

An Atlas for Ireland's Artists

It practically goes without saying that people develop emotional attachments to place. The Irish are particularly emotive with regards to townland, parish, county, province and country. Years of emigration have produced a diaspora abroad, cut off from the old country. While they have settled well in their new homelands there is a desire to reach back to places that were part of their families history.

Portraits of Ireland Ltd is a web based Irish company aiming to help connect the diaspora to people and places in Ireland through Art. This startup company required an online interactive atlas to assist both artists and those commissioning their work to find not only the island's more well known locations but also its remote and smaller place locations. To this end an Artist Atlas was created.

Some of the primary requirements were a cartographically rich, aesthetically pleasing vector based system, fully searchable, and with as extensive a database as possible. The company had a limited amount of seed capital so the budget was minimal. Therefore the software had to be open source and the data free or near enough to it.

The Data

The largest source of free data is the United States government. As table 1 details we located several sources of pertinent datasets. The US Geological Survey (USGS), makes available the Shuttle Radar Topography Mission (SRTM) data at 90 meter resolution of Ireland and most of the world (<http://edc.usgs.gov/products/elevation.html>). This elevation data was taken from the space shuttle in February 2000. The mission was a joint project undertaken by NASA, the National Geospatial Intelligence Agency (NGA) and the German and Italian space agencies. Taking inspiration for the Tirol Atlas (<http://tirolatlas.uibk.ac.at/>) we created a backdrop for our atlas with a hill shade based on this SRTM data.

The digital chart of the world created for the US government's Defense Mapping Agency (DMA) was a source for county and road data. We improved road data by rectifying it, utilizing Landsat satellite data. However, the largest source of data was the GEOnet names server (GNS) belonging to the US NGA. This source provided the geographic locations of thousands of populated places, topographic and hypsographic features in Ireland. However the NGA do state on their website that locations "are approximate and are intended for finding purposes only." "Finding purposes" is a somewhat vague statement, however we incorporated the data into the atlas and are continuously testing its accuracy. An email inquiring into details of how this data was gathered did not receive a reply from the NGA. I have mental images of 'men in black' types roaming the Irish countryside with GPSs on their backs, but surely not.

Layer	Source
Populated Places, Topographic and Hydrographic features (points)	Geonet Names Server (GNS) National Geospatial Intelligence Agency
Roads and Counties	Digital Chart of the World (DCW) Landsat Satellite Imagery
Elevation Data	NASA/NGA/USGS SRTM

Table 1.

The Software Architecture

The two RDBMSs we assessed for this project were PostgreSQL with its gis add-on PostGIS and Mysql 4.1 with it's spatial extension. We selected Mysql as it runs easily in both Unix and MS Windows environments. At the time of assessment, Postgresql was not easy to install on windows and in testing Mysql proved extremely fast in returning our queries. We developed under the Mysql 4.1 gamma version, but 4.1 has recently been released as a production version. The spatial extensions of Mysql "allow the generation, storage, and analysis of geographic features", (http://dev.mysql.com/doc/mysql/en/Spatial_extensions_in_MySQL.html). These geographic features are based on the OpenGIS geometry model, and the database importantly also provides spatial indexing functionality.

Description	Technology	Files
GUI	HTML SVG DHTML	*.html *.svg *.svgz
Client side code	Javascript	*.js
Server side coding	PHP	*.php
Server side database	Mysql 4.1 and SVG flat files plus jpeg images	*.jpg *.svgz Mysql Tables with Spatial types
Production Platform	Linux with Apache	
Development Platform	MS Windows with Apache	

Table 2.

Essentially at this point in the atlases development we required basic point in polygon functionality. As the user pans in the application we required the database to return data from layers of interest to the client. The downloading of geographic vector data via the internet is a bandwidth hog. The database collected and detailed above, is simply too large to efficiently download at one time, to a client. Therefore we limited the display of large datasets making them scale dependent and transferring only the data to the client, in XML, that falls within the extents of the map display.

The client, with the SVG plugin installed parses the XML and adds the spatial features to the view. For the rendering of the Spatial data as noted above, we required a vector based system that is programmatically flexible and artistically pleasing to the eye. We found this in Scalable Vector Graphics (SVG).

SVG

SVG was a good fit for our requirements. However it is not a panacea for everyone wanting to deliver geospatial data to the web. It has extensive visual capabilities, which is natural for a technology strongly supported by Adobe®. Developers however should keep in mind that delivering spatial data in vector format will enable clients to save the data locally. Many organizations do not want users to have this capability with their data.

SVG is a graphics environment not specifically designed for mapping purposes. This is evident when one realizes the origin of a SVG extent is in the top left hand corner. The technology does however provide transformation functionality to rectify this default standard. It is also a technology that relies upon a plugin and even downloading this on a dial up connection is painfully slow. That being said, within a couple of years I believe the vast majority of internet users will be using broadband.

