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# OSGeo Journal

The Journal of the Open Source Geospatial Foundation

Volume 2 / September 2007

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## Editorial

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# Community Flexibility

Working on this Journal is always enjoyable because you get to see, first-hand, the various kinds of projects and ideas going through the minds of those in our communities. It is also exciting to see the breadth of developments happening both inside and outside of OSGeo.

Volume 2 continues to capture these varied perspectives from open source communities around the world. The content in this volume is slightly different than the previous one – it has a focus on case studies and local chapter updates. We have also added a section for highlighting commentary from OSGeo sponsors – a place to describe their interest/involvement in open source or talk about ideas they'd like to share with the broader community. There are still the standard project introductions, topical studies, news and announcement sections.

The next volume will be focused on publishing the proceedings from the [FOSS4G 2007 conference](#). If you are a conference presenter and would like to submit a paper for this next edition, please contact me. If you will be at FOSS4G, please stop by the OSGeo booth and say hello.

We are still collecting general articles for the next volume and will publish them if space permits. I

invite you to contact me directly about any article, news, report, etc. that you could contribute to future volumes. I am especially interested in Case Studies and Event Reports that help us to see what people are doing.

*Continual change* is one way to describe the open source geospatial community. Since I am not averse to change I see this as one of our greatest strengths. I'm interested in hearing from you. Your comments, suggestions and [feedback](#) are welcomed and encouraged. We are always looking for more volunteers to help proof-read, tweak LaTeX, improve layout/design and edit articles.

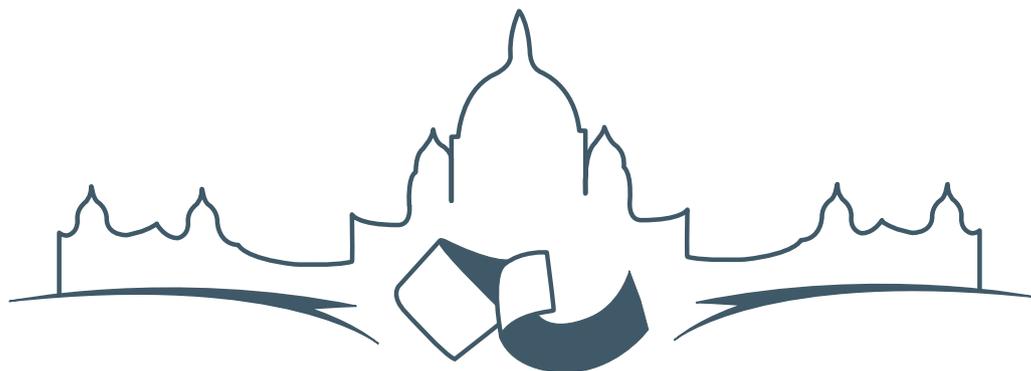
A special thank you to the OSGeo Francophone Chapter for translating [Volume 1](#) into French. And as always, thank you to the rest of the Editorial team, proof-readers and **more than 33 contributors** to this volume.

Enjoy the articles!

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**2007 FREE AND OPEN SOURCE SOFTWARE  
FOR GEOSPATIAL (FOSS4G) CONFERENCE**  
VICTORIA CANADA  SEPTEMBER 24 TO 27, 2007

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## News

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# Brief News from the OSGeo Community

*Compiled by Jason Fournier*

## FOSS4G 2008 Awarded to Cape Town, South Africa

The RFP solicitation closed July 20th, 2007. Four organizations submitted proposals to host next year's event:

- Bangkok, Thailand
- Cape Town, South Africa
- Florianópolis, Santa Catarina, Brazil
- Seville, Spain

The OSGeo Conference Committee is pleased to announce that the 2008 Free and Open Source Software for Geospatial (FOSS4G) conference will be held in Cape Town, South Africa, with the tentative dates of September 29th to October 3th 2008. The OSGeo Conference Committee would like to thank all of those who submitted to host the 2008 conference, we were all very impressed with the number and quality of proposals.

With the 2007 conference approaching<sup>1</sup> and the excitement building in the FOSS4G community, the 2008 conference will be an important date on the cal-

endar not to miss. The 2008 organizing committee has already begun preparations, and will be following up with a larger announcement. The detailed proposal is available online.<sup>2</sup>

Again, thank you for all of the excellent submissions.

*OSGeo Conference Committee*

## Google Summer of Code Projects

There are 15 OSGeo-sponsored projects underway in the Google Summer of Code program:

- GRASS Modules for line generalization and smoothing
- GDAL Raster Driver for PNG/JPG Tile Structure + gdal2tiles utility
- Materialized Views with Geometric Support
- Plugins for multidimensional raster data sources.
- Caching data in uDig
- JTileCache
- Shortest path in free (vector) space avoiding obstacles module in GRASS
- GDAL: KML read support for the existing driver

<sup>1</sup>FOSS4G 2007 web site: <http://www.foss4g2007.org>

<sup>2</sup>South Africa proposal to host FOSS4G: [http://www.osgeo.org/files/webfiles/conference/proposals/South\\_Africa\\_proposal\\_to\\_host\\_FOSS4G\\_2008.pdf](http://www.osgeo.org/files/webfiles/conference/proposals/South_Africa_proposal_to_host_FOSS4G_2008.pdf)

- New Transformation Algorithms for GeoTools and uDig
- Coverage model and operations for PostGIS
- GeoServer Style Editor
- Implementation of An Interactive GeorSS tool in uDig
- A Synthetic Aperture RADAR Processor using GDAL
- 3D Rendering Pipeline for GeoTools
- OGC WMS GDAL driver

For more information on each project, including the participant and mentor, please visit the Google SoC OSGeo page.<sup>3</sup>

## Project News

### MapGuide

MapGuide Open Source announces that the Fusion Technical Preview is available for download. The announcement was made by Paul Spencer of DM Solutions Group Inc.:

*"I am very happy to announce that DM Solutions Group will be contributing our Fusion technology to the MapGuide Open Source project. Fusion is the project name for a Software Developers Kit that provides tools and templates to speed development of web mapping applications.*

*Having worked with MapGuide Open Source since its first release, we saw an opportunity to better meet our clients application needs by creating a new toolkit based on our experience with MapServer - and we made quite a few improvements on the way!"*

The MapGuide Open Source developers and project steering committee are pleased to announce the release of MapGuide Open Source 1.2.0. This release contains many performance improvements, bug fixes and enhancements.<sup>4</sup>

For more information please visit the MapGuide OSGeo home page.<sup>5</sup>

<sup>3</sup>Google SoC OSGeo page: <http://code.google.com/soc/2007/osgeo/about.html>

<sup>4</sup>MapGuide release notes: <http://trac.osgeo.org/mapguide/wiki/Release/1.2/Notes> and <http://trac.osgeo.org/mapguide/milestone/1.2>

<sup>5</sup>MapGuide home page: <http://mapguide.osgeo.org/>

<sup>6</sup>MapServer Release Plan page: [http://mapserver.gis.umn.edu/development/release\\_plans/mapserver\\_5\\_0/release\\_plan/](http://mapserver.gis.umn.edu/development/release_plans/mapserver_5_0/release_plan/)

<sup>7</sup>QGIS web site announcement: <http://qgis.org/content/view/full/143/65/>

<sup>8</sup>MapBender changelog page: [http://www.mapbender.org/index.php/Template:Changelog\\_2.4.2\\_rc1](http://www.mapbender.org/index.php/Template:Changelog_2.4.2_rc1)

### MapServer

MapServer 5.0 is slated to be released just in time for FOSS4G 2007 on Wed Sept. 12, 2007. With this release comes a number of feature enhancement proposals including:

- Enhanced image output quality via the AGG library
- Dynamic Charting Capability
- Labelling prioritization
- and many more!

For more details please visit the MapServer Release Plan web page.<sup>6</sup>

### QGIS

It is our great pleasure to announce the immediate availability of Quantum GIS (QGIS) Version 0.8.1. The release includes numerous bug fixes and stability improvements to the 0.8 code base. QGIS is available in source form, and will be available as binary executables for Microsoft Windows, Mac OS X, and GNU/Linux.

The next release, Version 0.9, is well underway and is slated to be released soon. For more information see the QGIS web site.<sup>7</sup>

### MapBender

Mapbender 2.4.2 was released on August 2, 2007. A number of features have been added including:

- Bulgarian translation of the introduction to Mapbender
- Improved module Add WMS from filtered list: loading a configured WMS from a GUI is now possible
- JavaScript compression; Mapbender will load faster
- First draft of an API documentation for JavaScript classes
- and many more!

For a complete listing of changes and bug fixes please visit the MapBender changelog page.<sup>8</sup>

## GDAL/OGR

The GDAL/OGR team is pleased to announce the release of GDAL/OGR 1.4.2. This is intended to be a bug fix release extending the GDAL/OGR 1.4 stable branch and does not include the many new features in the development trunk (which will appear as GDAL/OGR 1.5.0). For more information please visit the GDAL/OGR news item.<sup>9</sup>

## GRASS

GRASS 6.2.2 is a new stable release which fixes several bugs discovered in the 6.2.1 source code. This release is solely for stability purposes and adds no new features. The default Graphical User Interface has been further stabilised, and the LIDAR processing tools and Linear Reference System support significantly improved. GRASS 6.2.2 also includes a

number of new message translations, and updates for the help pages. For more information please visit the GRASS GIS news item.<sup>10</sup>

## GeoTools

GeoTools released version 2.3.3 on August 2 2007. This is a bugfix only release. Most notable changes are Oracle datastore improvements (bug fixes and speed ups), as well as improvement in coverage serving and rendering speed. For a full change log, see the online release notes.<sup>11</sup>

## OpenLayers

OpenLayers released version 2.4. OpenLayers has addressed over 100 outstanding tickets with the 2.4 release. Release notes are available online.<sup>12</sup>

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<sup>9</sup>GDAL/OGR release announcement: <http://www.osgeo.org/node/367>

<sup>10</sup>GRASS GIS release announcements: <http://www.osgeo.org/node/369>

<sup>11</sup>GeoTools release notes: <http://jira.codehaus.org/secure/ReleaseNote.jspa?projectId=10270&styleName=Html&version=13532>

<sup>12</sup>OpenLayers release notes: <http://trac.openlayers.org/wiki/Release/2.4/Notes>

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## Community Event Reports

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### Events of the OSGeo India Chapter

by V.Ravi Kumar

#### Free and Open Source Software In Science

4-6 January, 2007, Union Christian College, Alwaye, Kochi

In this programme by an educational institution, the participants were introduced to Free and Open Source GIS software, and the organisations that promote them. A dataset prepared for the city of Hyderabad, using freely available satellite imagery along with free downloads of SRTM data was demonstrated by V.Ravi Kumar, emphasising FOSS GIS. For more information see the online report of the course.<sup>13</sup>

#### OSGeo Workshop

22-25 January, 2007, Map World Forum, Hyderabad

The very first OSGeo India Workshop was held at the Map World Forum, Hyderabad 22-25 January 2007. This well attended event was also attended by OSGeo delegates from China, Vietnam and Japan.

This event has been covered in several other reports.<sup>14</sup>

#### National Conference on Biodiversity Conservation

8-10 February, 2007, Osmania University

The National Conference on Biodiversity Conservation and Human Well-Being was organized by Department of Zoology, Osmania University and co-sponsored by SACON Deccan Regional Station, Hyderabad. The conference was held at Osmania University, February 8-10, 2007.

SACON conducted a workshop on Wetland Informatics. It was aimed to address some of the issues related to spatial information generation, processing and data base design, dissemination and software development. In this workshop SACON presented the *Wetlands of India* website and its future with the extensive use of FOSS tools.

V.Ravi Kumar, Joint Secretary of the OSGeo India Chapter presented about the various FOSS4G's GIS software and their use, taking the City of Hyderabad as an example. Prof K.S.Rajan, Treasurer of OSGeo

<sup>13</sup>Free and Open Source Software In Science site: <http://www.space-kerala.org/fsc/index.php/Fsc/FreeAndOpenSourceGIS>

<sup>14</sup>OSGeo India Workshop event coverage in Geospatial blog: [http://geospatial.blogs.com/geospatial/2007/01/map\\_world\\_forum.html](http://geospatial.blogs.com/geospatial/2007/01/map_world_forum.html), GIS Development Magazine: <http://www.gisdevelopment.net/magazine/years/2007/march/46.htm>, OSGeo Journal: [http://www.osgeo.org/files/journal/final\\_pdfs/OSGeo\\_vol1\\_Events.pdf](http://www.osgeo.org/files/journal/final_pdfs/OSGeo_vol1_Events.pdf)

India chapter also actively participated in the proceedings. P.K.Sinha and A.V.Satya Kumar demonstrated FOSS GIS by showing OpenJUMP and its user-friendly capabilities in performing vector GIS tasks like onscreen digitization of raster images into a shape file with attribution.

## National Convention On Free Software

3-4 March, 2007, Hyderabad, Andhra Pradesh

The National Convention On Free Software event included a session on *Geospatial data*. Dr. K.S.Rajan, and V.Ravi Kumar of OSGeo India chapter, presented *OSGeo Philosophy*, and Open Source GIS alternatives respectively, which was attended by Free Software Foundation (FSF) enthusiasts from around the country.<sup>15</sup>

## Geohorizon 2007 Symposium

16-17 March, 2007, Anna University, Chennai

Society of Geoinformatics Engineering at Anna University<sup>16</sup>, Chennai, conducted a two-day Geohorizon 2007 Symposium.

There were four participants from the OSGeo India chapter, two on each day. Sri Neeraj Deekshith of Autodesk India and Santosh Gaekwad of SACON Hyderabad, presented use of Open Source Geospatial software in their organisations.

Mr V.Ravi Kumar, and Mrs Mahalakshmi Narayanan presented *Open Source GIS Galore*, and *Open Source GIS for web-services* respectively.

Santosh Gaikwad presented the use of GeoServer for Internet mapping of Wetlands of India. He delivered the SACON's experience while studying GeoServer – a open source server for Web-GIS. Use of uDig and GeoServer for publishing vector or raster maps onto web by storing the spatial data into Post-GIS was also demonstrated.

## OSGeo Workshop

11 May, 2007, GIS Development, Noida

This one day OSGeo India workshop was held at, *GIS Development*, Noida (Delhi) with participants from the Indian geospatial community. They

represented organizations such as the National Remote Sensing Agency, Centre for Development of Advanced Computing (CDAC), Tata Consultancy Services (TCS), MapInfo, Adroitec, GIS Consortium, Eicher, 5Map, Infosys, Autodesk, National Institute of Health and Family Welfare, and Bharti Vidyapeeth's Institute of Computer Applications and Management (BVICAM).

The workshop was opened by OSGeo India representative Dr. P.S.Roy, gave the opening remark that, "*GIS has emerged as an important technology tool. GIS initiatives need to be upscaled in terms of outreach and this is where OSGeo comes into play.*" One of the most important objectives, from an Indian context, is to convert the free GIS tools like GRASS and MapServer into local vernacular languages to form a large interest group. Dr. Roy also elaborated upon some of the noteworthy initiatives taken by organizations in India in the open source domain.

Mr. V. Ravi Kumar, who is a founding member of OSGeo India, spoke about various FOSS GIS tools, such as GRASS, Quantum GIS, uDig, OpenJUMP – all available today. The demonstration on *Locating a Nuclear Power Plant*, using OpenJUMP, was not only interesting but also testified to how FOSS GIS can be equally useful as commercial GIS software. Ravi Kumar also talked at length about utility of FOSS GIS in India. The most pertinent point raised by him was that FOSS GIS is cost effective and can, therefore, become popular in a developing country like India. It can also provide employment through promotion of Village Cadastral GIS where all that one has to pay for is a branded computer (available for less than Rs.20,000) as no cost is incurred on the software because it is, free and open.

Sridhar Saraswati of Autodesk India, also gave a presentation, which answered a vital question – why is Autodesk supporting free and open source software? The reason is that firstly, Autodesk wants a broader adoption of Internet mapping technology and secondly, FOSS would create higher demand for related products. It would also be beneficial for the customers as the frequency of software releases will increase, cost of ownership will come down and there will be more innovation and support for standards.

Satyajit Rath from CDAC, Noida presented *CDAC's Initiatives on Open Source GIS*. A talk entitled *Geospatial Convergence with Open Source* was presented by Amit Jain, of Infosys. The workshop came to an end with the closing remarks by Dr. P.S Roy. He

<sup>15</sup>National Convention On Free Software: <http://www.swecha.org/node/29>

<sup>16</sup>Society of Geoinformatics Engineering: <http://societyofgeoinformaticsenigneers.blogspot.com/index.html>

expressed hope that "commercial software should invest in open source to make it a win-win situation for all."

## OSGeo Capacity Building Workshop

26-28 June, 2007, Salim Ali Centre For Ornithology & Natural History (SACON), Hyderabad

The OSGeo India Chapter conducted its 1st Capacity Building 3 day workshop. The workshop was attended by 18 participants from NIC, NRSA, IIT, Spec Systems, Army and Survey of India. All the participants were conversant with commercial GIS software and were eager to be acquainted with FOSS alternatives.

The 1st day included demonstration and hands-on practice with OpenJUMP GIS and map composition through Inkscape. The 2nd day was devoted to ILWIS GIS through raster analysis and generation of a stereo pair and 3D visualization. The 3rd day was for using GRASS GIS for network analysis and the creation of 3D visualisation and fly-throughs. The participants were shown how one can join the OS-

Geo as a member and help spread the awareness. The resource persons were from Geological Survey of India.

## Open Source GIS Lecture

A two hour lecture and demonstration of *Open Source GIS GALORE*, was presented by V.Ravi Kumar of OSGeo India, for the students of Geoinformatics post graduation course Nannaya University, Rajahmundry on 3 July, 2007. GRASS GIS and OpenJUMP were demonstrated using sample data. The students who could interact well in the question and answer session were presented with GRASS 6.2 Live CDs.

## Photographs

Several event photographs are available online.<sup>17</sup>

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# Géoévénement 2007

by Yves Jacolin

Géoévénement is the annual French geomatics tradeshow. In 2007, it took place at **Porte de Versailles** in Paris. It offered booth exhibits, thematic presentations and Birds of a Feather sessions. This year, more than 35 companies had a booth of which 13 were from the open source community. These 13 companies created an open source village which provided more than 30 free presentations, free as in free beer and in free mind. Some companies proposed workshops about Mapserver, CartoWeb and OpenLayers installation.

OSGeo participated in this village with a booth and two presentations. There was also a Birds of a Feather (BoF) meeting about starting an OSGeo Francophone Local Chapter. Topics discussed included: how to organise it, how to manage the election of officers, which organisations need to be contacted, etc.

