is the data to be stored, either as flat file on a local drive or server or in a spatial database?
2. Who is the intended audience for the final output?
3. What data does the user hold that is already spatial?
4. What data do I need to link to a spatial data set?
5. What questions does the user need to answer?
6. What level of mapping detail does the user require, for example, consider what scale the data is viewed at and the granularity of the data required, for example, postcode unit vs. full postal address?
7. Is there a need to capture and store spatial data?
8. Do other users need to access the data, so is there a need to have a shared server or a local installation?
9. How are the results going to be published, as static images or as live data on the web?

Once the user has considered these questions an implementation plan can then be created. This will act as a guide to what software is to be installed and in what ordered. It should also indicate what data will be required and how this should be accessed.

4 Next steps

Once the user has created a GIS implementation plan and chosen the software required the software will need to be downloaded and installed. Guides for installing and setting up some of the most popular applications are available as part of this series of white papers. These also include a guide to other resources which will help in your GIS implementation.