SVG has allowed us to avail of opaque and gradient rendering and has also provided for the mixing of raster and vector data. It even supports animation, this we intend to integrate into the application to draw attention to objects found after searches. The document object model is fully searchable and thus enables the creation of tools to allow the user to quickly find point locations or entire counties, in fact any geographic feature in the SVG document, See figure 2. While this is an extremely useful feature for the purposes of the Atlas we intend to move from SVG document searching to SQL searches on a backend database. This latter choice is simply a more flexible option for queries.

Performance and the path to Mysql

The internet is based upon communications between client and server machines. The pipe linking the two can be as limited as 28k modems or as broad as over 700k broadband. Vector data is a bandwidth hog. Streaming geometric definitions of each individual geographic feature, in a sizeable database, to a client requires a broadband connection. Even this powerful a connection can be slow. In the development of the Atlas outlined above a number of configurations were attempted. In our attempts to overcome performance issues we tried three design strategies.

Current Design: Thick Client

The end user hits the atlas and all code and data is downloaded to the client. All data is stored in flat file compressed format. Even utilizing compression techniques the download will take approximately thirty to sixty seconds depending on your broadband connection. This version is currently being utilized and we are currently unable to add more data as this would slow it down further. We have stopped development on this architecture.

Scenario 2: Progressively Thicker Client

The end user hits the atlas and client code and overview data is downloaded to the client browser. This provides for faster loading of the application. Depending upon layers selected larger data sets are streamed to the client on an as needed basis from a mysql database. This involves javascript executing php code on the server to return the data layers. This design did load the atlas much faster to the client. However we were concerned that as the database increases in size the client could be swamped and individual client machines would run seriously low on resources. After testing we abandoned this approach.

Scenario 3: Balanced Processing and Data Recycling.

By the time this article goes to print we will have implement this design in our production system. This setup is as scenario 2 above with two exceptions. As the user pans the atlas, client code passes the map extents to the server and the server executes a spatial query returning only those features in the map extent which have layers selected in the table of contents. This design includes code that flushes the SVG document of features that have been panned out off, i.e. are no longer in the map view extent. To implement this setup it was necessary to upgrade to mysql 4.1.

