

## **MILES VIRTUAL SEMINAR - Nov 2005**

### **FREE SOFTWARE, GEOINFORMATICS AND ENVIRONMENTAL MANAGEMENT INFORMATION SYSTEMS AT THE LOCAL LEVEL**

## **User-friendly Desktop Internet GIS**

Jody Garnett, Refractions Research Inc.

### **Greetings**

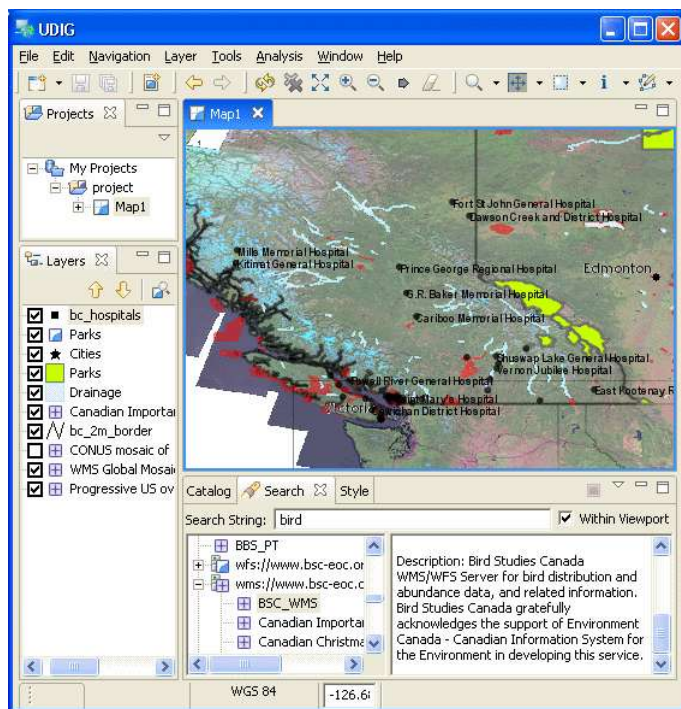
Open-source Geospatial is an international, cross organizational, undertaking. Everyday I work with people from around the World. People come to open-source from all sorts of backgrounds, with all manner of interests, and from many different projects.

Together we form a community, and although they may not have a name (our conference has changed its name each and every year it has been held), I consider these people I enjoy working with. I would love to add the members of MILES to the list.

In this document I have been asked to write about my experience in developing uDig, and address some of the issues slated for discussion in the MILES forum in November.

### **User-friendly Desktop Internet GIS**

UDIG is open source desktop GIS development platform that includes support for local data, databases, and internet data. The development of uDig started in spring of 2004, with initial support from the Canadian GeoInnovations program, and has continued throughout 2005 as an independent project.



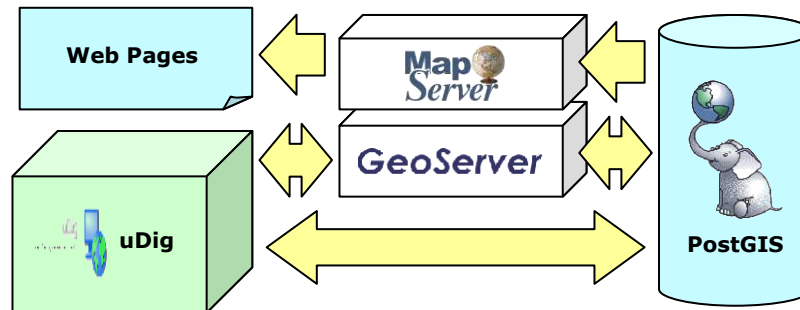
uDig has been designed from the start as a general purpose development platform:

- Industry standard extension framework using Eclipse technology;
- Completely scalable and customizable rendering pipeline to handle even the largest data sets;
- Complete integration with standard internet data sources such as OGC Web Map Service and Web Feature Service;
- Coordinate reference system support for all data sources, and on-the-fly coordinate system integration;
- Support for ESRI Shape files, PostGIS, DB2, Oracle Spatial, and OGC web services; and,
- Extensive standards support (OGC Filter, OGC Spatial Reference System, OGC Styled Layers, etc).