<sup>17</sup>Event photographs: <http://www.kodakgallery.com/I.jsp?c=cjns10h3.batchqkn&x=0&y=o6f4mq>

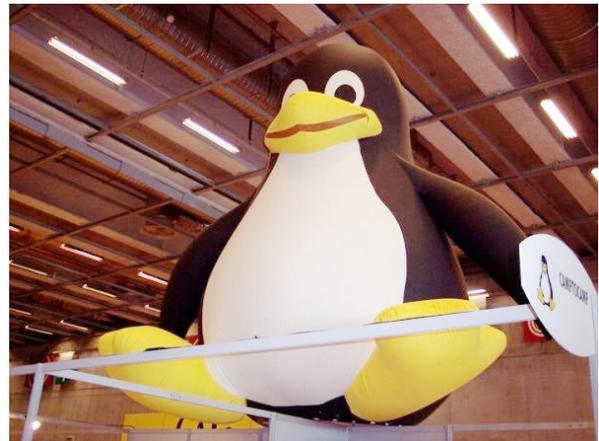


Figure 1: Tux welcomed people in the Open Source Village

This report aims at presenting the results of the booth, presentations and BoF. First of all, here is a presentation of the Francophone Local Chapter.

## The Francophone Local Chapter

The idea of creating a Francophone Local Chapter first emerged at FOSS4G 2006, Lausanne. In October 2006 the Francophone mailing list and the Francophone wiki page were created. People subscribed to the mailing list and the number of members grew to more than 75 people (still growing). Following the Local Chapter Guidelines, the next step, after the self-organisation, is to define the group's missions. Here they are:

### Free Organisation

- Create a portal for the Francophone users of open source geomatics (data, software, jobs, ...)
- Set up meetings and tradeshows
- Promote OSGeo and its missions

### Free Data

- Promote open source licensing
- Host, share and create free data

### Free Software

- Promote and demonstrate open source software
- Localise/translate software
- Translate and share documentation
- Provide support in French (mailing-list and forum)

For more on the activities of the Francophone Local Chapter, see the Local Chapter Reports section of this Journal.

## Promotion of OSGeo

### Exhibition Booth

The Francophone Local Chapter put up an exhibition booth to promote the OSGeo mission and its hosted projects. We focused on FOSS and missions promotion rather than demonstrate some projects which will be possible next time using some LiveCD (i.e. Omniverdi LiveCD<sup>18</sup>, Geolive<sup>19</sup>). In order to promote OSGeo missions and projects the Francophone Local Chapter ran a *sprint translation* project to translate the OSGeo Flyer,<sup>20</sup> created a poster and showed a presentation on two laptops.

The booth welcomed a continuous stream of people who showed a lot of interest in the OSGeo and its projects, here are some frequently asked questions:

- What is OSGeo?
- Is OSGeo different than AFIGEO? (AFIGEO is a French geomatics association)
- What is the difference between OSGeo and OGC?
- Do I have to pay something or subscribe to become an OSGeo member?
- How can I contribute?
  - How can I find what help is needed?
  - Where can I learn how to contribute?
  - Who should I contact?
- Do you have some project demonstrations on LiveCD or anywhere?
- Do you have any examples of projects?
  - Example of contribution?
  - Example of funding projects?
- What is the equivalent of MapInfo/*Cartes et Bases* in Open Source? (*Cartes et Base* is a proprietary GIS analysis tool)
- Do you think you will create a summary of projects with a comparison of each?
- Does a simple tool exist to create a WMS web service?
- Does OSGeo plan to provide training?
- Does OSGeo fund any external projects?

Some questions focused on the migration from proprietary software to FOSS and to learn if this software is good enough for their use, if they can find some training, etc.

### Birds of a Feather (BoF) Meeting

This meeting took place at the GéoCafé (an open central place in the tradeshow) on the Wednesday 4th of April at 14h00. About 20 people participated. The content included an OSGeo Presentation, Presentation of Local Chapters and the development of the Francophone one. Discussion also included:

- How can we organise ourselves? Organisation, election, ...
- Who can help support the Francophone Chapter? Contact some associations that share common missions (join, organise, structure, ...)

<sup>18</sup><http://livecd.omniverdi.org/index.php?page=LiveCD&toc=livecd>

<sup>19</sup><http://geolive.cartography.st/geolive/wiki/FrenchDesc>

<sup>20</sup>OSGeo Fliers: <http://www.osgeo.org/visibility>

Topics of the meeting were free and was larger than expected.



Figure 2: A presentation at the Open Source Village

Some ideas discussed on the Francophone mailing list were accepted: companies have the same place as inside OSGeo (sponsor role), members are only physical individual people. Others ideas were proposed, such as, the creation of a webring which can promote each other and running a poll to know more about user and contributor interests.

Structure of the proposed Francophone Local Chapter followed closely to its missions: a lead manager to connect the local chapter to the OSGeo (providing monthly reports, etc.) and three other committee managers to lead one of the three main missions: organisation, free data and open source software. Each of them have active projects (translating OSGeo Journal for example). If one of these projects is especially important a project manager will be chosen by the committee manager with agreement of the list. Election of this structure ran at this end of June - results are reported in the Local Chapter Report of this Journal.

Free data is a part of the mission that seems to get the main interest from Francophone communities: How to host data? Where? Do we need to set up a data catalog? It seems that some datasets could be free in the current year.

Another meeting aims to do a synthesis about the Open Source Village. Everybody seems to agree about its success and will renew next year. We hope that OSGeo-fr may manage this to get stronger.

## Presentations

Géoévénement organised some thematic presentations, one of them focused on *How to get your hands on Open Source technologies*:

<sup>21</sup>OSGeo Library: <http://www.osgeo.org/switchuilocale/fr?destination=library>

- *Rising of a FOSS industrial ecosystem* - David Jonglez, Camptocamp France SAS and François Badet, WaynaSoft
- *OSGeo: why a Francophone Local Chapter is important* - Yves Jacolin, Géorezo and Gwenael Bachelot, Autodesk
- *Free GIS: freeness for reachness?* - Nicolas Klein, SI17
- *Some elements to compare 3 GFOSS* - Olivier Ertz, Erwan Bocher, Nicolas Ribot and Yves Jacolin
- *Development of an Information System for Water (SGBD - SIG) in the Charente county* - Harold Rethoret, EPTB Charente

The Open Source Village also organised more than 35 presentations. Themes of this session covered testimonials, presentation of OSGeo or Open Source projects (OpenLayers, CartoWeb, GeoNetwork, etc.), free data, Web Services, open source licences, and project presentations. Almost all presentations are publicly available in the French translation of the OSGeo Library.<sup>21</sup>



Figure 3: A presentation at the Open Source Village

## Conclusion

The start-up of this Local Chapter project is allowing us to inform others about the OSGeo Foundation, and about the future Francophone Local Chapter. This is a success with 3 presentations about the OSGeo, a lot of people meeting at the booth, and a great richness in the discussion. Furthermore, a first contact between some contributors of the future Francophone Local Chapter gave some great ideas for future project (e.g. about free data topics, among others).

And now? We need to send OSGeo a proposal about the Local Chapter structure and organisation.

For the next tradeshow we aim to translate many more brochures and fliers into French, share Geomatics LiveCD and present some workshops in addition to presentations.

Some media reported the success of the Open Source Village: "*An Open Source Village in the Géo-événement 2007 tradeshow*" (Le Monde Informatique), "*Rendez-vous at Géo Événement 2007*" (SIG la lettre), portailsig which relays OSGeo-fr informations to the geomatics community.

All this effort has been made possible by the generous financial support of AutoDesk inc, Camp-to-camp SAS and Autodesk France. I would like to

thank them for that.

**Some links:**

- Conference papers are available online in French<sup>22</sup> and mentioned also in English.<sup>23</sup>
- For more information about the Francophone Local Chapter, see the OSGeo wiki page.<sup>24</sup>
- For more information about the Géoévénement, see the conference web site.<sup>25</sup>

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<sup>22</sup>Conference papers (French): [http://wiki.osgeo.org/index.php/Fr\\_geoevenement2007](http://wiki.osgeo.org/index.php/Fr_geoevenement2007)

<sup>23</sup>Conference papers (English): <http://wiki.osgeo.org/index.php/GeoEvenement2007>

<sup>24</sup>Francophone Local Chapter: <http://wiki.osgeo.org/index.php/Francophone>

<sup>25</sup>Géoévénement, see the conference web site: <http://www.ortech.fr/geo-evenement/index.php>

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## Project Spotlights

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# Introducing the MapWindow GIS Project

by Daniel P. Ames, Christopher Michaelis and Ted Dunsford

## Introduction

MapWindow is an open source geographic information system (GIS) and an application programming interface (API) distributed under the Mozilla Public License (MPL), built upon the Microsoft Dot Net Framework 2.0. The project is maintained by an active group of international developers who regularly release updates and bug fixes through the [MapWindow.org](http://MapWindow.org) web site.<sup>26</sup>

In 2005, the United States Environmental Protection Agency adopted MapWindow as the core GIS platform for its BASINS watershed analysis and modeling software which is used by environmental professionals at all levels of U.S. government and internationally. This was followed by adoption at the United Nations University and many other governmental, non-profit, and commercial entities throughout the world. Indeed, from November 2006 through July 2007 the software was downloaded over 60,000 times and has over 7,000 members on the opt-in mailing list. There are also currently 630 subscribers to source code commit notification mailing lists, and 43 regular source code committers.

The MapWindow components and end user ap-

plication support manipulation, analysis and viewing of geospatial data in many standard GIS data formats. Hence, MapWindow is a mapping tool, a GIS modeling system, and a GIS API, in a redistributable open source form that is appealing for its simplicity of use and for running on Microsoft Windows. This paper presents the project history, current status, key elements and future plans.

## Project Background

In 1998, researchers at Utah State University in Logan, Utah, USA were using MapObjects LT 1.0 from Environmental Systems Research Institute (ESRI) as a GIS component in several research projects. However, restrictive redistribution licenses and the inability to edit vector or attribute data files or display and interact with raster data became significant barriers to use of this component.

Indeed, dynamic and interactive functions that require low level access to spatial data were not well-supported in freely distributable Windows-based GIS programming components at that time. An alternative approach for these projects was to move to a proprietary desktop GIS system (e.g. ArcView 3.1), writing the needed tools as extensions. However, many applications in environmental science and engineering are more suited to a standalone environ-

<sup>26</sup>MapWindow web site: <http://www.mapwindow.org>

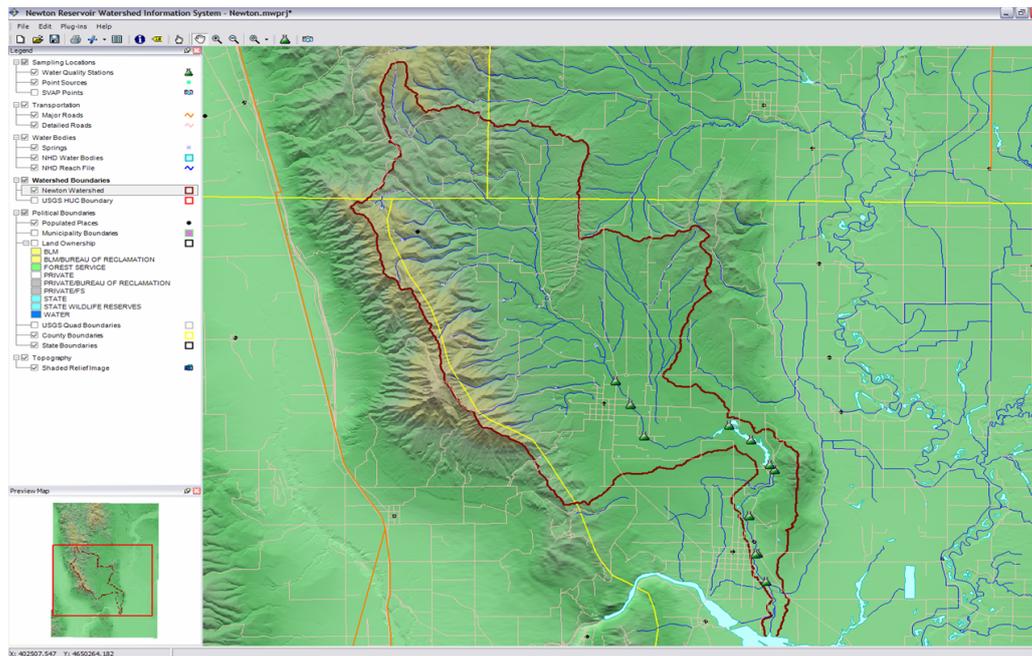


Figure 1: Basic MapWindow interface with Shapefile Editor enabled.

ment due to the need to distribute the tool to individuals who do not own a desktop GIS or are not GIS experts.

The core MapWinGIS component was developed to meet this need for an alternative to existing proprietary GIS components. MapWinGIS is an ActiveX control that gives full ability to display, query, manipulate, and use spatial data. Because of the engineering-oriented nature of the projects that necessitated its development, MapWinGIS was particularly optimized for rapid display of data and is intended to be a fully functional model interface, not simply a map viewer. Development focuses included high-speed image and raster display, limiting the amount of re-drawing, and including APIs for low-level access to spatial data.

The MapWindow GIS desktop application wraps all of the MapWinGIS ActiveX functionality, providing end users with a common legend, toolbar and a consistent interface that can be extended by adding plug-ins or a customized configuration file. In short, MapWinGIS ActiveX was built to add GIS functionality to custom end user applications and MapWindow GIS desktop was built to help users deploy GIS-enabled applications assembled from pre-built plug-ins and datasets.

## Project Description

### MapWindow GIS Application

The MapWindow application is a lightweight spatial data viewer with an intentionally slim default interface intended to simplify its use and improve adaptability to specific uses. The main GUI and functionality can be extended through plug-ins and scripts which add capabilities as needed. Also the default application itself can be customized to change the look, feel and even its title-bar name at runtime. By default, the MapWindow layout includes a map, a legend, and a preview-map. Built-in toolbar buttons allow one to manage project files (collections of data layers), to print, and to navigate the map. Figure 1 shows the MapWindow interface with the Shapefile Editor plug-in enabled and with the title bar customized for a specific project. Both open source and commercial plug-ins have been developed by users worldwide for a variety of applications; many of these are available for download from the MapWindow.org web site.

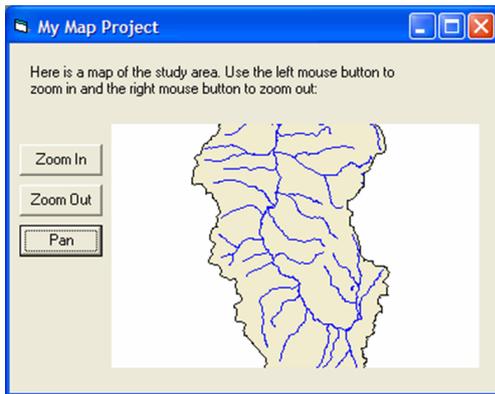


Figure 2: A Simple Mapping Application

In addition to building plug-ins, one can customize the look and feel of the MapWindow application by changing the included *default.mwcfg* XML configuration file. Changes to this file can affect title bar, splash screen, about box, plug-in loading and window layout settings, among others. An XML project file allows users to save a list of loaded data layers and session settings. The *Newton Reservoir Information System* project in Figure 1 is an example project included in the MapWindow installation package. All of the data loaded into MapWindow and all settings (e.g. symbology, loaded plug-ins, and project projection), are saved to the project file.

### MapWindow Plug-ins

MapWindow has an extensible architecture that allows developers to write plug-ins to add functionality using Dot Net compatible languages such as VB.Net or C#. This is done by implementing a specific plug-in interface in a custom DLL file which is placed in the application directory and automatically detected at runtime. Plug-ins can also be written and compiled directly in the MapWindow plug-in editor eliminating the need for an external development environment. The MapWindow plug-in interface provides extensive capabilities allowing the developer to use as little or as much as needed to accomplish a particular goal. Default plug-ins packaged with MapWindow include tools for editing shapefiles and attributes, identifying features and performing common geoprocessing tasks. Plug-in developers retain all copyright and licensing rights for their work and hence can redistribute their products as proprietary, open source, or otherwise as needed.

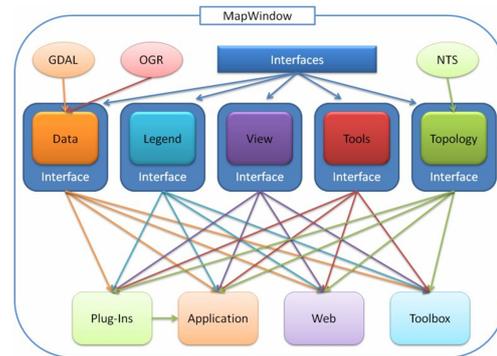


Figure 3: MapWindow 5 Component Diagram

### MapWindow ActiveX Control

The core MapWindow component is an ActiveX control, *MapWinGIS.ocx* that can be used in Visual Basic or any language that supports ActiveX (e.g. C#, Microsoft Access, Microsoft Excel). MapWinGIS has been optimized for fast image and raster display, limiting the amount of redrawing, and including APIs for low-level access to spatial data. A simple Visual Basic program using the control and just a few lines of code is shown in Figure 2.

### Ongoing Development and Future Plans

Development plans for MapWindow include a component structure upgrade in version 5.0. This version focuses on incorporating the Geospatial Data Access Library (GDAL) and OGR Simple Feature Library for additional data format support, and Net Topology Suite (NTS) for topological support. Version 5.0 also targets OGC compliance and improved modularization. An ASP.Net-based web component for performing online mapping and geoprocessing has also been introduced.

Version 5.0 also introduces an interface layer around every component. By doing this, any given component (e.g., MapWindow.Data) may be replaced with a third-party component if needed. Indeed any code that implements the specified interfaces will be compatible with other MapWindow 5.0 components.

Finally, MapWindow 5.0 components are designed and written entirely in Microsoft Dot Net code (Managed C++, C#, and VB.Net) except for linked-in components (GDAL and OGR) which are maintained in their native form. This eliminates

many long-standing problems with COM registration on the Windows platform. An overview diagram of the planned MapWindow 5.0 components and linkages is shown in Figure 3.

## Conclusion

The MapWindow GIS project is a dynamic and active effort to build and distribute open source GIS tools that integrate tightly with the Microsoft Windows operating system. Supported by a large number of commercial and non-commercial funding sources, volunteer developers, and student research activities, this project is expected to grow in the foreseeable future and continue to be a model of a successful open source for geoinformatics software develop-

ment and use.

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# GeoNetwork opensource

## Internationally Standardized Distributed Spatial Information Management

by Jeroen Ticheler and Jelle U. Hielkema

*GeoNetwork "opensource"* is a standardized and decentralized Geospatial Information Management System, based on the concept of distributed data and information ownership and is designed to enable access to geo-referenced data and cartographic products through descriptive metadata. Collections maintained at different organizations are accessible through a single entry point. This approach of geographic information management enhances easy and timely access to existing spatial data for a wide community of users, supporting informed decision-making in a variety of application fields. Web 2.0 techniques have been adopted to allow more interactive and intuitive use of the system and to offer building blocks for future web service offerings.