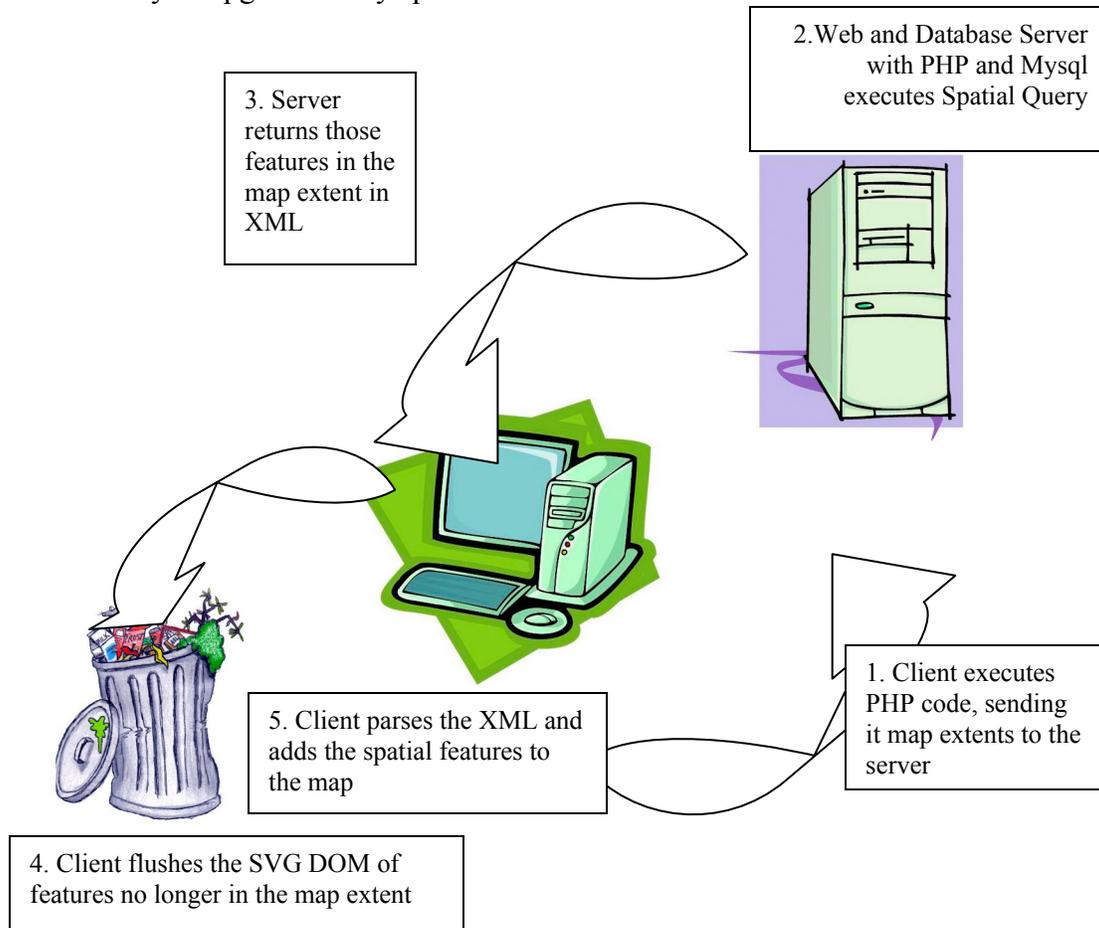


Figure 1.

Artist Atlas User Interface

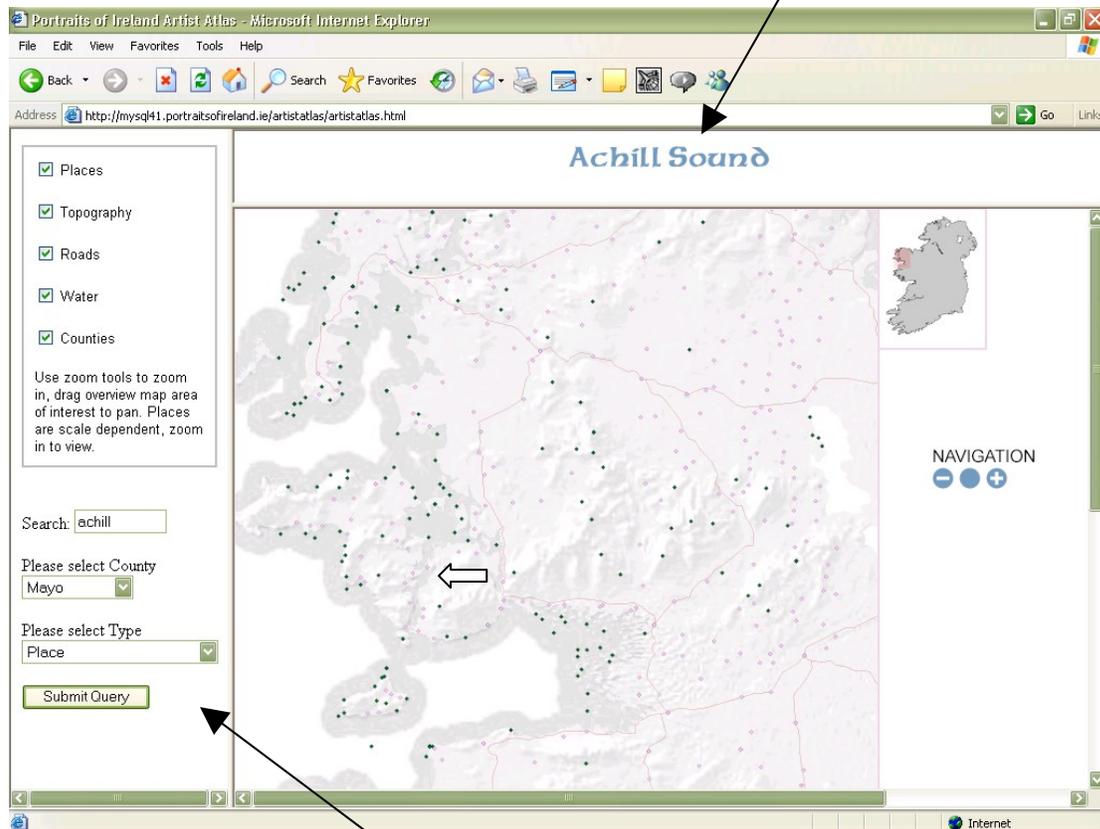


Figure 2

Fully searchable database, will zoom to a queried location if in the database.

The current system is a foundation for an Atlas for Ireland's artists. There are so many more datasets, which could be integrated into the application. There are a number of improvements to the Atlas that are on the wish list, these include the:

- addition of all place names in Irish and their meanings in English.
- The addition of Townlands.
- Addition of a more extensive roads database.
- Ability to click on any place name and issue a query returning all art associated with it.
- Addition of historical maps.
- Creation of a lite weight version producing raster on the fly for dial up users.

The Atlas certainly could be made more user friendly and cartographically richer. However I am confident that both these aims are possible due to the tools selected to create this initial application, it is something that can be built upon. My thanks must go to

the open source community for making this start possible and especially to the authors of the papers listed at the end of this article.

Daniel McAlister is Chief Technical Officer of Integrated Spatial Solutions Inc. of Whittier California and can be contacted at dmcalister@issi-gis.com.

www.issi-gis.com .

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