We are an active, and friendly, developer community. The uDig source code is available via an LGPL open source license.

## Background

The vision for uDig is to fill functional gaps in two technology communities: the open source geospatial community; and the open standards geospatial community (as represented by the OpenGIS Consortium).



- For the open source community, uDig is meant to fill in the functional role provided by ArcView in proprietary software architectures. It provides data viewing across a range of formats and projections, and provides access to downstream data sources (such as PostGIS) that contain data, but do not expose it visually. The software architecture has been chosen and developed to encourage modular improvement to the platform. Successful open source projects provide a modular architecture to allow maximum collaboration from a wide community of interest, and the technical design of uDig has been focussed on providing that foundation.
- For the open standards community, uDig is meant to fill the role of an “integrated client” capable of consuming internet services and data transparently and easily. While the OpenGIS process has created a number of server specifications, and numbers of servers obeying those standards have been set up, access to the data is still largely through clunky web interfaces. uDig brings network spatial data access to the desktop, and makes adding network data to the map as easy as a drag-and-drop.

Initial funding for the uDig project came from the Canadian GeoConnections program and ran from spring of 2004 to spring of 2005. Refrations Research proposed the uDig vision and GeoConnections provided sufficient funding to take the project through design to an initial implementation.

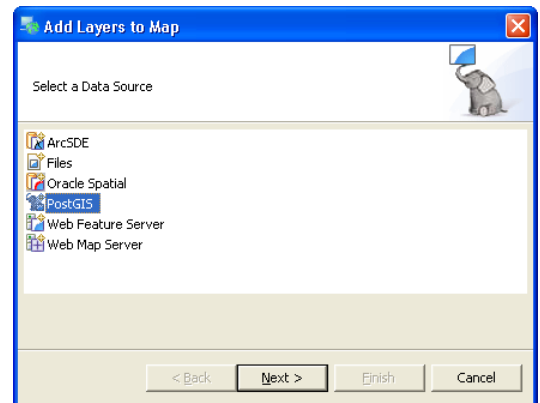
Since then, Refrations Research has continued with uDig development, and is working on a number of consulting projects that use uDig as a development base. In particular, we are currently completing a project for the OpenGIS consortium to deploy uDig as a demonstration integrated client for their upcoming “Open Web Services” demonstration to the US government. Since the spring, Refrations has also used uDig as a platform for a data entry tool for the UN Food & Agriculture Organization (FAO), and an emergency response data aggregator for the US State Department.

Our experience is that more and more organizations are recognizing the utility of uDig as the basis for advanced application development. In Finland, uDig is being used as the basis for a forestry management application. In Peru, the UN FAO is using uDig as the basis for a spatial data analysis application with their potato genetics library. In the United States, the Army Corps of Engineers is building AutoCad format support into uDig to support their applications.

## Relationship to other Open Source Projects

There are two relationships that are worth examining: the relationship with other unrelated projects; and, the relationship with projects that have similar goals.

With unrelated projects, uDig is designed to leverage and make them more valuable by making them more accessible. PostGIS and GeoServer both benefit from having an intuitive desktop tool for direct data access. Mapserver benefits from having a universal WMS client available to test maps and show integration between Mapserver and other data sources. Refrations is currently working with the OSSIM raster processing community to integrate the OSSIM processing system directly into uDig, providing another point of viewing and data integration for imagery processed through OSSIM.