The main goal of the *GeoNetwork opensource* project is to provide free and open source software that improves accessibility to a wide variety of geospatial data and information products at different scales and from distributed sources. The collections are organized, documented and published in a standardized, consistent way both at the metadata and data level following international standards. As such the tool has become a popular and widely accepted geospatial Information Management System within the UN system, forming a central and basic

element in the development of a United Nations Spatial Data Infrastructure (UNSDI). In other national and international organizations and initiatives such as the Consultative Group on International Agricultural Research (CGIAR), the European Space Agency (ESA), the US Federal Geographic Data Committee (FGDC), in countries implementing National Spatial Data Infrastructures (NSDI), in Europe in the context of The **IN**frastructure for **SP**atial **IN**fo**R**mation in Europe (INSPIRE), as contribution to the Group on Earth Observations (GEO) and others, *GeoNetwork opensource* has also seen a remarkable uptake.

## The *GeoNetwork opensource* project

*GeoNetwork opensource* is a decentralized geospatial information management system based on international standards. It is designed to enable easy and timely access to geo-referenced data and cartographic products through descriptive metadata from a variety of data providers. The system tries to support a wide community of spatial information users to make better-informed decisions. It improves geospatial information sharing between organizations and their users, using the capacities of the Internet. It often triggers improved collaboration within and between organizations, reducing duplication and enhancing information consistency and data preparedness.

Maps, including those derived from satellite imagery, are effective communication tools and play an important role in the work of various user communities:

- Decision Makers, e.g. sustainable development planners and humanitarian and disaster emergency managers in need of quick, reliable and up to date cartographic products as a basis for better planning, action and monitoring of their activities.
- GIS Experts in need of exchanging consistent and updated geographic data.
- Spatial analysts in need of multidisciplinary geospatial data to perform geographic analysis, resulting in more reliable forecasts that help to better organize interventions in vulnerable areas.

In 2001 the Food and Agriculture Organization (FAO) of the United Nations started the development of a prototype catalog system to systematically archive and publish geospatial data developed and used within the organization. The prototype built on experiences within and outside the organization. It used metadata content available from legacy systems that was transformed into what was then a preliminary draft metadata standard, ISO 19115.

Joined in 2003 by the World Food Programme (WFP), the prototype was taken as input for a first version of *GeoNetwork opensource*. It was decided to develop the software as a Free and Open Source Software (FOSS) to allow other parties to benefit from the development efforts and to allow for their participation. The result was a 1.0 release in 2003 of the software as well as the establishment of operational catalogues in FAO and WFP. The system was based on the ISO19115:DIS metadata standard and provided an embedded Web Map Client, InterMap, that supported Open Geospatial Consortium (OGC) compliant Web Map Services. Distributed searches were possible using the Z39.50 catalog protocol.

With support from the UN Environment Programme (UNEP) a second *GeoNetwork* version was developed in 2004. The release allowed users to work with multiple metadata standards in a transparent manner. It also allowed metadata to be shared between catalogues through a caching mechanism, improving reliability when searching in multiple catalogs. A further major improvement was made with the release of version 2.0.2 in April 2006 which was accompanied by CD version of the software, including a variety of other open sources packages, as well as a detailed user installation manual and an attrac-

tive flyer, followed up by a DVD version in October 2006.

The latest release of *GeoNetwork opensource*, version 2.1 (July 2007), is the result of another round of critical improvements, supported by among others FAO, the UN Office for the Coordination of Humanitarian Affairs (OCHA), the Spatial Consortium of the Consultative Group on International Agricultural Research (CSI-CGIAR) and UNEP. Support for the final metadata standard ISO19115:2003 has been added by using the ISO19139:2007 implementation specification released in May 2007. The release also serves as the open source reference implementation of the OGC Catalog Service for the Web (CSW 2.0.1) specification. Improvements to give users a more responsive and interactive experience have been made on parts of the system, including the web map viewer and the search interface.

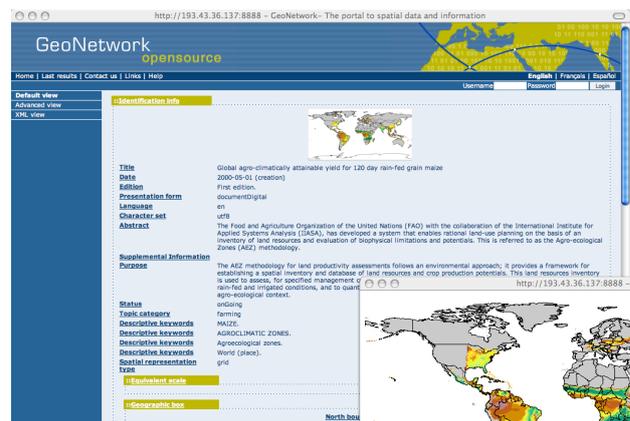


Figure 1: *GeoNetwork opensource* version 2.0. Shown is the Map Viewer that is embedded in the application.

At present, *GeoNetwork opensource* is a central and basic building block in the UN Spatial Data Infrastructure (UNSDI) currently under development. In other national and international organizations and initiatives such as the (CGIAR), the European Space Agency (ESA), the US Federal Geographic Data Committee (FGDC), in countries implementing National Spatial Data Infrastructures (NSDI), in Europe in the context of The Infrastructure for Spatial Information in Europe (INSPIRE), as contribution to the Group on Earth Observations (GEO) etc., *GeoNetwork opensource* has also seen a remarkable uptake.

## Free and Open Source Software and Community Development

Started as a small open source project in a very specialized field, the community of users and developers of the *GeoNetwork opensource* software has increased dramatically since the release of version 2.0 in December 2005 and the subsequent pre-releases of version 2.1. At present the project sees over 800 downloads of the software per month from the website. The user and developer mailing lists have close to 200 subscriptions each. Members provide feedback within the community and provide translations, new functionality, bug reports, fixes and useful instructions to the project as a whole.

Building a self sustaining community of users and developers is one of the biggest challenges for the project. This community building process relies on active participation and interaction of its members. It also relies on building trust and operating in a transparent manner, thereby agreeing on the overall objectives, prioritization and long term direction of the project. A number of actions have been taken by the project to facilitate this process.

A work plan is developed and presented at the yearly GeoNetwork workshop. This plan is maintained and updated throughout the year where needed. The foundation for the establishment of a GeoNetwork Advisory Board was laid at the 2006 workshop in Rome and membership was defined. The project management team reports back to the advisory board during the GeoNetwork workshop.

Two public websites have been established. One focuses on the users of the software, the other focuses on the developers. Both can be updated and maintained online by trusted members of the community. They provide documentation, bug reporting and tracking, WIKI pages et cetera.

Source code is maintained in a publicly accessible code repository, hosted at an independent service provider, SourceForge.net that hosts thousands of FOSS projects. Developers and users have full access to all source code, while trusted developers can make changes in the repository. Standardizing documentation development is the next challenge taken up by the project to ensure versioning and multiple output formats (e.g. HTML and pdf) are supported.

A small part of the community connects through Internet Relay Chat (IRC) on a public #geonetwork channel. But most interaction takes place on the user and the developer mailing lists. Subscription to these lists is open to anyone interested. The archive of the mailing lists provide an important resource for users

and can be browsed online. A special mailing list has been established to monitor changes in the code repository. This so-called commit mailing list delivers change reports by email to its subscribers.

During the 2006 workshop, the project advisory board decided to propose the *GeoNetwork opensource* project as an incubator project to the newly founded Open Source Geospatial Foundation (OSGeo). This incubation process is currently ongoing and is close to conclusion. The project websites have been moved to servers accessible under the umbrella of the OSGeo foundation. Web pages have been updated to reflect the OSGeo umbrella function and a source code review with related changes to the code has been done. The GeoNetwork team has dedicated efforts to develop a DVD containing the best free and open source software in the field of Geoinformatics. This DVD has been printed and distributed in hard copy to over three thousand people and is also available through the Internet.

## Technology

As discussed, the *GeoNetwork opensource* has been developed to connect spatial information communities and their data using a modern architecture, which is at the same time powerful and low cost, based on the principles of Free and Open Source Software (FOSS) and International and Open Standards for services and protocols, among others from ISO/TC211 and the OGC. The *GeoNetwork opensource* architecture, in fact, is largely compatible with the Geospatial Portal Reference Architecture, which is the Open Geospatial Consortium (OGC) Guide to implement a standardized geospatial portal.

To deploy a full Spatial Data Infrastructure, a range of related software packages can be implemented in addition to *GeoNetwork opensource* and the embedded InterMap opensource. Within the range of FOSS solutions, these include Web Map Server software like MapServer, GeoServer and MapGuide Open Source; GIS desktop software like GRASS, OSSIM, Quantum GIS, uDIG and gvSIG; Web Map Viewers like MapBender, MapBuilder and OpenLayers.

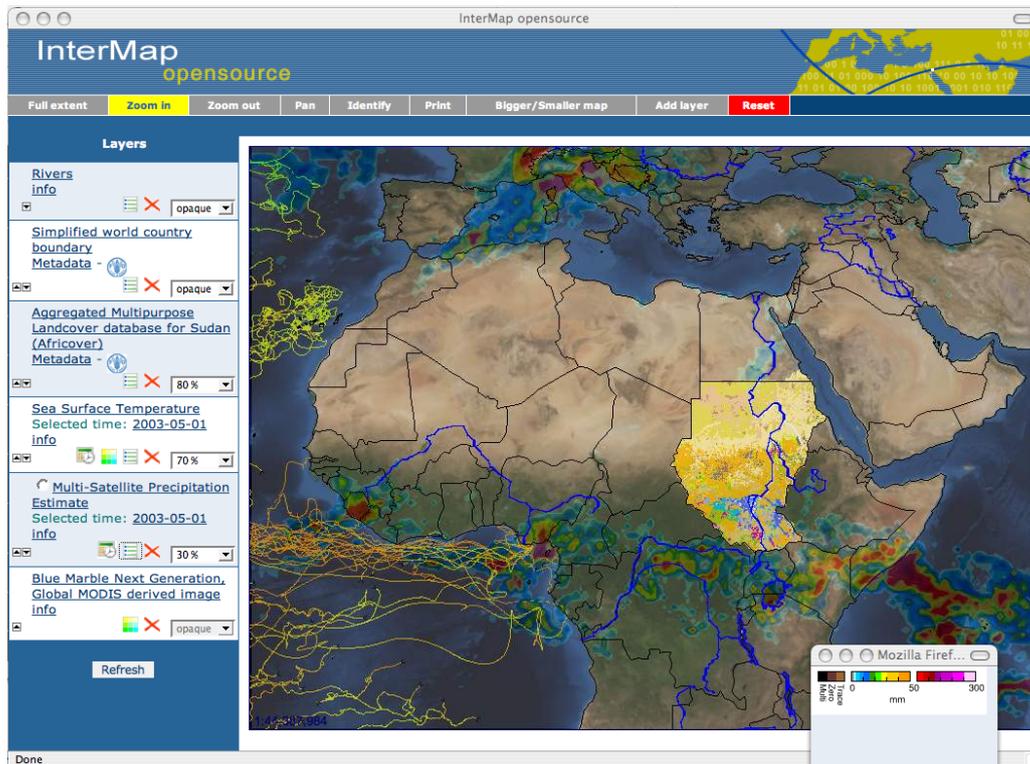


Figure 2: GeoNetwork opensource version 2.0. Shown is a screenshot of a metadata record.



Figure 3: GeoNetwork 2.1 preview.

The software uses an approach that separates content and format as much as possible from the internal business logic. It therefore uses XML encoding for much of its internal information and data handling. Using Stylesheet transformations (XSLT),

XML content is modified to provide the required output at different levels in the application. Metadata is handled in this way and is stored in its original format, giving full flexibility when manipulating its content as well as format.

A generic framework has been developed in Java. Web services are exposed to the network through a servlet engine like Apache Tomcat or Jetty and produce among others HTML and XML output. The framework provides all the required functionality to deal with XML, XSLT, database connections through JDBC, Internet protocols, user sessions and file systems. Custom web services can be developed using existing functionality or by writing small extensions.

Recently, the use of AJAX techniques in the web interface has started. By splitting existing services into smaller services, the user can now interact with the system in a more interactive manner. A comprehensive search interface has been build without compromising on speed. This has allowed to integrate the existing web map viewer in the home page. In earlier versions this viewer was available as a pop-up window, causing confusion to users. In the administrative part of the system, similar interactive functionality has been implemented that pro-

vides easy access to the system configuration pages dealing with site settings, catalog harvesting and scheduling and maintenance.

## Conclusion

This article provided an insight in the history, project structure and technologies behind the *GeoNetwork opensource* Geospatial Information Management System. It only touched the related FOSS components that are required to implement a full Spatial Data Infrastructure and that are part of the OSGeo Foundation and the wider Geoinformatics FOSS community.

The future of the project looks bright, receiving a wider attention every day. The biggest challenges will be in further community building and in keeping focus on the original goals of the project. At the same time, more demanding and challenging requirements have to be met and new technologies have to be used where they provide significant benefits to the project.

The system will have to be split into well defined server and client components in order to allow third parties to integrate components into their existing environments. A plug-in mechanism has to be developed for key functions in the system, like language

support, custom user interfaces as well as metadata application profiles. It is likely that the use of AJAX will be taken further in the future releases, including most importantly in the online metadata editor. This poses exciting technological challenges resulting in more intuitive and responsive user-system interaction.

A large user and developer community will allow the project to flourish and advance the development of interoperable global spatial data infrastructures. Taking the Free and Open Source Software development approach results in comprehensive Geospatial Information Management Software that can be used by any interested party as a straightforward and cost-effective means of publishing geographical metadata and data on the web.

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<sup>27</sup>Food and Agriculture Organization of the United Nations (FAO): <http://www.fao.org/geonetwork>

<sup>28</sup>UN Geospatial Information Working Group (UNGIWG): <http://www.ungiwg.org>

<sup>29</sup>GeoNetwork opensource: <http://geonetwork-opensource.org>

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## Case Studies

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# FAO GeoNetwork in a Multinational Development Programme

## The Case of the Programme Against African Trypanosomiasis

by *Giuliano Cecchi and Raffaele C. Mattioli*

### Abstract

The Programme Against African Trypanosomiasis<sup>30</sup> - Information System (PAAT-IS) is hosted by FAO and it produces, collates, stores, analyses, and disseminates information on tsetse, trypanosomiasis and related sustainable agriculture and rural development for the benefit of 37 trypanosomiasis affected countries of sub-Saharan Africa and of international FAO/PAAT partners. In 2006 PAAT-IS began to utilize the infrastructure and functionalities of FAO GeoNetwork to improve the dissemination of PAAT-IS spatial datasets, mainly small scale predictive distribution maps of different tsetse fly species, the vector of the disease. Standardized metadata were created and key GIS datasets made available on the FAO geospatial portal, thus complementing other existing dissemination channels and media (i.e. PAAT web site, CD-ROMs, FAO/PAAT statu-

tory meetings). More recently, GeoNetwork was included in the agenda of PAAT training activities. In this context, selected PAAT partners from affected countries were trained on the basics of GeoNetwork to foster a more effective sharing and documentation of data in the context of ongoing multinational intervention projects. The potential of such a tool in the management of trypanosomiasis and other vector-borne and transboundary animal diseases is briefly discussed and progress and setbacks in its dissemination to PAAT partners in developing countries are outlined.

## The Programme Against African Trypanosomiasis (PAAT)

Tsetse-transmitted trypanosomiasis (also called sleeping sickness in humans) is an infectious disease unique to Africa, caused by various species of trypanosomes. The disease affects both people and animals and occurs in 37 sub-Saharan countries covering more than 9 million km<sup>2</sup>, an area which corresponds approximately to one-third of Africa's total

<sup>30</sup>PAAT is an international, inter-agency alliance aiming at harmonizing and coordinating the activities of the four mandated organizations (AU/IBAR, FAO, IAEA, WHO) in relation to tsetse-trypanosomiasis and related sustainable agriculture and rural development in affected areas of sub-Saharan Africa. (<http://www.fao.org/ag/paat.html>)

land area. The infection threatens an estimated 60 million people and about 50 million head of cattle.

PAAT is an international forum which guides and assists the trypanosomiasis affected countries in the development of policies and strategies aimed at the implementation of integrated interventions in identified priority areas. PAAT brings together international institutions [African Union (AU), Food and Agriculture Organization of the United Nations (FAO), International Atomic Energy Agency (IAEA) and World Health Organization (WHO)], other UN Agencies, international, regional and national research institutes, extension services and scientific and technical staff from affected countries.

## PAAT - Information System (PAAT-IS) and the use of GIS datasets

PAAT-IS aims at generating, harmonizing and sharing technical and scientific information among PAAT partners and stakeholders. GIS datasets and tools constitute important components of PAAT-IS and more emphasis has been placed on them during the recent system upgrade.

Geospatial datasets are used in several phases of the tsetse and trypanosomiasis decision making process. Global datasets (i.e. continental level datasets) are used by international agencies and donors to identify priority areas of intervention in relation to feasibility and potential benefits of tsetse/trypanosomiasis control or elimination projects. Key datasets at the continental scale are the predicted distributions of tsetse species, maps of the agro-ecological potential and poverty maps. Higher resolution datasets, normally at the national or subnational level, are needed to plan, implement, monitor and evaluate interventions in the field. Typical spatial datasets used in this context are field-based entomological and parasitological data, land cover maps, digital elevation models and medium resolution satellite imagery (e.g. Landsat, Spot, etc.)

## FAO GeoNetwork for PAAT-IS

FAO, hosting the PAAT-IS, utilized and promoted GeoNetwork opensource<sup>31</sup> among the partners and beneficiaries of the Programme. In a first phase, standardized metadata (ISO-19115) for key PAAT spatial

datasets were created and posted on FAO GeoNetwork<sup>32</sup>. The first datasets to be uploaded were the predicted distributions of tsetse fly, at 5 km resolution for the whole sub-Saharan Africa and at 1 km resolution for some priority areas of intervention. Figure 1 shows two of the PAAT-IS datasets now available through FAO GeoNetwork.

From an operational standpoint, the choice of an open source solution and of FAO GeoNetwork offered several advantages. By using FAO GeoNetwork, PAAT-IS did not need set up a new hardware and software infrastructure to target a large community of GIS data users. Access to the existing FAO platform was granted to PAAT-IS, which also benefited from technical assistance of FAO GeoNetwork staff on all matters related to the user interface and metadata creation. GeoNetwork administration functionalities allowed to create a new group of users labelled "PAAT-Information System", administered by the PAAT-IS manager. The latter was registered in the system with the privileges of "User administrator". This profile allows the PAAT-IS manager to create new users within their group; PAAT-IS users will be able to access dataset that may not be visible or downloadable for occasional (i.e. non-registered) users. This hierarchical policy of users' management allows to restrict access to sensitive information to a predefined group of authorized people. At the present stage, no visualization or downloading restriction is applied to PAAT-IS datasets in GeoNetwork, with the exception of test datasets or datasets "under development".

In a second phase, PAAT-IS introduced the usage of FAO GeoNetwork to key partners in trypanosomiasis affected countries, which have embarked on a tsetse-trypanosomiasis elimination initiative at continental level, the Pan African Tsetse and Trypanosomiasis Eradication Campaign (PATTEC). PATTEC is structured on several national projects which are expected to address the transboundary nature of the problem in a coordinated manner. All national projects established GIS units to support entomological mapping, land use planning and strategic decision making. GeoNetwork opensource could play a role in storing, documenting and sharing the geospatial information in this type of multinational project. During an interactive training workshop held in Rome, three selected GIS specialists from Burkina Faso, Ghana and Uganda received training on several aspects of information management and GIS-based decision making, including GeoNet-

<sup>31</sup>GeoNetwork opensource: <http://geonetwork-opensource.org>

<sup>32</sup>FAO GeoNetwork: <http://www.fao.org/geonetwork>



Figure 1: Two sample datasets produced by PAAT and also available through FAO GeoNetwork.

work. They were provided with FAO GeoNetwork accounts as “Editors” within the PAAT-Information System group, thus allowing them to create and upload their own test metadata. Feedback was positive and the potential of the tool was widely recognized. Still, in the aftermath of the workshop, the usage of the system failed to gain momentum and follow-up actions such as completion of test metadata and further dissemination lag behind. This can be ascribed to shortcomings in the management of the national projects in general, and of the information systems in particular. Further training and pro-active actions by FAO will probably be needed in this field for lasting assimilation of data sharing approaches to be achieved.

## Interactive mapping in FAO GeoNetwork

In addition to the on-line publication of metadata and the download of GIS datasets, FAO GeoNetwork offers to authorized users the possibility to create

Web Map Services (WMS), a standard of the Open Geospatial Consortium (OGC) which allows to visualize, overlay and query maps interactively, either through a GIS application or directly from the web browser (through InterMap<sup>33</sup>, an interactive map viewer). The software used by FAO to create the WMS is MapServer<sup>34</sup>.

PAAT-IS set up WMS for the land cover maps of eight trypanosomiasis-affected countries, all derived from the FAO Africover databases. The maps are tailored to tsetse habitat mapping and they were created through the process of thematic aggregation of the original full-resolution, multipurpose databases. Such a customization took advantage of the inherent flexibility of the Land Cover Classification System<sup>35</sup> (LCCS), upon which Africover maps are based.

The dissemination channel of Africover products is a dedicated web-site<sup>36</sup>; in particular, access to the full resolution datasets requires authorization from the National Focal Point Institutions. In addition to this preferential dissemination channel, an aggregated multipurpose version of Africover is available as WMS through FAO GeoNetwork. PAAT-IS fol-

<sup>33</sup>InterMap viewer: <http://sourceforge.net/projects/intermap>

<sup>34</sup>MapServer: <http://mapserver.gis.umn.edu/>

<sup>35</sup>Land Cover Classification System: <http://www.glcnc-lccs.org/>

<sup>36</sup>Africover: <http://www.africover.org>

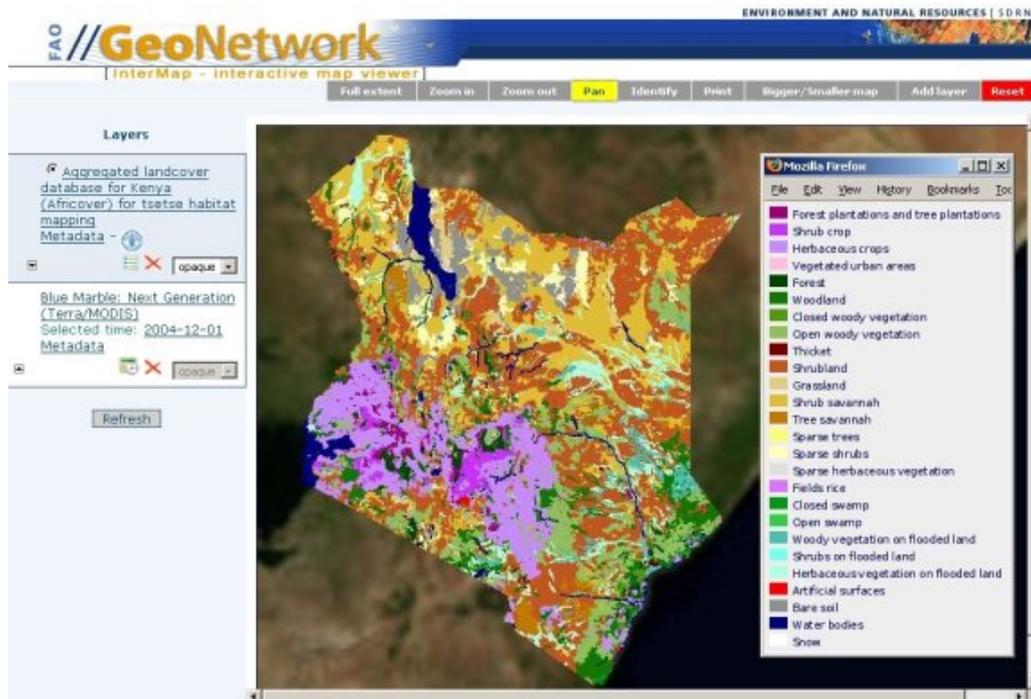


Figure 2: Web Map Service of the land cover of Kenya customized for tsetse habitat mapping, visualized through the FAO GeoNetwork interactive map viewer “InterMap”.

lowed this example to first introduce the technology of web map service to the tsetse and trypanosomiasis community. WMS is one of the most fundamental OGC’s interoperability standards that PAAT can use to allow its partners to access datasets remotely through a variety of applications. PAAT partners could also use WMS to display datasets for which direct download might not be advisable. FAO GeoNetwork already provides a robust hardware and software infrastructure that, through the support of PAAT, could be used to these purposes.

## More info

Programme Against African Trypanosomiasis:  
<http://www.fao.org/ag/paat.html>  
 PAAT - Information System: <http://www.fao.org/ag/paat-is.html>  
 FAO GeoNetwork: <http://www.fao.org/>

[geonetwork](http://www.fao.org/geoportal)

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# The West Alexander Neighbourhood in Winnipeg

## A Mapserver Case Study

by David A. Enns

### Abstract

West Alexander, a neighbourhood located in Winnipeg has been facing ongoing destruction of affordable housing making way for the ever expanding nearby hospital and community college. The issue at hand was how to increase public awareness of this situation before complete sections of a neighbourhood go missing and to determine how people living in the community view their neighbourhood as opposed to those outside the neighbourhood. In a sense we defined our goal as a social GIS project. It required the gathering of several data sources, some purchased and some supplied by the City. The software used to display this data and make it accessible to the public is MapServer/Chameleon.

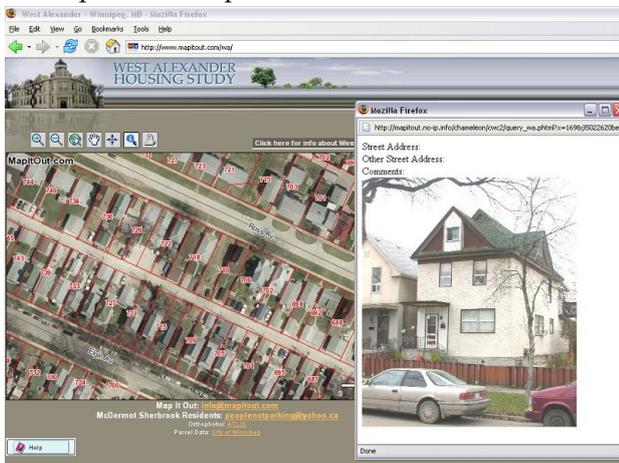


Figure 1: West Alexander Housing Study

In the end, the public was able to discover that an area that is often described as “run down” is rich in history both with people and buildings. Our goal was achieved by creating a public website offering interactive mapping tools. This web mapping site allows some basic interactive tools such as zoom in / out, pan, etc, and one of my favourites, the information tool which brings back detailed information about the parcel clicked on, along with a photograph of the area.

### Technology:

The first step in this project was obtaining the photographic record of each parcel within this neighbourhood, and then tying these photos to base data that was obtained from the City of Winnipeg. This base data included parcels, roads and hydrography. The 20cm imagery (1 tile) was purchased just for the West Alexander area.

Once we had all the data and photos in place, it was time to create an interactive mapping website. The technology chosen was based on Open Source mapping applications. For the web map portion, I used MapServer, an internet mapping application and for developing the maps with widgets, etc. I used Chameleon.

Initially we had looked at some commercial products, but software cost was an issue and our client had no existing GIS software so we were free to choose. In this case, I chose open source tools such as MapServer and Chameleon because of the power and stability available in these products. It was actually the advantages of using these two tools that was the deciding factor in the choice to go with open source. I especially found the online forum and the community to be very useful with quick turnaround times on questions I had. I consulted both the MapServer IRC channel and the MapServer forum frequently and found that people were very friendly and more than willing to help me get on the right track, even when I had basic Linux questions that related to MapServer.

In the beginning it can be quite difficult, not because of the tools, but because it is a new way of thinking. For someone used to commercial products, moving into the open source arena had its learning curve. Perhaps the most important, but not hardest, issue was the getting the look and feel (GUI) plus increasing redraw times on the map. We chose to use some large imagery which had to be resampled several times until I got a good cross between quality and performance. In terms of development time, the most time consuming part of the project was the cleaning up of layers along with the photos. The linking of the photos took some time, but I had figured that out in a previous project. The beauty of this technology is that when you create your template/widgets, they can then be re-used.

## In Summary:

For anyone wanting to start a similar project, I would recommend these tools, as there are several books available on this topic and plenty of good people willing to help on the forums. It was really the encouragement and goodwill help from others in the open source community that made this project successful.

The [site](#)<sup>37</sup> is open to the public so hopefully citizens of Winnipeg and other cities across the world can look at our example and implement the same idea in their neighbourhoods.

David A. Enns

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# Brazilian Industrial Fishing Vessels Monitoring Program

## A Practical Experience with Web Services and Webgis

by Rafael M. Sperb, Carlos H. Bughi, Adriana G. Alves, Luis E. Bonilha, Cláudia R. Zagaglia, Roberto Warlich, Felipe L. Pereira, Tadeu E. D. Granemann, Jeferson Koslowski<sup>1</sup> and Nataly P. da Silva

## Abstract

This paper presents RASTRO, a web-based information system that has been developed and implemented for the Brazilian Industrial Fishing Vessels Monitoring Program using open source technologies, such as Ka-map (MapServer), PostgreSQL (PostGIS, PL/PGSQL) and Symfony (PHP, AJAX). In its third version, the system includes features such as agents that control exclusion areas and distress requests from vessels; Web Services for tracking data reception and delivery; and a WebGIS interface for visualization of vessels that are operating on Brazilian jurisdictional waters, as well as on the Commission for the Conservation of Antarctic Marine Living Resources - CCAMLR areas. This paper presents RASTRO's architecture, functionalities and its potential impact on the industrial fishery scene.

## Introduction

Fishing vessels monitoring systems (VMS) have been implemented all over the world since the mid 90's (OECD, 2005). They are considered as a primary instrument to guarantee the fulfillment of fishery management measures. Within the context of the Code

of Conduct for Responsible Fishery and its main objective of warranting fisheries sustainability, the illegal, unreported and unregulated (IUU) activity is a serious, growing problem worldwide (FAO, 2002).



Figure 1: RASTRO V.1 WebGIS interface

IUU activities damage fisheries directly and prevent the implementation of sustainable measures from evolving, contributing to overfishing, therefore jeopardizing stock recovery. In the long term, this situation is leading to loss of socio-economic opportunities, as well as to negative effects on food availability and the environment. The people involved in IUU fishing try to avoid the detection of their activities, operating in areas where monitoring, control and surveillance are reduced or do not exist. This is the case in Brazil, where IUU fishing activities are

<sup>37</sup>West Alexander web mapping site: <http://wa.mapitout.com>

mainly related to:

1. National and foreign vessels operating without the due permission;
2. Vessels operating in protected areas;
3. Unauthorized operation in restricted areas, including those originated from international commitments, such as catching quotas; and
4. Catches are not reported as required by national regulations or as established by regional management organizations (e.g.: International Commission for the Conservation of Atlantic Tunas - ICCAT and the Commission for the Conservation of Antarctic Marine Living Resources).

In order to cope with this situation, the Brazilian Federal Government has adopted many tools proposed by FAO to combat IUU fishing, such as on-board observers program, catches reports, vessel inspection in ports and on the open ocean, and preventing vessels involved in IUU fishing from accessing ports, as well as denying their privileges (FAO, 2002). The last one to be effectively implemented, at industrial scales, was the vessel monitoring program.

## Brazilian Industrial Fishing Vessels Monitoring Program

The Brazilian VMS Program (Programa Nacional de Rastreamento de Embarcações Pesqueiras por Satélite - PREPS) was instituted by the Inter-ministerial Normative Instruction n. 02, from September 4th, 2006 (SSAF, 2006a). It is important to point out that the Decree n. 4.810/2003 had already established that, in order to operate on Brazilian jurisdictional waters, owners, shipbrokers, or leaseholders were required to use equipments that allowed their vessels to be monitored, when demanded by the Special Secretariat of Aquaculture and Fisheries - SEAP/PR or the Ministry of Environment - MOE through a normative act. However, the first experience towards VMS started as early as 1999, when foreign fishing vessels leased by Brazilian companies were required to operate equipped with tracking devices. From 2001 to 2005, this fleet operates on Brazilian jurisdictional waters with an average of 37 out of 60 fishing vessels being monitored per year.

During this period, 404 trips to Brazilian jurisdictional deep-waters to fish red crab and monkfish were monitored by the Group of Fishery Studies -

GEP from the Itajaí Valley University (UNIVALI), officially assigned to receive, plot and report on vessel activities. The first problem faced by this experience was that the government established poor definitions on the tracking technology and control practices. Delivering vessel position and date every four hours was enough to certify any tracking service provider and vessel to legally operate on the Brazilian shore. As a consequence, the fishery industry hired low cost services just to meet government requirements and legally run their operations. Therefore, most fishery companies chose a tracking system to provide a simple, low cost service, which delivered the GEP emails listing vessel name, date, latitude and longitude (CABRAL et al, 2003).

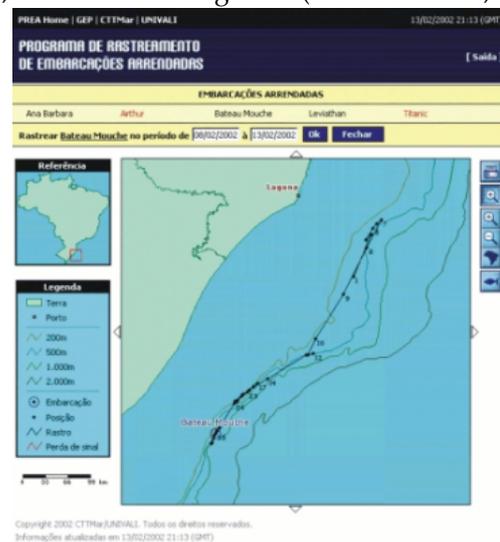


Figure 2: a single vessel path (CABRAL et al, 2003)

In early 2001, GEP found itself buried deep in quantities of data constantly arriving by email, and with a complex procedure involving one full-time position to receive, read, and type into a GIS desktop software incoming position data. Not to mention bi-weekly reports to be written and the possibility of human-failure due to non-automated steps. At that time, we were, at the Applied Computing Lab (G10), experimenting with WebGIS technologies. We found that the problem GEP was undergoing was a good challenge to practice our knowledge. The first version of RASTRO (Figure 1) was developed to solve this situation. The system was a collection of Web and shell scripts that perform a variety of tasks, including data fetching and processing, shapefile generation, dynamic data visualization on maps for the Web and on-demand reports (CABRAL et al, 2003).

In addition to the problem faced by GEP, the ex-

perience with RASTRO's first version has shown several operational constraints and newer problems, despite the great value it has given regarding the comprehension of the fleets' fishing strategies and legal controlling constraints. Government agencies jurisdiction overlap and the poor definitions on tracking technology, services, and operational practices, pointed out earlier, were the ground for developing PREPS. Regarding the information system itself, it was an enlightening and fruitful experience for the upcoming versions of RASTRO. Communication protocols and data format standards were among the most important system requirements that were to be officially defined by the government for a large scale VMS program such as PREPS. In the following sessions of this document, we present RASTRO Version 3 not as an evolution of the previous ones, but rather as a result of the deployment of IT state-of-the-art concepts and technologies to achieve PREPS general requirements:

1. Communication with external servers and clients should be done through Web Services standards;
2. Use of open source technologies;
3. The functionality to perform tracking data providers' accreditation; vessel permit processes; vessel(s) operation audit; cadastre and control over restricted areas (control done by agents); keeping track of the history of legal transgression and enforcement measures; and distress warning;
4. WebGIS should use Open Geospatial Consortium - OGC interoperability standards (WMS and WFS); and
5. Web-based application with access control.

### RASTRO Version 3 Implementation

The development of RASTRO V. 3 took almost 20 months by a team of 14 people, including Computer Science undergrad students. The system started to operate in January, 2007, under test condition, with a monthly release of new versions. In July the system was already fully functional, monitoring 298 vessels out of an estimated number of 3500 industrial fishing vessels.

### Open Source Technologies

The open source technologies that the application is built upon are shown in Figure 2, according to its architecture. Linux version OpenSUSE 10.2 is the underlying operational system in both Web and

Data Base servers. PostgreSQL is the DBMS that, with PostGIS extension, handles non-geospatial and geospatial data. Requests from the Web server side are executed in two ways: non-geospatial data requests are done through PHP, while MapServer does all geospatial data, generating dynamic maps to be visualized via KaMap.

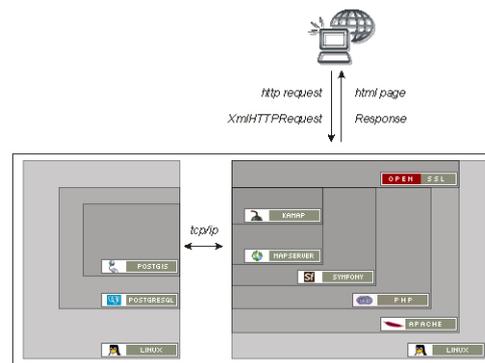


Figure 3: Open source technologies used the RASTRO application.

The entire application was developed in the Object-oriented paradigm, on three layers (e.g., model, control and view), using the Symfony framework. For users, requests are arranged in a safe way (e.g., by using OpenSSL), either in synchronized way by HTTP Request, or unsynchronized using AJAX (XmlHttpRequest).

### Web Services Standards

RASTRO uses three types of Web Services (Figure 3). The first one we developed to be officially adopted by the government through the Normative Instruction n. 20, from September 15th, 2006 (SSAF, 2006b). In order to provide data to the PREPS program, a tracking data provider company needs to be accredited after complying with the VMS Web Service Standard (VMS-WSS) tests. Since RASTRO is a WebGIS, it was natural to adopt OGC Web Services (OWS) standards. In this version, the system uses Web Mapping Specification (WMS) and Web Feature Specification (WFS) for geospatial data distribution and access (i.e. providing maps of restricted areas or displaying sea surface water temperature). Finally, the last Web Service provides data (vessel's name, characteristics and operating distances for certain periods) for the Federal Government Diesel Subsidy. Unfortunately, thus far, there has been no effort to create a standard for this WS.