The relationship to projects with similar goals to uDig is more complex, and worth exploring a case at a time:

- **JUMP** (now OpenJUMP) is a precursor project to uDig, in many ways. Refrations already had extensive experience with JUMP, as a co-developer of the platform. Our proposal to GeoConnections initially proposed enhancing JUMP by integrating GeoTools. However, at the design phase, we evaluated a number of technology platforms, and came to the conclusion that building on Eclipse RCP with GeoTools would provide a much more robust system in the long run. Retro-fitting JUMP looked like an option that would require just as much effort as a new system, without the long term benefits of basing the application on the Eclipse RCP.
- **QGIS** is a C++ viewer, and at the time of technology evaluation was basically moribund. This has changed over the past 12 months, but at the time of evaluation it was a one man project with little momentum. As with JUMP, improving QGIS architecture to handling things like multi-megabyte shape files would require substantial effort. Finally, we wanted to take advantage of the community effort and code base already available in the GeoTools Java project, and since QGIS is C++ would not have been able to do that.
- **gvSIG** is a Java viewer editor, with very similar goals to uDig, also designed from scratch, at around the same time as uDig. Initially, the gvSIG and uDig teams did not know the others existed, and as a result made a number of technical decisions early on that made their efforts incompatible in the short term. While uDig opted to architect heavily up front, optimize late, use Eclipse RCP and use the GeoTools library from the start, gvSIG chose to get a working application as quickly as possible, rejected using GeoTools initially, and implemented a UI in Java Swing. Obviously, it would be ideal to have both teams working on the same code base, but at this point the technology bases of the two projects have diverged a great deal. The final issue is one of licensing: uDig uses the LGPL, while gvSIG uses the GPL, and neither team is willing to change.

At this point, it is unlikely that either gvSIG or uDig will give up the accumulation of effort committed thus far to create a merged project, so the long term question of which project will survive will be answered through community building. The project which builds the largest community of contributors and maintainers will be the one which will survive and prosper in the long term. If a project is dependent on government funding for future development or maintenance, it will eventually fail when the funding fails.

At a technical level the development communities are interested in collaboration, both the **Deegree** and **GeoTools** toolkits have made progress harmonizing around the **GeoAPI** project.

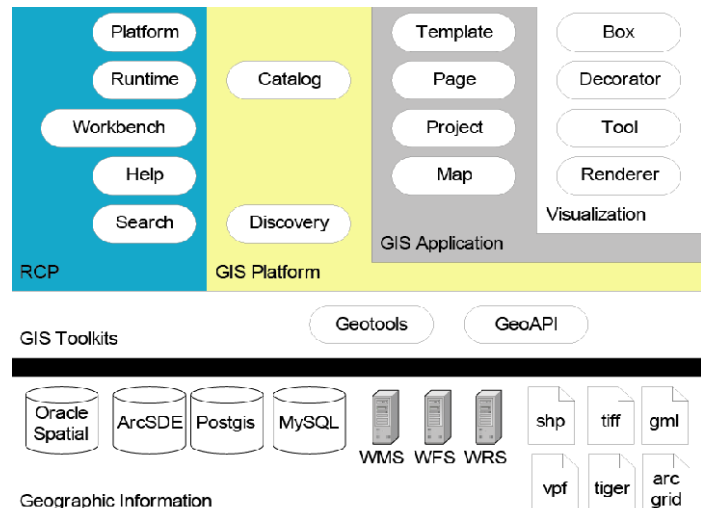
## Business, Government

Most successful open source projects require an initial kick to get started: enough working code has to exist that incoming contributors can receive meaningful value by taking the existing code and adding incremental improvements. Getting the initial volume of working code is a place where government can have the greatest leverage, recognizing a general need for functionality, evaluating the marketplace, and contracting for a core piece of functionality which is amenable to extension.

There are some great examples of this approach, either deliberate or accidental, already in existence:

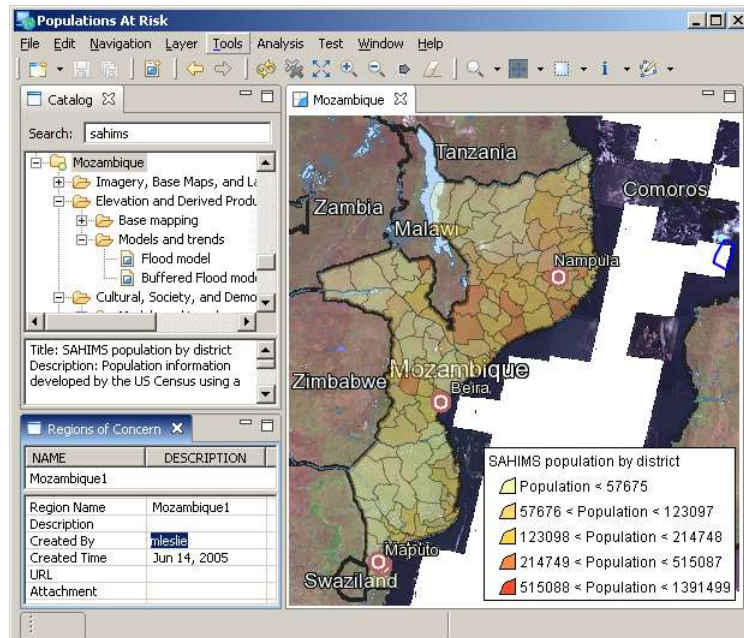
- **GRASS** was built up at a core level by the US Army Corps of Engineers, in a modular manner, and eventually open sourced. Since then, the GRASS core has provided an integration and experimentation point for academic geospatial researchers and geospatial power users.
- **OSSIM** was funded by NIMA specifically to provide a modular integration point for high powered image processing algorithms. Rather than paying contractors to build complete image tool chains, NIMA can now pay contractors to develop *just* the relevant algorithms as OSSIM modules. In the cases where the development is classified, NIMA simply keeps the modules in house and uses them with the open OSSIM code base. Where they are unclassified, they can be contributed back into the OSSIM core and maintained by the community.
- **Mapserver** was funded by NASA and the Minnesota DNR as part of an unrelated research project, but ended up being more useful in its own right than the research it was supposed to support. Enough basic capability existed in the early releases that incrementally improving and expanding it was always more economic for new contributors than simply starting from scratch. As a result, Mapserver has long since outgrown having any one funding agency, and receives upgrades and improvements from multiple developers with multiple funding sources.

The initial kick to get the uDig code base up to a working state was provided via the GeoConnections funding. Refractions provided the vision, and built the first revision of code using the government funding. Since then, we have been working to bring in more and more collaborators, so that uDig grows an independent development community.



## Longevity

Our corporate interest is to see uDig grow and succeed because we are the pre-eminent experts in the uDig technology. We have assisted many organizations in learning to use uDig for free, because we know that in the long run a larger community will bring more clients to us for services. We have also sold application development explicitly based on uDig to our clients, building a consulting services approach to uDig from the very start. Our first external uDig consulting project was started before the core software was even released to version 1.0.



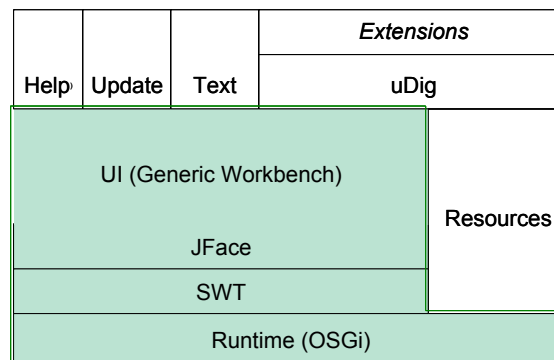
Now that other companies are proposing uDig to their clients for solutions, we feel very secure that uDig will have a long term existence. More and more clients will have a need for ongoing updates and maintenance as more applications are based on the core uDig system, and more and more companies will be available to provide that service.



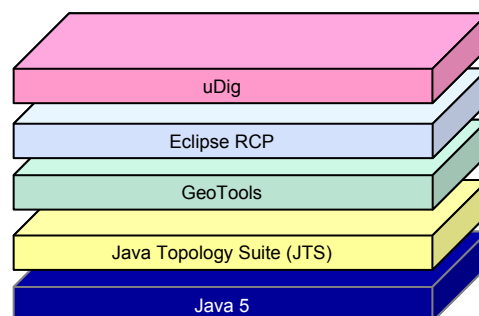
## Technology and Software

One of the most notable points about the uDig project has been our conscious attempt to leverage as much existing technology as possible in our development. We have tried to avoid re-inventing any basic technology. As a result, uDig has become a case study in some of the latest modular software development tools being used in the business community.