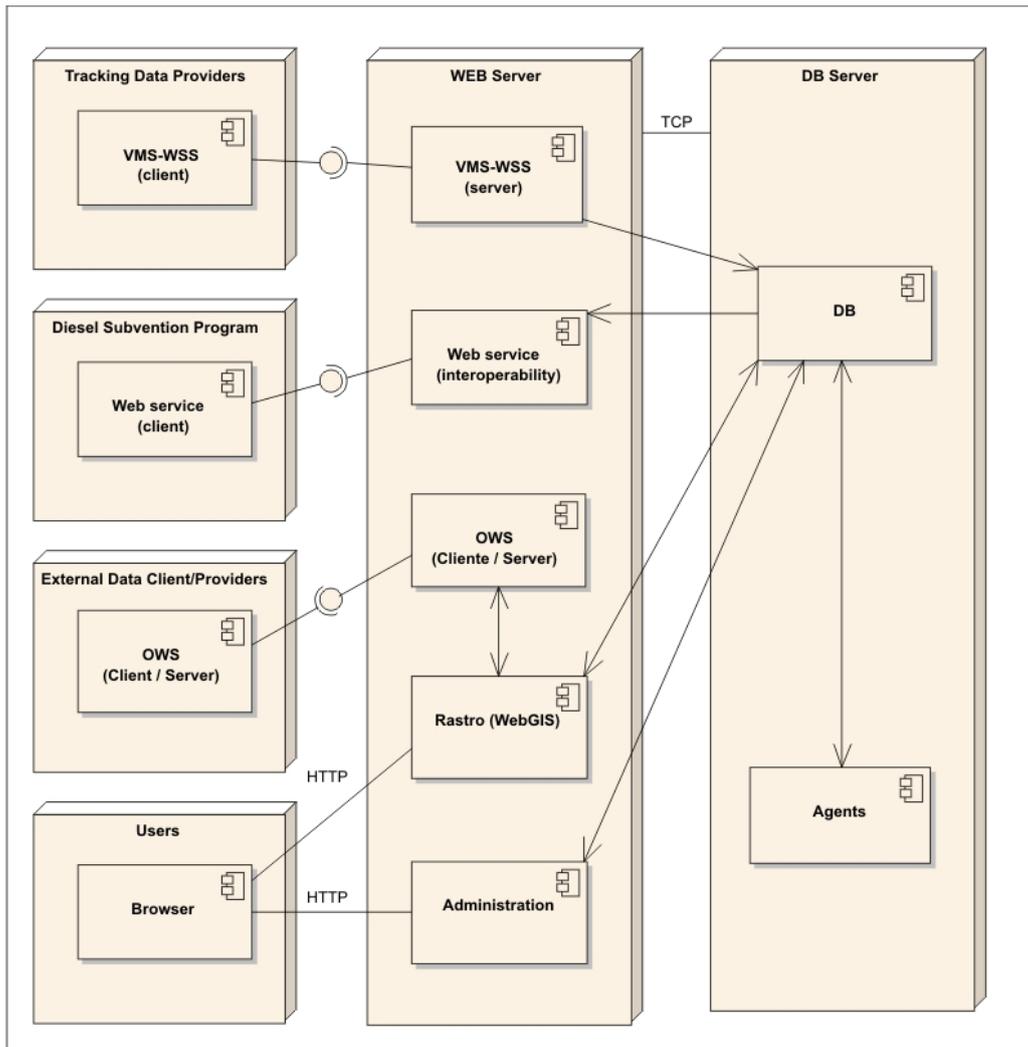


Figure 4: System's architecture.

## System Architecture

The system operates with two servers using the technologies earlier presented (Figure 2). In the Data Base Server (DB Server), besides data management processes, it is worth mentioning the agents (Figure 3). After tracking data reception through the VMS-WSS, they are in charge of triggering and performing several analyses:

1. Vessel sensor data: searches for distress warning signal or tracking devices battery failure, communicating them to the Brazilian Navy-MB (SALVAMAR/SAR);
2. Navigation data: verifies whether the vessel is navigating/operating on protected or restricted area;
3. Timely data: verify whether the tracking data was sent in due time (every hour with a gap no longer than 4 hours); and
4. CCAMLR notice: verifies whether the vessel tracking data is within the CCAMLR area, communicating it to this organization using VMS data format NAF (CCAMLR, 2005).

On the Web Server side, one will find the VMS-WSS, OWS, and Diesel Subvention Program WS. In this server, MapServer 4.10.2 handles OWS requests as server and client.

## Interface

RASTRO's interface was customized to PREPS requirements. Thus, each Government institution that holds a share on the Program operation (SEAP/PR, MOE, and MB) has a set of specific functionalities available (e.g.): warning distress for the MB). Tracking data companies and vessel owners, shipbrokers, or leaseholders also have access to the system. It is restricted to vessels that are under their official responsibility, though.

The WebGIS behaves in the same way, granting access to functionalities according to user level. Built upon KAMAP framework, the interface provides a comprehensive set of tools, customized to support monitoring procedures for each one of the operators. These tools are presented in Figure 5. The basic WebGIS operations are available through the Navigation tool box (a), including pan, zoom in and out, reset, legend display, measurement, buffer, and save the map. The cursor is used to query vessel info on the map itself (b), as well as to define a point for buffer operation, which returns a list of vessels at a defined distance. This functionality is impor-

tant for the MB (SALVAMAR/SAR) rescuing procedures, since it might be faster to dispatch a vessel that is closer to the distressing vessel, than sending any other means of rescuing.

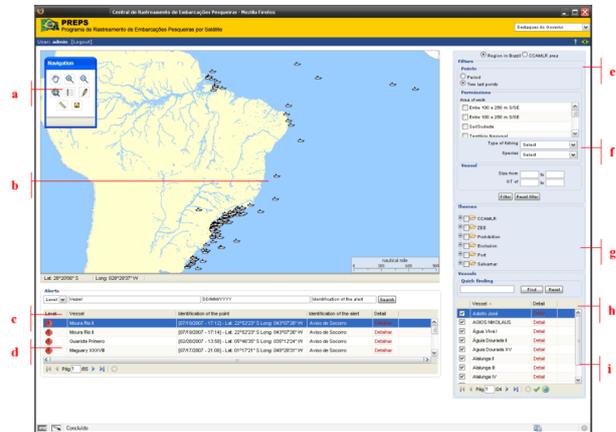


Figure 5: RASTRO administration WebGIS interface

Figure 5 (c) and (d) displays the alert area. In (c), alert filters are available based on the operator needs: level (intervention, attention, observation); vessel's name; date; and type of alert. A list of results is displayed on (d). Other filters are available in the system as well: the user might see the last two coordinates or audit the operation for a certain period of time (f); and visualize according to vessels' permit, target species, type of fishery, and vessel's characteristics (e.g. size). A quick vessel finder is available on (h), whereas in (i) the user may choose vessel(s) he wants to visualize. The interface's language might be changed from Portuguese to English (e) in order to allow foreign users (e.g.: CCAMLR officials) to easily navigate in the system. Finally, thematic maps list (g) includes themes such as exclusion and protected areas, SAR areas and bathymetry. An example of a VMS ROSTRO product is shown on Figure 6, where an operation area of two vessels (1 and 2) might be identified in the circle (a).

## Conclusion

Our newly developed PREPS VMS information system is novel in several respects. First, it supports a combination of interests and jurisdictions among SEAP/PR, MOE, and MB. This combination was planned in order to avoid conflicts of interest and waste of financial and human resources. At the same time, the intention is to increase the efficiency

of management and control of commercial fishery. From this perspective, this is the first innovating feature that promotes co-management initiatives. Second, not only the Federal Government is in charge of the operation. When a vessel has a gross tonnage equal or to or greater than 50 tons, or if its length is equal or greater than 15 meters, the vessel's owners, shipbrokers, or leaseholders must adhere to PREPS. Therefore, their part is defined in the vessel monitoring process itself. This can be considered as the second innovating point of PREPS.

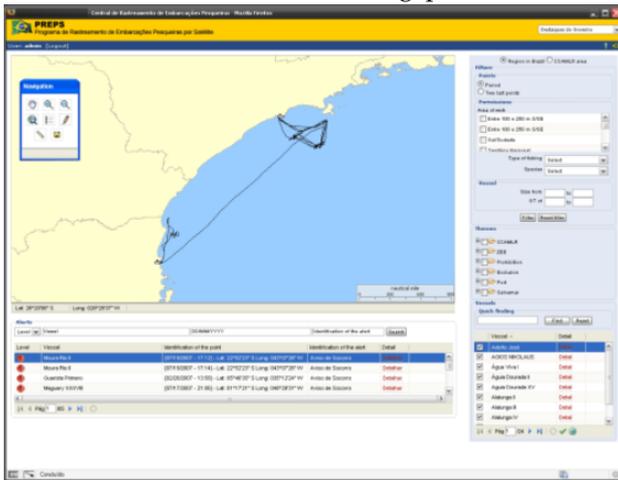


Figure 6: Example of VMS auditing with the identification of operation area

It is of their biggest interest to maintain, in the long term, the fisheries potential catches. Not by coincidence, this is also the Government's interest. Therefore, PREPS formally establishes the productive sector's responsibility related to its performance, for example, when recognizing fishing areas and providing data on catch associated to these areas. These elements are essential for dealing with fishing resources properly. When implementing PREPS, the Government makes the private enterprise co-responsible for the future of the fishery in national waters. Providing their access to RASTRO, the government grants transparency to the process, while it includes the productive sector's effort in a set of tools that eventually may lead to responsible fishery. Third, our system represents a technologic innovation. The pioneer character in which the telemetry (tracking) issue was approached deserves attention. The proposal of the Web Service Standard for RASTRO's operation made possible for any company willing to provide tracking services to apply for accreditation as tracking data provider. In other words, this standardization not only benefits the Govern-

ment, which has easy conditions to integrate tracking data sent by different tracking companies. Tracking companies can establish themselves in a free-competition market, unlike the monopoly situation that other countries have experimented with in this type of service. Accordingly, the market will adjust for the competitive quality and cost, with positive impacts for PREPS and the productive sector.

Forth, the system employs state-of-the-art technologies and architecture, allowing SEAP/PR, MOE, and MB to act within their responsibilities from one system only. This allows the information system to support plans and decisions operated in a shared way. That is, the same information may be used, for example by the MOE to inspect specific areas, by SEAP/PR to control a certain fleet's operations, and by the MB to find vessels at any moment that pose a threat to the security on the sea. Finally, the fifth innovating element is the tracking system's interoperability with other governmental systems. The conception of the system developed for PREPS permits the communication of data with a system for managing the subvention for diesel, with a computerized system for managing fishing permissions, and OWS compliant systems.

## Acknowledgements

The authors would like to acknowledge the importance of the Government Agencies and Officials involved in the system's modeling process, in special SEAP/PR for the financial support given to the

project's development.

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## Topical Studies

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# Spatial Relationships in GIS – Geospatial Topology Basics

*Landon Blake*

## Introduction

This article provides the reader with an introduction to geospatial topology. It is a continuation of the article in the last issue of the OSGeo Journal, which provided the reader with an introduction to spatial relationships in GIS. This article is intended for a reader with a basic knowledge of GIS, and does not cover advanced concepts. To get the most benefit out of this article the reader should [1] understand what a “feature” is in the context of a GIS, [2] understand how features are commonly represented by vector geometry types like points, lines, and polygons, and [3] have a basic knowledge of geometry and coordinate systems.

## What is topology?

The word “topology” has several different definitions. The *Random House Webster’s College Dictionary* provides one definition of topology as “the mathematical study of those properties of geometric forms that remain invariant under certain transformations, as bending or stretching.” If you wanted to trans-

late this definition to a simpler, more common language you might say that topology is “the study of the relationships between shapes or geometries that do not change when the shapes or geometries are subjected to a common transformation or manipulation.” In GIS, topology can be considered a special type of spatial relationship. It is a spatial relationship that does not depend on the coordinate geometry of the shapes or geometries participating in the relationship.

A short example will help us to understand the definition of geospatial topology. Consider two line segments that intersect one another. You could apply several transformations to both lines, such as a translation, rotation, scaling, or warping, and the lines will still intersect. The fact that the two line segments intersect does not change if the transformations are applied to both line segments in the same manner. We also do not need to know anything about the coordinate geometry of the two lines to understand this particular spatial relationship. Therefore the intersection of the two lines is a topological relationship.

This is different from the typical type of spatial relationship that we discussed in the first article on this topic. As an example, the interior angle formed by two line segments will change if the two line segments are warped or stretched. This is an example of

a spatial relationship that is not topological.

## Article Scope

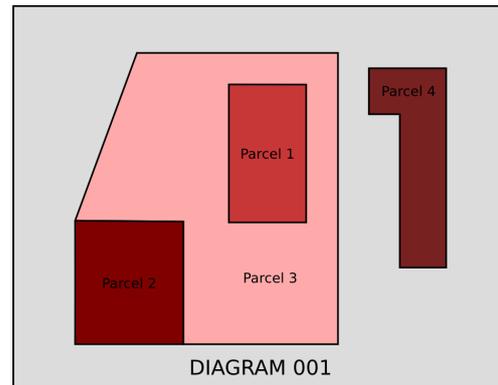
In this article we will deal specifically with the topology that can exist between features modeled with “vector geometries”. For the purposes of this discussion we define “vector geometries” as shapes that can be expressed using distances, angles, or coordinates. The shape and location of features in a GIS are commonly described in two dimensions, but may be described in only one dimension, or in three or more dimensions. In this article we will concentrate on the topology that can exist between real world objects represented in only two dimensions. We will only discuss two types of geospatial topology in this article. The first type will be containment and adjacency. The second type will be network topology.

## Containment & Adjacency Topology

The first basic type of geospatial topology that we will discuss is containment and adjacency. This type of topology considers two similar types of spatial relationships. The first is that one feature geometry may contain, or be contained by another feature geometry. The second is that one feature geometry may be next to, alongside, or adjacent to another feature geometry.

An example will help us to understand containment and adjacency topology. Diagram 001 shows a group of polygons that could be used to represent parcels in a GIS. Consider the containment and adjacency topology evident in this diagram.

- Parcel 1 is contained by Parcel 3.
- Parcel 3 contains Parcel 1.
- Parcel 3 is adjacent to Parcel 2.
- Parcel 2 is adjacent to Parcel 3.
- Parcel 4 is not contained by, does not contain, and is not adjacent to Parcel 1, Parcel 2, or Parcel 3.



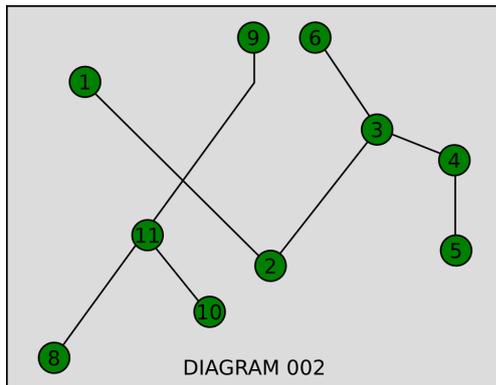
From this example we can see that containment and adjacency relationships can usually be expressed in a bi-directional manner. Thus, if Parcel 1 is contained by Parcel 3, Parcel 3 must by necessity contain Parcel 1.

## Network Topology

The second basic type of geospatial topology that we will discuss is known as network topology. Network topology represents the relationships between segments in a linear network, or a collection of line segments. (This could be straight line segments, curved line segments, or both.) There are 3 basic relationships between line segments that are important in network topology.

1. The end point of one line segment can connect to the end point of another line segment. This connection is typically called a node.
2. A line segment can intersect a node, but not connect to that node or the line segments joined by that node. (This often takes place when a line segment passes “above” or “below” a node. For example, a railroad track might cross over the junction of two streams.)
3. A line segment can intersect another line segment.
4. A line segment can terminate at some point along another line segment. Typically this termination point is also represented with a node.

An example will help us understand network topology. Diagram 002 shows a group of line segments that could be used to represent a road network in a GIS. The end point of each line segment is represented by a node. Each node has been numbered in the diagram for the purposes of our discussion. Let's consider some of the network topology that is evident in this diagram.



1. Node #2 and Node #4 connect to line segments to one another. Node #3 connects 3 line segments, while Node #1, Node #5, Node #6, and Node #9 are present at the end point of line segments, and represent the termination points of the network.
2. The line segment between Node #8 and Node #9 crosses over, but does not connect to the line segment between Node #1 and Node #2.
3. The line segment between Node #10 and Node #11 terminates at a point on the line segment between Node #8 and Node #9. This point is represented by Node #11.

Relationships in network topology can be expressed in a bi-directional manner, as the relationships in containment and adjacency topology can. Thus, if the line segment between Node #1 and Node #2 connects to the line segment between Node #2 and Node #3, then the line segment between Node #3 and Node #3 must also connect to the line segment between Node #1 and Node #2.

## Practical Application of Geospatial Topology

What is the practical application of geospatial topology in a GIS? Like the more basic type of spatial relationships, topology can be used to aid in spatial analysis. For example, topology can be used to greatly increase the speed and efficiency of the operations or tasks that must be performed as part of spatial analysis. But in this article we will consider another practical application of topology that allows it to be used in situations where typical spatial relationships just won't do what we need them to.

Spatial relationships can also be used to a tool for data quality assurance. This is done by placing a constraint or a check on a unique aspect of

the spatial relationship between feature geometries. Geospatial topology allows us to do this in some special ways. It can be used to verify that the geometries of two or more features participate in a topological relationship in a way that does not violate the rules or restrictions set up for that particular relationship.

Let's consider a couple of examples.

Consider the containment and adjacency topology that was evident in Diagram 001. In this diagram we see parcels of land or real property represented by two-dimensional polygons. We discussed how these polygons can contain other polygons, and how they can also be adjacent or next to other polygons. When modeling parcels of land, or a "parcel fabric" as it is sometimes called, it is helpful to set up some basic rules that govern how the polygons used to represent the parcels can be related when it comes to containment and adjacency. We typically do not want adjacent parcels to overlap, nor do we want to have a gap between adjacent parcels. This is a rule that we can set up and verify using geospatial topology.

We might also set up a rule about the number of land parcels that can be contained in any single assessment district. (In this case the tax assessment district would also be represented by two-dimensional polygons.) Because we are talking about containment, we can set up a rule and verify it for this scenario using containment and adjacency topology.

What about network topology? How can it be used to verify data quality in a GIS? Consider for a moment a network of sanitary sewage pipes and the manholes that connect them. What type of rules could we set up for this type of utility system modeled by a series of straight line segments and nodes? (A straight line segment would represent a sewer pipe, while a node or a point would represent a manhole.) We could define a direction of flow for each manhole and then require the manhole at one end of a line segment to be represented by a node with an elevation that is higher or greater than the elevation of the node representing the manhole at the other end of the line segment.

We might also have a rule that indicates only line segments belonging to a sanitary sewer segment can connect to a sewer manhole, and that line segments representing other types of pipes would not be allowed. We might also dictate that a pipe leaving a manhole be at least the same size or bigger than the pipe entering the manhole. All of these things could be verified by setting up rules that take advantage of network topology.

## Conclusion

In this article we defined geospatial topology. We took a brief look at the two main types of topology, containment and adjacency topology and network topology. We also briefly examined a practical application of geospatial topology, a tool to ensure data quality in a GIS.

In a future issue of the OSGeo Journal we will examine how we can use the open source Java Topology Suite to construct two-dimensional geometries used to represent features, and then set up constraints on those geometries to ensure data quality.

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<sup>38</sup>Reidmann on topology: [http://www.agile-secretariat.org/Conference/greece2004/papers/8-1-3\\_Riedemann.pdf](http://www.agile-secretariat.org/Conference/greece2004/papers/8-1-3_Riedemann.pdf)

<sup>39</sup>OGC SF for OLE/COM: [http://portal.opengeospatial.org/files/?artifact\\_id=830](http://portal.opengeospatial.org/files/?artifact_id=830)

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## Programming Tutorial

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# Porting a GRASS raster module to distributed computing

Examples for MPI and Ninf-G

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## Abstract

Satellite imagery provides a large amount of useful information. To extract this information and understand them may require huge computing power and processing time. Distributed computing can reduce the processing time by providing more computational power. GRASS, an open source software, has been used for processing the satellite images. To let the GRASS modules benefit from distributed computing, an example module `r.vi` is ported in both MPI (`r.vi.mpi`) and Ninf-G (`r.vi.grid`) programming modules. Their implementation methodologies are the main discussion issue of this paper which will guide the basic way of representing any GRASS raster module in distributed platform. Additionally, a comparative study on modified `r.vi`, `r.vi.mpi` and `r.vi.grid` is presented here.

## Introduction

Satellite image processing plays a vital role for research developments in Remote Sensing, GIS, Agriculture Monitoring, Disaster Management and many other fields of study. However, processing those even increasing spatial resolution satellite images require a large amount of computation time due to its complex and large processing criteria. This seems a barrier for real time decision making. Distributed computing can be a suitable solution to complete the job timely. Cluster and Grid are two well-known distributed systems have been associated with high performance computing of massive CPU bound applications. GRASS GIS (3) is an open source software/-tool, which has been used to process satellite images. Inside GRASS, different modules have been developed for processing satellite images. GRASS module `r.vi` is developed by (5), and is used as a test example for this study. Developing the methodology, which enables to run GRASS GIS environment for satellite image processing on distributed computing systems, is the main concerning issue of this paper. Additionally, two different implementation methodologies for distributed `r.vi` are discussed for two different programming platforms MPI (6) and Ninf-G (7).

Vegetation Index (VI) is the major set of indicators for vegetation. The GRASS module `r.vi`, is used to process 13 different vegetation indexes for the satellite images. NDVI (Normalized Difference Vegetation Index (8)) is one of them. The NDVI is calculated from these individual measurements as  $NDVI = (NIR - Red) / (NIR + Red)$ , where RED and NIR stand for the spectral reflectance measurements acquired in the red and near-infrared regions, respectively. Other vegetation indices are as follows:

RVI	Ratio Vegetation Index
IPVI	Infrared Percentage Vegetation Index
DVI	Difference Vegetation Index
PVI	Perpendicular Vegetation Index
WDVI	Weighted Difference Vegetation Index
SAVI	Soil Adjusted Vegetation Index
GARI	Green Atmospherically Resistant Vegetation Index
MSAVI	Modified Soil Adjusted Vegetation Index
MSAVI2	Second Modified Soil Adjusted Vegetation Index
GEMI	Global Environmental Monitoring Index
ARVI	Atmospherically Resistant Vegetation Index
GVI	Green Vegetation Index

Figure 1: Vegetation Indexes

They are derived using various methods of differentiations and contrast. Fig. 2 shows a snapshot of an output of GRASS Software.

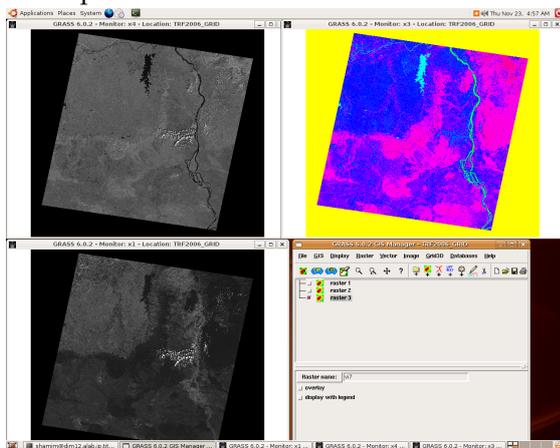


Figure 2: NDVI calculations with GRASS  
GRASS module `r.vi` works with raster images

(rows x columns). Different band raster images are required for different indices. The generic indices (NDVI, RVI, etc) use red and NIR (Near Infra-Red) band images. However, ARVI uses red, NIR and blue band images, GVI uses red, NIR, blue, green, chan5 and chan 7 of landsat images and GARI uses red, NIR, blue and green bands. GRASS functions are used to extract row-wise data from the specific band images and store them in buffers. Then, each column value is extracted sequentially from the buffers and sent for generating the specific VI values. Thus, after completing the VI from row buffers, the row wise VI values are put back into output image and this process will continue for each row. Fig. 3 presents the structure of serial running `r.vi` module (for simplicity only two band images have been presented).

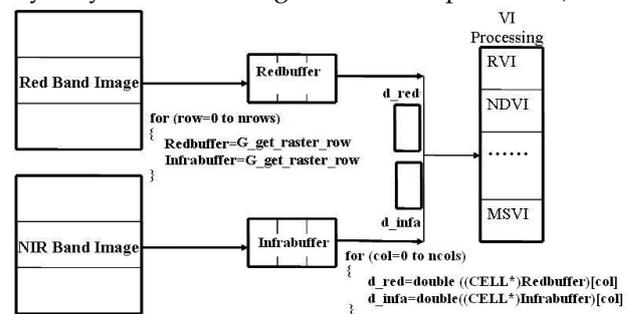


Figure 3: Serially Running `r.vi` Module Structure

## Objectives

Under the assumption that distributed style of computing will remove computational time constraints, new image processing distributed algorithms for remotely sensed images can be considered. Different GRASS modules have been developed for solving different Remote Sensing Image analysis problems. To evaluate the performance of the GRASS modules in distributed computing environment is the major objective of this paper. Additionally, it is a new dimension for the remote sensing users to port their jobs in distributed computing environment. Another issue addressed in this paper is to find out the sufficient amount of workload that is needed to dispatch among the worker nodes for getting better performance than the serial module.

## Methodology

To fulfill the above objectives or requirements, the GRASS module (`r.vi`) has been parallelized by using the master-worker model. The master process runs

in the GRASS environment, and decomposes the target images in rows and dispatches the computation of rows to multiple worker processes. Worker processes are free from GRASS, they just run the computation and send back the row wise result to the master process. The module `r.vi` is implemented using MPI on a PC cluster system (`r.vi.mpi`) and Ninf-G on the same PC cluster system (`r.vi.grid`) to hold the similarity between the experimental environments. However, `r.vi.grid` module has been structured as it is capable to run in distributed GRID system. Additionally, experiments were done to analyse the results with distributed `r.vi` modules by increasing the number of operations, to find out the amount of workload that is necessary to get a performance benefit from the distributing environments.

In Fig. 4, the implementing structure of distributed `r.vi` is presented (for simplicity only two band images have been presented). Here,  $S_1, S_2, \dots, S_n$  are different worker processes.

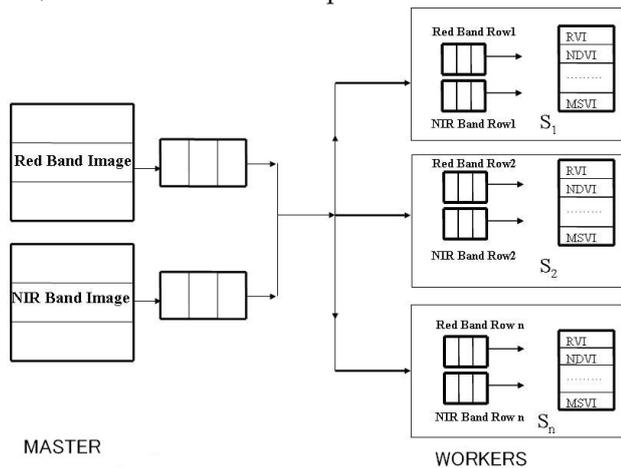


Figure 4: Distributed `r.vi` Module Structure (`r.vi.mpi` and `r.vi.grid`)

## Implementation

### MPI and Ninf-G Framework

MPI (Message Passing Interface) is a library of functions (in C) or subroutines (in FORTRAN) that one can insert into the source code to perform data communication between processors (1). MPI was designed for high performance on both massively parallel machines and on workstation clusters and developed by a broadly based committee of vendors, implementors, and users.

The Ninf-G has been developed by AIST (National Institute of Advanced Industrial Science and

Technology, Japan) and TITECH (Tokyo Institute of Technology, Japan). Ninf-G is a reimplementation of the Ninf system on top of the Globus Toolkit (2). Globus serves as a robust and common platform for implementing higher level middleware and programming tools, etc., ensuring interoperability amongst such high level components, one of which being NinfG. NinfG system is based on client server computing. The computational resources are available as remote libraries at a remote computation host which can be called through the global network from client program written in existing languages such as FORTRAN, C, or C++.

### Specification of the Davinchi Cluster

The Cluster nodes for the experiments are as follows:

Number of hosts	4
Host Spec	Each Host 2 CPUs(Xeon 2.4GHz x 2) 512 KB Cache Size 1 GB Hard Disk
GRASS Version	6.0.2
MPICH Version	1
Ninf-G Version	4.1.0
Globus Toolkit Version	4.0.3
Local Job Manager for <code>r.vi.grid</code> module	SGE (SUN Grid Engine, 2007)

Figure 5: Specifications of Davinchi Cluster

### Distributed `r.vi` Module in MPI (`r.vi.mpi`)

For `r.vi.mpi`, GRASS source code is installed in master node and GRASS libraries are copied to the slaves local memory location exactly the same as master (`/usr/local/grass-6.0.2/`) and the following configuration steps are completed to setup the MPI-GRASS environment.

- `grass.conf` file is created inside `/etc/ld.so.conf.d/` directory and the required grass library names are written inside this file.
- Then the `/sbin/ld_config` command is executed.

MPI\_Send and MPI\_Recv both functions have been used for data communication.

The following Makefile is created for compilation

```
MODULE_TOPDIR = ../../
CC=mpicc
PGM = r.vi.mpi
LIBES = $(GISLIB) $(GMATHLIB)
DEPENDENCIES = $(GISDEP) $(GMATHDEP)
include $(MODULE_TOPDIR)/include/Make/Module.make
default: cmd
```

To run the code the following shell command has been used:

```
mpirun -np 3 location_of_exec_file parameters..
```

In this experiment the location of the executable file is: *GRASS\_COMPILE\_DIR*/dist.i686-pc-linux-gnu/bin/r.vi.mpi The pseudo-code of r.vi.mpi is appended here:

```
#include "gis.h"
#include "glocale.h"
#include "mpi.h"

/* main.c: Declare the following MPI code */
/* NUM_HOSTS is total host number      */
/* me is defined processor rank/number  */

MPI_Status status;
MPI_Init(&argc,&argv);
MPI_Comm_size(MPI_COMM_WORLD,&NUM_HOSTS);
MPI_Comm_rank(MPI_COMM_WORLD,&me);

/*-----*/
/* Master Code Begin: Rank 0 (me=0)      */

/* Extract total row and column number  */
/* and sends them to the slaves          */

for(i=1;i<NUM_HOSTS;i++)
// i Loop Started:

    MPI_Send(&nrows,1,MPI_INT,i,1,MPI_COMM_WORLD);
    MPI_Send(&ncols,1,MPI_INT,i,1,MPI_COMM_WORLD);

// i Loop Finished.

/* Row data are extracted from images and */
/* dispatched them among slaves with specific*/
/* row number by Round Robin Fashion      */

for (r = 1; r*(NUM_HOSTS-1) <= nrows;r++ )
// r Loop Started:

    for(k=1;k<NUM_HOSTS;k++)
// k Loop Started:

        row=(r-1)*(NUM_HOSTS-1)+k-1;
        G_get_raster_row(infd_redchan,...
        G_get_raster_row(infd_nirchan,...
        for (col=0; col < ncols; col++)
// col Loop Started:

            //Each column cell values form all bands
            // are extracted and put them in a 2D array
            db[0][col]= d_redchan;
```

```
        db[1][col]= d_nirchan;

// col Loop Finished.

    row_n=k-1;
    I[ncols]=row_n;
    MPI_Send(I,ncols+1,MPI_INT,k,1,\
    MPI_COMM_WORLD);
    MPI_Send(db,6*ncols,MPI_DOUBLE,k,1,\
    MPI_COMM_WORLD);

// k Loop Finished.

// Waiting for the result...

for(k=1;k<NUM_HOSTS;k++)
// k Loop Start:

    MPI_Recv(R,ncols+1,MPI_DOUBLE,k,1,\
    MPI_COMM_WORLD,&status);
    row_n=R[ncols];
    for (cn=0;cn<ncols;cn++)
// cn Loop Started:

        outputImage[row_n][cn]=R[cn];

// cn Loop Finished.

// k Loop Finished.

// Processes row put back to the result images
for(k=0;k<(NUM_HOSTS-1);k++)
// k Loop Start:

    for(j=0;j<ncols;j++)
// j Loop Start:

        ((DCELL *) outrast)[j] = outputImage[k][j];
        G_put_raster_row(outfd,outrast,data_type_output);

// j Loop Finished.

// k Loop Finished.

// r Loop Finished.

/* If any row left when (row_number%slaves!=0), */
/* the round robin fashion rest rows (lets n) */
/* are distributed from slave 1 to slave n again*/

MPI_Finalize();
G_free(inrast_redchan);

/* Master code Finished */
/*-----*/

/*-----*/
/* Slave Code Begin: Rank not 0 (me!=0) */
```

```

MPI_Recv(&nrows,1,MPI_INT,0,1,MPI_COMM_WORLD,\
&status);
MPI_Recv(&ncols,1,MPI_INT,0,1,MPI_COMM_WORLD,\
&status);

n_rows=nrows/(NUM_HOSTS-1);
modv=nrows%(NUM_HOSTS-1);
if(modv>=me)
n_rows++;

// Data Receiving from master and process
for(i=0;i<n_rows;i++)
// i Loop Started:

    MPI_Recv(I,ncols+1,MPI_INT,0,1,MPI_COMM_WORLD,\
    &status);
    MPI_Recv(db,6*ncols,MPI_DOUBLE,0,1,MPI_COMM_WORLD,\
    &status);

    for (col=0; col<ncols; col++)
    // col Loop Started:

        ndvi(db[0][col],db[1][col]); // Process ndvi()

    // col Loop Finished.

    r[ncols]=I[ncols];

    // results are in r[] and
    // sends back to master
    MPI_Send(r,ncols+1,MPI_DOUBLE,0,1,\
    MPI_COMM_WORLD);

// i Loop Finished.

MPI_Finalize();

/* Slave Code Finished.                */
/*-----*/

```

## Distributed r.vi Module in GRID (r.vi.grid)

r.vi is easier to port in Ninf-G environment than MPI. Here, no need to copy the library files, because the worker procedure is totally independent from the master procedure and GRASS environment. GridRPC (4) calling API is used for communication between the master and workers. The following Makefile is created for compilation

```

MODULE_TOPDIR = ../..
CC=ng_cc
PGM = r.vi.grid
LIBES = $(GISLIB) $(GMATHLIB)
DEPENDENCIES = $(GISDEP) $(GMATHDEP)

```

```

include $(MODULE_TOPDIR)/include/Make/Module.make
default: cmd

```

Like any other GRASS modules r.vi.grid can run by the command:

r.vi.grid parameters

Worker IDL file is as follow:

```

Module VI_Server;
Define VI_CALC (IN int n,IN double I[n], \
IN double a[n], IN double b[n], IN double c[n],\
IN double d[n], IN double e[n],\
IN double f[n], OUT double r[n])
Required "VI_ServerC.o"
Calls "C" VI_CALC(n,I,a,b,c,d,e,f,r);

```

Worker code is as follow:

```

#include <stdio.h>
#include <math.h>
#include <stdlib.h>
#include <unistd.h>

void VI_CALC(int n, int *I, double *a,\
double *b,double *c, double *d, double *e,\
double *f,double *r){
    int col;

    for (col=0; col<n; col++)
    //col Loop Started

        //column wise value going to process for
        // specific indexing, put results in r []
        // as for ndvi processing...
        r[col]=(a[col]-b[col])/(a[col]+b[col]);

    //col Loop Finished.

} //function call finish

```

Master module code is as following:

```

#include "gis.h"
#include "glocale.h"
#include "grpc.h" // we need grpc.h header file
#define NUM_HOSTS 5 //how many hosts available

char* hosts[] = {"davinci1.alab.ip.titech.ac.jp",\
"davinci1.alab.ip.titech.ac.jp", ... , ... , ... ;
grpc_function_handle_t handles[NUM_HOSTS];
grpc_sessionid_t ids[NUM_HOSTS];
int ret;

if((ret= \
    grpc_initialize("../raster/r.vi.grid/vi.conf") \
    !=GRPC_NO_ERROR)){
    fprintf(stderr, "Error in grpc_initialize, \
    %d\n",ret);

```

```

    exit(2);
}

//creating one handle for each host node
for(i = 0; i < NUM_HOSTS; i++)
    grpc_function_handle_init(&handles[i], hosts[i],\
        "VI_Server/VI_CALC");

for(row = 0; row < nrows; row++)
// row Loop Started:

    host_n=host_n%NUM_HOSTS;
    if(G_get_raster_row(infd_redchan,\
        inrast_redchan,row,data_type_redchan)<0)
        G_fatal_error(_("Could not read from <%s>"),\
            redchan);
    if(G_get_raster_row(infd_nirchan,\
        inrast_nirchan,row,data_type_nirchan)<0)
        G_fatal_error(_("Could not read from <%s>"),\
            nirchan);

for(col=0; col < ncols; col++)
// col Loop Started:

    // each column cell values for all
    // band images are extracted together
    // and put them in 2D arrays
    db[0][col]= d_redchan;
    db[1][col]= d_nirchan;
    db[2][col]= d_greenchan;
    db[3][col]= d_bluechan;
    db[4][col]= d_chan5chan;
    db[5][col]= d_chan7chan;
    // vegetation indexing array values are
    // filled in I[ncols] array

// col Loop Finished.

if(grpc_call(&handles[host_n],ncols,I,db0,db1,\
    db2, db3,db4,db5, R) != GRPC_NO_ERROR){
    fprintf(stderr,"grpc_call ERROR\n");
    exit(2);
}

// All outputs are put back into raster
for(j=0;j<ncols;j++)
// j Loop Started:

    ((DCELL *) outrast)[j] = R[j];

```

```

// j Loop Finished.

    if(G_put_raster_row(outfd,outrast,\
        data_type_output) < 0)
        G_fatal_error(_("Cannot write to output\
            raster file"));

    host_n++;

// row Loop Finished.

// Destruct the handles
for(i = 0;i < NUM_HOSTS; i++)
    grpc_function_handle_destruct(&handles[i]);
grpc_finalize();
G_free(inrast_redchan);
G_close_cell(infd_redchan);

// ...etc...(Free memory)

```

## Experimental Results

Fig. 6 is generated by running `r.vi` and `r.vi.mpi` GRASS module with increasing the operation numbers. To calculate different vegetation indices the workload in the slaves is too small to get benefit from `r.vi.mpi` module. Thus, the purpose of this experiment is to find out the sufficient amount of workload that will make the parallel version faster. In Fig. 6, to calculate the NDVI takes only 3 operations (subtraction, addition and then division) and this amount of workload takes just few seconds to execute, where the serial version takes less processing time than parallel version. However, increasing the number of operations provide better performance in parallel version. It is clear from Fig. 6 that to get the benefit from the parallel version the total workload needs to be around 300 operations or more so that the communication overhead will be overpassed by the computational workload.