- Eclipse RCP.** The RCP stands for “Rich Client Platform”, and it is from the RCP that uDig inherits its extreme modularity. IBM has invested millions of dollars in perfecting the plug-in system and other technologies that support the RCP, and has re-architected their entire software engineering product line to use these technologies. Ordinarily, using a brand new technology like the RCP would be considered risky, but the weight of effort that IBM has placed behind the RCP technology means that uDig will be well supported by the RCP for years to come.



- GeoTools.** The GeoTools project is a Java software library that handles infrastructural GIS tasks, like reading GIS file formats, connecting to spatial databases (PostGIS, Oracle), doing coordinate reprojection, rendering GIS objects into colored maps, and so on. We chose to base uDig on GeoTools because it saved us the effort of re-inventing all the standard GIS processing infrastructure. It also gave us access to a pre-existing GIS developer community, who would help us in our project and save us from having to learn various portions of GIS arcane. For example, uDig supports coordinate reprojection, but none of the uDig development team has any knowledge of the mathematics of coordinate system transforms. Using GeoTools has let us focus on creating a user interface for GIS. In turn, GeoTools has gained an example application that exposes its functionality to greater use and visibility by end users.



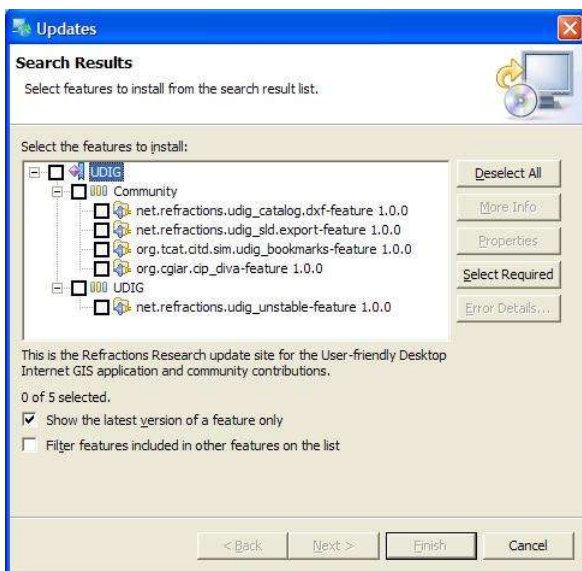
## Company

Refractions Research is a geospatial consulting company with headquarters in Victoria, Canada. We have been in business for 8 years, and have 25 staff working on a variety of spatial data technology projects. Our technology philosophy has been to use the right tools for the job, and to recognize that open source tools occasionally have large advantages over their proprietary counterparts.



Our projects have involved using ESRI technology, Oracle, FME, and others. We have also taken the lead in providing development and evangelizing communities for the PostGIS spatial database, the uDig spatial framework, the GeoTools library, and the GeoServer spatial web server. Refractions is a member of the Open Geospatial Consortium, and contributes to geospatial standards development on a regular basis.

- Refractions Research : [www.refractions.net](http://www.refractions.net)
- PostGIS: [postgis.refractions.net](http://postgis.refractions.net)
- uDig: [udig.refractions.net](http://udig.refractions.net)
- GeoTools: [www.geotools.org](http://www.geotools.org)
- GeoServer: [geoserver.sourceforge.net](http://geoserver.sourceforge.net)



## Community

To contact the uDig community, please visit our website. You may also wish to join the email list. For direct contact there are two Internet Relay Chat (IRC) channels where uDig developers can be found.

- Website: [udig.refractions.net](http://udig.refractions.net)
- Email list: [lists.refractions.net/mailman/listinfo/udig-devel](http://lists.refractions.net/mailman/listinfo/udig-devel)
- Internet Relay Chat:  
<irc://irc.freenode.net/udig>  
<irc://irc.freenode.net/geotools>

## Contact

If you have any questions about this document, please feel free to contact me.

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