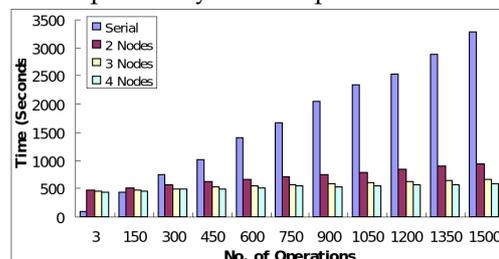


Figure 6: Performance Evaluation of Serial (`r.vi`) and MPI (`r.vi.mpi`) Version

When master with one worker node (slave) are

working together to solve a particular problem, the master node will dispatch the whole job to his slave for processing. When there will be 2 slaves, the workload will be distributed among two slaves. Similarly for 3 slaves, the workload will be distributed to 3 slaves equally. So the time performance increase for master with 2 slaves will be 2 times than master with one slave and the ratio will be 3 times for master with 3 slaves with one slave and so on... This would highlight a perfect parallelism.

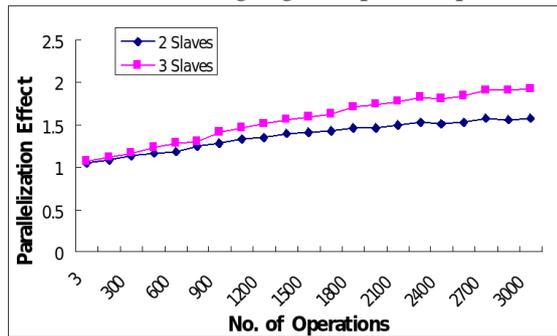


Figure 7: Parallelization Effect of r.vi.mpi Module with DTT

Concerning the above philosophy and experimenting on r.vi.mpi module, Fig. 7 and Fig. 9 have been generated. In Fig. 7 and Fig. 9, the 2 Slaves curve presents the ratio of the total running time between master with two slaves and master with one slave. The 3 Slaves curve represents the ratio of the total running time between master node with 3 slaves and master (one slave) with increasing the operation numbers. Increasing the operations, reflects to increase the workload in slaves and improving the performance. However, in Fig. 7, the performances are not satisfying with the desire values (as perfect parallelism) due to the regular and high communication overhead.

In equation 1, 2 and 3 the following terms have been used.

Term Name	Term Meaning
DTT	Data Transfer Time (Sec)
VDS	Volume of Data Send (each time)
VDR	Volume of Data Receive (each time)
NC	Number of Columns = 8519
NR	Number of Rows = 7630
NB	Number of Band Images = 6
DTS	Data Type Size = 8 Bytes
NBW	Network Band Width = 100Mb

Figure 8: Terms used and their definitions

$$DTT = \{NR \times (VDS + VDR)\} / (NBW) \quad (1)$$

$$VDS = NB \times DTS \times (NC + 1) \quad (2)$$

$$VDR = DTS \times (NC + 1) \quad (3)$$

From equation 2 and 3, equation 1 has been derived as

$$DTT1 = (6 \times 8 \times (8519 + 1)) + (8 \times (8519 + 1)) \quad (4)$$

$$DTT2 = 100 \times 1024 \times 1024 \quad (5)$$

$$DTT = (7630 \times 8 \times DTT1) / DTT2 = 277.74Sec \quad (6)$$

To evaluate the parallel version performance more precisely, Fig. 9 has been generated. Only the execution time (Data Transfer Time has been reduced from the total running time) is concerned here. Due to a constant amount of data need to transform between master and slaves, the transfer time (DTT) is derived from the above equations. Fig. 9 shows that the performance in the slaves curves are improving and nearly to the desirable values. It concludes that r.vi.mpi module is working well in distributed manner.

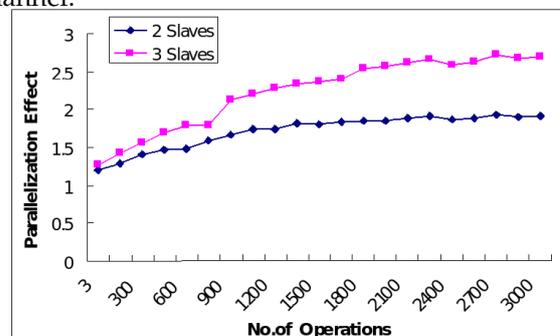


Figure 9: Parallelization Effect of r.vi.mpi module without DTT

Fig. 10 evaluates the performance of the GRASS modules (*r.vi*, *r.vi.mpi*, *r.vi.grid*) in the time domain. Low, middle and high, three testing workloads have been set in the modules. When the workload is low, serial version (*r.vi*) is performing best because of the fine-grain parallelism where communication time is bigger than the execution time. To get the coarse-grain, the workload need to be increased so that the communication time will be hidden by the execution time. As the workload increased to 1800 and 3000 operations, parallel versions are performing better then the serial version.

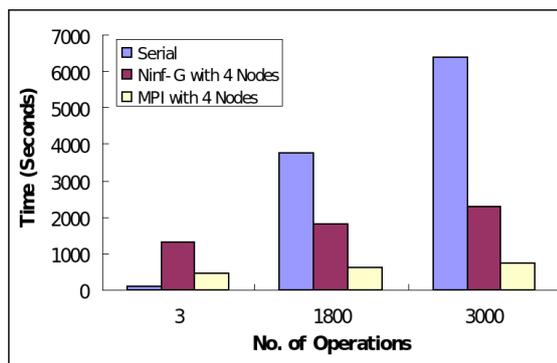


Figure 10: Performance Evaluation of GRASS Modules (*r.vi*, *r.vi.mpi* and *r.vi.grid*)

MPI version, *r.vi.mpi* provides the best performance among the three models. However, MPI is used mainly in Cluster Computers where the nodes are homogeneous in their specification. Additionally, available nodes in Clusters are limited up to a specific range and this will be an obstacle for load balancing for big processing jobs. In this case, Grid computing infrastructure is necessary. Indeed, (the environment maintains heterogeneity as well as distributed connecting networks). So far Ninf-G is performing better than the serial version for high workload examples.

Particularly, in this issue, Ninf-G is not performing better than MPI for the reason that, the communication overhead (to establish the session with remote hosts) in Ninf-G is larger than MPI. Ninf-G is specially made for Grid-Computing environment (not for running inside Cluster computing environment as have been done in above experiments). When the processing workload is much higher than the communication workload, the real performance improvement with Ninf-G platform will show up. So far, *r.vi.grid* is developed and tested. In near future, the experiment on real Grid testbed will be highlighted.

## Conclusion

Geographic Resources Analysis Support System (GRASS) has been used for RS and GIS data analysis and visualization. Currently, GRASS handles large datasets and the performance and capabilities of GRASS for large datasets can be greatly improved by integrating GRASS with parallel and distributed computing. The major objective of this research was to provide the Remote Sensing user a compact example with Grid and MPI programming for GRASS GIS distributed processing. Additionally, this type of research will merge the Remote Sensing and GIS with High Performance Computing communities.

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## Sponsor Perspectives

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# LizardTech: Why We Use and Support Free and Open Source Software

### An Informal But Earnest Manifesto

by Matthew Fleagle and Michael P. Gerlek, LizardTech

*One of the authors, Michael Gerlek, has been a Charter Member from the beginning of OSGeo and was highly influential in its success. LizardTech officially became an OSGeo Associate Sponsor in 2006 and has been an active user of open source geospatial tools for a long time. It is with this in mind that they were invited to describe how they use open source from both a business and community perspective. – Editor*

As a small company with a niche-market customer base originally built on the strength and ubiquity of its proprietary technology – the widely used MrSID technology and image format – LizardTech has reason to cherish private ownership. The fact that we have something that no one else can use without paying us for it has, to say the least, advanced our prospects over the years. Many might be unaware, however, not only that we support open source development efforts in general but that in particular, we have been supporting OSGeo since its inception.

Why would a small, proprietary shop like LizardTech use and support free and open source de-

velopment? Don't the advance of open source development and the spread of an ethos of sharing in the software industry represent threats to LizardTech's business model? We believe the contrary, and this article aims to articulate why. First we'll discuss some of the free and open source software (FOSS) products that we use or have used in the past, and then we'll talk about why it makes sense strategically for small companies like ours that have proprietary code not only to use the products made by the free and open source development community but also to materially support its work.

### How and Why LizardTech Uses FOSS

LizardTech has used free and open source software packages since its founding in 1992. An informal survey of LizardTech's development team revealed just how much we rely on open source tools and libraries: we quickly were able to list dozens of packages, ranging from the popular (Firefox, Apache, Linux) to the geo-specific (GDAL, PROJ4, OpenLayers). Many of these libraries are built into our shipping, commercial software products. In fact, by comparison to the following list we use very few closed source, third-

party libraries.

**Geospatial libraries:** GDAL/OGR, GeoTIFF, GEOS, OSSIM, PROJ.4, MapServer, PostGIS, OpenLayers

**Non-geospatial libraries:** Berkeley DB, CppUnit, Crypto++, libcurl, dlmalloc, efence, Expat, gSOAP, libgif, libjpeg, libtiff, OpenSSL, libpng, libungif, xalanj, xercesc, xml4c, zlib, zthread, boost, littlecms

**Other tools and packages:** Apache, Tomcat, gcc, Linux, Perl, Python, Putty, Firefox, Cygwin, Wireshark, Emacs, gnuplot, siege, autoit

Okay, you say, you're impressed by the number of free and open source software packages out there that can be used in making geospatial software, but you wonder, are there benefits besides the obvious savings in license fees? By way of answer, we'll not only enumerate the benefits, we'll also give a couple of examples. Here are the benefits:

**We don't have to reinvent the wheel.** LizardTech is a sleek outfit. We don't have the resources, in terms of personnel and their time, to create everything from scratch, especially when it would be duplicated effort. If the work has been successfully done already, it makes good business sense not to waste time, money and sweat beating a new path up the same mountain. This is good strategy even if you decide to pay for the existing product. When companies start up they deploy OpenOffice.Org or license MS Word; they don't routinely invent new word-processing programs just because they know they'll need to send interoffice memos.

**We can concentrate on our core competencies.** LizardTech lacks experience in some areas that the open source community has plenty of experience in. This point is similar to the first, but it bears mentioning that we save money when our own developers can concentrate on what they do best. Diverting our energies into areas where we are not experts and don't need to be experts, when the experts stand by proffering their wares at little or no cost, is foolhardy.

**We can play in larger arenas.** Having access to intellectual property beyond the sum of our developer parts means that we can equip our products to play in larger fields without taking on the costs of finding and engaging additional personnel. This point is again related to the first benefit, but it highlights the opportunity to widen our customer base and sell more products to more people.

**We can leverage well-used, well-tested code.** The open source development community is not three guys in a garage – not anymore anyway. The community actively hammers away at open source projects, putting code to the test, finding out where it breaks, discovering bugs and supplying patches and other solutions in a robust volunteer testing and feedback loop. The code evolves at the pace of real-world use, testing and fixing, not of marketing schedules and sales imperatives. As a result, open source projects represent some of the tightest products never sold.

**We enjoy unplanned advantages.** Not uncommonly, a side benefit will emerge through the use of an open source project, some benefit that we may not have had any knowledge of beforehand. Intrigued? Read on...

## Real-World Examples

LizardTech wanted to introduce reprojection to its popular GeoExpress product. This would give us access to a wider customer base by better synchronizing the functionality of our product to the identifiable pains of potential users. But while we are experts in imaging technology, we are not experts in reprojection. Projection systems involve hard, scary math. Moreover, in many applications people's lives depend on their accuracy, so they present the twin horrors of being simultaneously mission critical and easy to get wrong. Even if we'd had the personnel to send off to work on reprojection, we had rathered not mess with it.

Our options, then, were two. We could buy a commercial, proprietary package or we could use an open source package like the PROJ.4 reprojection library.

The second option was the hands-down smarter choice, and not just because of the absence of licensing fees. What if the corporate product had a bug that affected our project? What if it only worked on 32-bit systems but we needed it to work on 64-bit systems? We'd have to put in a bug report or a feature request for 64-bit support and then wait six months for the next release of the product, paying for a maintenance plan the while. And 64-bit support may or may not be in the box when we finally got to peel off the wrapper.

By contrast, with PROJ.4 we could likely get a bug fix or 64-bit support in short order. It's true that there is no "company" standing behind

the PROJ.4 package, but we've found (especially in larger projects) that this is rarely a problem. Unafflicted by corporate boardroom pressures, the open source community's priority is finding and fixing bugs in its code and adding features and functionality to its products. (In fact, we very frequently satisfy a particular customer request by taking an open source package and porting it to a compiler such as SunPro on which we previously hadn't supported that package.) If there was something seriously wrong with open source code, then we could pay someone in the community to fix it and still come out ahead in terms of time and cost.

While PROJ.4 gave our product a very important and visible feature, another kind of open source product supports our product invisibly. We use GDAL, a library that supports dozens of image formats used in GIS alone, to make sure that our product supports those formats. Rather than supplying a feature or functionality, GDAL gives us access to the wider GIS ecosystem. More than once we have found out through our customers that we support a format that was important to them that we otherwise may not have bothered with – the unexpected advantage mentioned above.

## How and Why LizardTech Supports Open Source Development

It's true that it just wouldn't be cricket to take advantage of the now abundantly evident benefits of FOSS while refusing to support free and open source development and continuing to charge money for our own products. But LizardTech's central claim in this article is not that our use of and support for open source is moral (another paper, perhaps, submitted to a different journal). We're claiming that it's strategic.

There are a number of ways an organization can support open source development in material ways, that is, beyond simply using FOSS. They include monetary donations and sponsorship; membership and volunteering; feedback, bug fixing and patches; contracting open source developers for work, such as we did for 12-bit JPEG support; and attendance at conferences. LizardTech is active in the open source community in all of these ways, often as part of our regular workaday world. Here's how supporting open source benefits us:

**If open source projects fail, we fail.** It must be remembered that as a company, LizardTech relies on

open source products in order to create and improve our own products. Seen from this single perspective, it makes sense to feed the chickens that lay the eggs, especially when what you pay in the grand scheme amounts to ... ahem ... chicken feed.

**The return on investment is high.** Contributing, say, \$5000 a year to sponsor an organization like OSGeo, where that money helps keep open source projects alive and vital, makes good sense when you compare the options that would exist in a world without FOSS. Hiring several additional developers would cost several times as much annually, and supporting open source, which provides us with well-tested code and quick fixes when necessary, is a much better use of funds than paying a proprietary company for software that might be more buggy and harder to get fixes for. For that matter, how does one know if a product or library is buggy? Would you rather rely on the biased marketing messages from the proprietary owners of code or access firsthand experience from users and developers? Sponsorship in this regard is like a different and cheaper kind of contract labor.

**We can effect positive, rapid change in the products we need to use.** It has never been necessary for us to lobby for or engage in radically changing an open source package, but if a substantial change was necessary it's a cinch that the open source development community could turn it around much quicker than a proprietary code-owner whose priorities and schedules are beholden to the boardroom.

**Open source conference attendance pays dividends.** Given finite budgets, why would we want to take several of our development crew to the annual OSGeo conference instead of to one of the well-attended "proprietary" user conferences? Because not only will they get exposed to all the cutting edge technology that they'll find at other shows, but they'll also acquire knowledge they can bring back and use for free. Further, the information and knowledge they'll get is divorced from any corporate agenda: no one will try to sell them a grand solution or ply them with company-biased information. Finally, the developers they'll meet at open source conferences are more available for follow-up with conversations spawned at the event. A related way to support open source development is to donate facilities, soda and snacks to a local user group. LizardTech hosts a small monthly OSGeo meeting in

our Seattle offices.

**Open source plays well with open standards.** We have also invested heavily in supporting ISO and Open Geospatial Consortium (OGC) standards, which are "open" in a way that is different from the way open source is. We've found that the open standards and open source development processes are similar enough that many advantageous synergies emerge between them.

**It's the right thing to do.** We said above that this was not about morality, but if science hasn't yet proven that the world smiles along with you when you smile, it's only a matter of time. It cannot but advance the wholly considered interests of any 21st

century company to adopt toward customers, competitors and partners an attitude that reflects the values of cooperation, collaboration, community, trust and humility embodied by open source development.

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# 1Spatial: Spatial Data Quality and the Open Source Community

by Mike Sanderson, Graham Stickler, Steven Ramage, 1Spatial

*With a specific interest in FDO and the direction of other open source technologies, 1Spatial (formerly Laser-Scan) became an official OSGeo Associate Sponsor in 2006. 1Spatial's area of expertise is data management, quality management and their Radius Studio product. The authors were invited to present some of their thoughts on these topics, including how they see these ideas being delivered using open source tools. —Editor*

## Introduction

The Open Source Geospatial Foundation (OSGeo) introduces itself on its website, with the words "The Open Source Geospatial Foundation has been created to support and build the highest-quality open source geospatial software." It is clear the objective is to create a peer review community to improve software quality (1). This article addresses the quality element, but from an entirely different perspective.

Spatial data are subject to different regimes of quality management, irrespective of whether they are used in an open source environment or not. There will always be issues regarding data consistency and integrity or fitness for purpose because

data are constantly changing. This may be through real world change, the introduction of new technologies for capture, update or organisational change that alters the boundary conditions.

Since the mid '90s the International Standards Organisation (ISO) and the Open Geospatial Consortium (OGC) have worked on standards, creating and overseeing the Web Feature Service (WFS), Web Map Service (WMS) and Geography Markup Language (GML). Then more recently through the work of the OSGeo mechanisms now exist to access geospatial data regardless of source through Feature Data Objects (FDO).

As a result a whole new set of issues are created around spatial data quality and fitness for purpose. We want to now extend the paradigm to include these spatial data quality and reuse issues as data collected for one purpose are being accessed for increasingly diverse use, more often by a completely separate entity. As an industry, Google has raised the industry profile to the point where it will hurt us all if data quality is suspect.

Our vision is to provide a set of web-based tools to enable spatial data quality to be assessed, i.e. conformance checking. Ideally this will offer improved spatial data management in an open source environment. It will support the goal of improving operational efficiency by allowing a framework to be developed to aggregate spatial data.

We wish to offer the OSGeo community the possibility of contributing to these initiatives via our Practitioner Program and through the Open Geospatial Consortium (OGC) Data Quality Working Group.

## Background Information

By way of supporting information it is necessary to understand the work that has been carried out by the International Standards Organisation (ISO). ISO provides guidelines for putting together spatial data quality management frameworks. ISO 19113 and ISO 19114 describe various mechanisms for determining and measuring data quality. These ISO standards embody principles and evaluation procedures for geographic information (for a useful summary of these principles and procedures, see Chapter 15 in [Spatial Data Quality](#) (2)). The opening sentence of ISO 19113 sets the tone:

Geographic datasets are increasingly being shared, interchanged and used for purposes other than their producers' intended ones.

The forerunner to the current ISO standards were applied by them using the Digital Chart of the World (DCW) project as a case study. The DCW<sup>40</sup> was produced in 1992 and there was an effort to work on "fit for purpose" issues. But in 1995, the initiative ran out of steam, because only non-quantitative (i.e. qualitative) assessments of the quality of geographic datasets could take place. Quantitative assessments were just not possible for large geospatial datasets due to the lack of processing power available at the time. It is quantitative assessment that is really valuable for assessing logical consistency and positional accuracy. And as Jakobsson said so eloquently: "Combining data sets that have no quality information can be very difficult or impossible." (2)

## Quantitative Spatial Data Quality

A data quality audit is designed and implemented in order to determine the answer to the question, how bad (or good) is your spatial data? There are three high-level objectives of a data quality effort:

- Produce statistically valid data quality measurements of source or master data

<sup>40</sup>Digital Chart of the World: <http://www.nlh.no/ikf/gis/dcw/>

- Investigate, identify, and document leading data quality causes (and exceptions)
- Create an assessment and recommendation report

However, in order to undertake quantitative assessments, there must be some guidelines to follow and a formal approach. The flowchart in Figure 1 describes such an approach for reviewing spatial data quality. This is a tried and tested approach used by 1Spatial for projects with customers and partners - it offers a route for undertaking quantitative assessments.

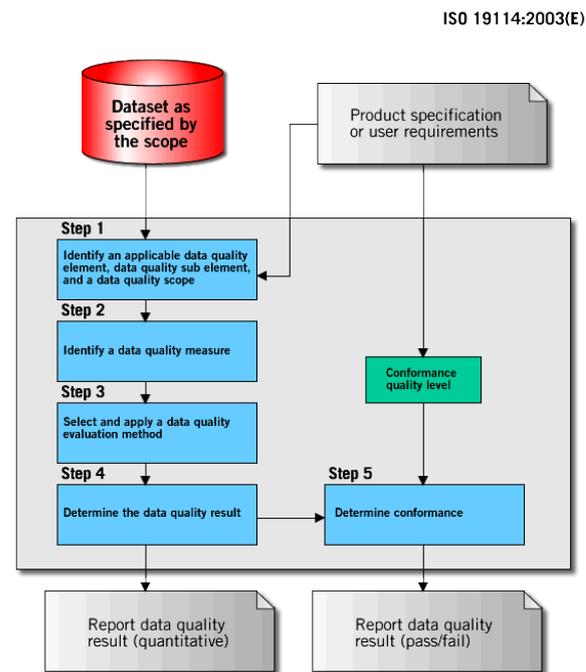


Figure 1 - Evaluating and reporting data quality results

Figure 1:

What is important in this approach is contextual analysis of the data quality records or spatial data holdings. This involves working through steps 2 to 5 using a rules-based approach to determining the conformance of spatial data against the specifications or business rules. In an Open Source environment this would be accessed using an XML interface to Feature Data Objects (FDO). There are two key elements to this approach. Firstly, it provides a quantitative assessment of spatial data quality, i.e. data conformance % against business rules. Secondly, it is an independent verification, i.e. not using the GIS tools that create or edit the data – these remain unchanged.

Data quality problems are often widespread and originate in the source data itself. They can be geometric, topological or attribute-based. In order to combat these problems, data custodians, analysts and stakeholders must understand their source data. This understanding can come from data profiling or what can be thought of as self-describing metrics. The analysts and data managers must understand how the data profile fits the business requirements. This is where a business rules-based audit is not only useful, but critical.

## Data Quality Rules!

In order to establish the fitness for purpose for spatial data, it is clear that it is first necessary to understand the business rules relating to those data and how they should be interpreted. Conducting a business rules-based audit can be critical to combating data quality problems.

Figure 2 highlights an example of identified measures for assessing spatial data quality. It refers to five key elements that change according to the type of spatial data or its application. The objective at this stage is to define the business rules that the data should obey. It is often difficult to obtain this information from the user. The original data model specification is often unavailable or hasn't been updated since inception. Rather than start from a blank piece of paper a potential source of rules is the data itself. Rules may be discovered using an analysis of dominant statistical patterns in the data.

The current challenge is that there are limited toolsets available in the open source community and the wider geospatial market place as a whole to carry out such tasks and quantitatively measure spatial data quality. While we may look to open architectures and standards as defined by Service-Oriented Architectures (SOA), the World Wide Web Consortium (W3C) semantic Web framework and the Web Ontology Language (OWL), it is clear that the semantic Web rules language doesn't support the geospatial needs. Work done recently by the OGC as part of their OWS-4 test bed on a Topology Quantitative Assessment Service (TQAS) supports this view.

ISO 19114:2003(E)

Data quality element	Data quality subelement	Relevant?
completeness	commission	yes
	omission	yes
logical consistency	conceptual consistency	no
	domain consistency	yes
	format consistency	no
	topological consistency	yes
positional accuracy	absolute or external accuracy	yes
	relative or internal accuracy	no
	gridded data position accuracy	no
temporal accuracy	accuracy of a time measurement	no
	temporal consistency	no
	temporal validity	no
thematic accuracy	classification correctness	no
	non-quantitative attribute correctness	no
	quantitative attribute correctness	no

Figure 2: Summary of relevant quantitative quality information

Figure 2:

1Spatial have been addressing this problem and have developed a web-based tool, Radius Studio, based around this quantitative rules-based data quality paradigm. Using a variation of an artificial intelligence boosting algorithm adapted to spatial data mining, it works by initially considering a small sample of objects taken at random from the data store and then works outwards from these objects, considering nearby objects. An initial set of spatial rules are proposed and subsequently enhanced to include non-spatial elements such as attribute joins, equalities and inequalities, correlated to the spatial relationships between the objects sampled. The final set of rules is converted to a form that allows them to be stored in a rules repository, which is based on a common language interface that incorporates OGC spatial operators.

It is clear that such a tool, when combined with FDO and MapGuide Open Source, can enable an assessment of spatial data against business rules. This conformance checking approach can be invaluable in providing a quantitative assessment of spatial data quality.

As a result 1Spatial has already commenced a Practitioner Program to enable their end customers to validate spatial data across the Web by running spatial data audits. Through remote access to Radius Studio, Practitioners are able to use the rule building and assertion capabilities to carry out data certification audits on behalf of customers. In return 1Spatial receives feedback on the product and 1Spatial tools are recommended for any fix up or ongoing repurposing, reuse or re-engineering requirements.

## Open Source Opportunity

There is an opportunity here for the open source community to engage with Radius Studio to develop this capability and make it widely available.

By lodging this assessment service within OSGeo

could enhance its reach, providing the basis for cooperation between parties to allow the harmonization of geographic information to take place, and to build a community (3). The opportunity will then exist for the open source community to extend the range of FDO providers and open up more formats that can be subject to a quantitative assessment of spatial data quality.

Another reason for placing an assessment service within OSGeo is to create a community that will work on defining the rules expression language for creating the quality measures. The Semantic Web Rules Language (SWRL) is currently not mature enough, but as history has shown, we in the industry can create a standard. Once we have this, rather than having to accept caveat emptor, we can all make our own assessments of whether the data are fit for purpose. This has to be an automated assessment, and unlike in 1995, the tools and computing power are now available to do this. It may need a 14-day free trial to make an assessment, if the data are not free, but once the assessment is made, it will then be possible to decide whether or not to pay, or how much to pay (value) for those data. Suddenly the free vs. licensing debate becomes irrelevant.

If the rules expression language can't be created fast enough, we can move to the geographer's solution, the "pseudo-quantitative expression." Following the Amazon tradition of peer group review, the user community could assess the nominal value of a spatial data set for completeness, logical consistency, and positional, temporal and thematic accuracy. The Open Source community works well under

the same model of peer group review and so we believe it should be interested in this approach.

If you are interested in extending the OSGeo into spatial data quality assessment or playing a role in standards development relating to spatial data quality we urge you to contact 1Spatial direct or through the OGC Working Group on Data Quality at:

<http://www.opengeospatial.org/projects/groups/dqwg>

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# Local Community Reports

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## Francophone Local Chapter Update

*by the local chapter members*

### Introduction

The creation of the Francophone Local Chapter (OSGeo-fr) started in October 2006, following the FOSS4G 2006 meeting in Lausanne. As of July 2007, we are close to its creation and about to send a proposal to the OSGeo Board (expected in July or August 2007).

Since October, a huge work in the Francophone mailing list <sup>41</sup> has been performed in order to share ideas about the missions of the local chapter. The Francophone local chapter missions are now separated into three main committees: organisation, open geodata and open source software. For each committee, a chair will manage communication between contributors and will send information to the local chapter about the progress of the project.

Some other important details need to be clarified, i.e. how OSGeo-fr is organized (only the main structure is currently drawn), how to manage and hold elections? etc. This is the main purpose of the new local board which has been elected at the end of June (see subsection below).

<sup>41</sup><http://lists.osgeo.org/mailman/listinfo/francophone>

During this time some small projects has been engaged:

- OSGeo got a booth in an Open Source village at the main geospatial tradeshow in France (see <http://wiki.osgeo.org/index.php/GeoEvenement2007>)
- we translated a document which presents OSGeo missions and projects,
- we ran a poll to discover people's motivations and to know whether they would be consumers or actors in the upcoming Francophone local chapter,
- we initiated the translation work of the OSGeo Journal Vol. 1.

### Election

As of 6th of July, the first round of the election is finished and a second round to elect the Data Committee chair will start the 9th of July. The first round results are:

- **Local chapter president:** Yves Jacolin
- **Organisation Committee chair:** Gwenael Bachelot

- **Software Committee chair:** Vincent Picavet

The next step aims at writing the proposal for the Francophone Local Chapter creation as well as writing an RFC about the organization of elections and how to manage them. In other words, we need to formalize the structure of the Francophone Local Chapter in order to be efficient and start on solid bases.

## Poll

A 15 days poll was published at the beginning of June. 54 persons answered the poll. 37 persons out of the 54 had subscribed to the Francophone mailing list.

From the poll results, we realized that communication of the OSGeo missions will be a key point of the future Chapter: what is OSGeo for? Which project people can be interested in? This could be one of the main purpose of the Francophone Local Chapter organization committee.

The reasonably large amount of answers to this poll allows us to see the creation of the future Francophone local chapter positively. Once this will be done, the visibility of the OSGeo-fr will be greatly

improved and we expect to see more contributors joining us.

Finally, the translation of OSGeo Journal Vol. 1 showed us that we are ready to manage projects and this will help to improve OSGeo-fr's visibility.

## OSGeo Journal Vol. 1 Translation

A French translation of OSGeo Journal Vol. 1 is, at the time of writing this article, about to be published. Only two articles need to be finalized (proof readers). 7 persons have contributed to this project and have translated 27 articles (70 pages). 5 persons have proof read the translated articles. Some of them both have translated and read articles.

This is the biggest project OSGeo-fr managed by itself so far, and some details of the process need to be clarified. Managing 27 articles in a process of translating, proof reading, and back to the translator for finalization appeared to not be a so easy task. The working process has to be clarified and a RFC has been drafted for this purpose.

*Written by Francophone Chapter Members*

<http://wiki.osgeo.org/index.php/Francophone>

# Activity Report of OSGeo Taiwan

**At the 5th Taipei International Digital Earth Symposium (TIDES-07) and FOSS4G.tw Summer Training 2007**

*Dongpo Deng*

OSGeo Taiwan, founded on March this year, is a new and vibrant social network in Taiwan. OSGeo Taiwan actively participated in local GIS-related conferences and meetings to advocate open geo-data, promote Open Source GIS and introduce OSGeo to Taiwanese GIS communities. OSGeo Taiwan further collaborated with Academia Sinica Computer Center GIS Team, and Chinese Culture University Digital Earth Research Center, to organize a session for Free/Open Source Software for Geoinformatics (FOSS4G) at the 5th Taipei International Digital Earth Symposium (TIDES-07) which is held at Chinese Culture University from May 15 to 18. Moreover, OSGeo Taiwan started to conduct Summer Training courses for Open Source GIS on each Friday during

June 29 to August 3 at Academia Sinica Computer Center.

## A Session for Open Source GIS in TIDES-07

The FOSS4G session in TIDES-07 was conducted on 18th May, during the morning session. There were four talks and a panel discussion in this session. The aims of talks are to deliver introduction of FOSS4G and demonstrate how the FOSS4G works. First of all, Dr. Victor T.S. Horng, general manager of OSS Integral Institute Co., Ltd., gave the attendees a clear and interesting summary for the benefits of using FOSS. Even the advantages of using OSS is obvious, the intellectual property rights issue of the OSS is often doubted in Taiwan GIS communities. Ms. Tung-Mei Ko, project manager of Open Source Software Foundry (OSSF), is familiar with legal topics of FOSS.

In her talk, she delivered an overview of FOSS

characteristics and the FOSS authorization model. Her experience is useful for encouraging the use and development of FOSS4G in Taiwan.

Mr. Hsiung-Ming Liao, initial member of OSGeo Taiwan and project instructor of GIS Term of Computing Centre of Academia Sinica, demonstrated a web-based geospatial application constructed by MapGuide Open Source and Web 2.0 techniques. He considered that the development of the Geo Web cannot lack FOSS4G and that more successful experience of FOSS4G is important to FOSS4G progress in Taiwan. However, the prevailing commercial GIS solutions absorbed the public attention toward alternatives like FOSS4G. There is urgent need to provide more alternatives to deal with geospatial information in Taiwan.

The final speaker in this session is Mr. Dongpo Deng who is coordinating, and also the initial core member of, OSGeo Taiwan. He introduced the OSGeo Foundation, global rapidly forming OSGeo communities, and OSGeo Taiwan, with further explanatory discussion of crucial software aspect of FOSS4G. The talk gave the attendees a roadshow of current geospatial open source software applications, guiding them with the freedom of choices of appropriate tools for their own applications.



Figure 1: Dongpo introduced OSGeo Taiwan and gave a tour of FOSS4G

The final panel discussion focused on *Encourag-*

*ing Development of OSGeo Activities in Taiwan.* Panelists not only shared their experiences of FOSS and FOSS4G, but also provided some suggestions for future development of FOSS4G in Taiwan. Most panelists agreed, Open Data is the first and most urgent task on the list of priorities of OSGeo Taiwan. Enthusiastically discussed by panelists, the OSGeo Taiwan should make concerted efforts to lobby the government releasing the geospatial data and providing useful resources, and co-developing tutorials, technical notes, training courses, workshops and conferences to assist novices of OSGeo & FOSS4G to influence & support local geospatial professional communities. For instance, Taiwan's Ministry of The Interior Information Center promised to start releasing map data to facilitate the learning and exchange among geospatial communities & industry.

## FOSS4G.tw Summer Training

FOSS4G.tw Summer Training is held on each Friday during June 29 to August 3, 2007, at Academia Sinica Computer Center, Taipei. The free courses aim to provide technical and practical introduction for beginners, especially students and research assistants. We hope the attendees will use these tools in their homework or projects, gaining a deeper understanding, and we anticipate them to be seeds for future promotion of FOSS4G. The serial courses cover several heavy-weighted applications such as GRASS, PostgreSQL/PostGIS, MapServer, GeoTool and MapGuide, for example. Every instructor has his/her own rich experiences for FOSS4G, and can apply to local scenarios to best demonstrate the usage of it. The series of courses is sponsored by Institute of Information Science, Academia Sinica and Academia Sinica Computer Center.

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# Nascent UK Local Chapter Update

5th July 2007

*Jo Cook and Leif Isaksen*

After returning from FOSS4G in 2006, several UK attendees felt there was an interest in setting up a

UK local chapter for OSGeo. The following mission statement was derived:

- To provide a forum for discussion and promotion of Open Source Geospatial Software in the

## UK

- To help more UK organisations discover the opportunity of open source geospatial tools
- To support the development of a fully featured UK SDI<sup>42</sup>
- To provide a starting point for people from the UK who are new to the Open Source Geospatial movement
- To raise awareness of the benefits of public access to geodata in the UK
- To work with OGC members in the UK to promote the implementation and development of open standards for geodata exchange
- To, maybe, one day, act as focal point for a UK-hosted and organised FOSS4G conference

To date we have had 13 expressions of interest on the wiki page.<sup>43</sup> This may not seem like a lot of people, but they are from a range of different organisations and disciplines. There has been attendance at a number of functions and conferences, most notably the Open Knowledge Foundation's Open Knowledge 1.0 conference in March 2007. There is some overlap with the OpenStreetmap Project, which is growing in popularity and held it's own conference in Manchester 14-15th July 2007<sup>44</sup>, and discussion between the two groups has been interesting! In the UK there is also a campaign being run by the Guardian newspaper on free access to data of all kinds,<sup>45</sup> and again there is a degree of overlap of interests that will be worth investigating further.

## Activity

Other than gathering expressions of interest, a specialised forum for discussion has not yet been implemented, and interaction is mainly informal, via related discussion groups and mailing lists, along with attendance at geospatial conferences. Individual members are planning attendance at FOSS4G 2007 and have submitted ideas for presentations, awaiting the peer vote in mid July [at least one proposal was accepted].

Individual members have also been involved in a number of initiatives that relate to the specified missions: Oxford Archaeology<sup>46</sup> have begun to release data on the location of their excavations via WMS/WFS, and are working on a number of software ideas such as GIS on a USB stick. They have also begun to arrange training courses for their staff in GRASS and QGIS as part of a programme of evaluating open source geospatial tools within their day to day work.

Overall – more work is needed to build on these promising beginnings and to gain more expressions of interest, along with a specialised forum for discussion. Many of the issues that a local OSGeo chapter would hope to raise are gaining public awareness within the UK, and we should seek to be more involved in this.

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<sup>42</sup>UK SDI: [http://wiki.OSGeo.org/index.php/UK\\_SDI](http://wiki.OSGeo.org/index.php/UK_SDI)

<sup>43</sup>UK Wiki page: [http://wiki.OSGeo.org/index.php/United\\_Kingdom](http://wiki.OSGeo.org/index.php/United_Kingdom)

<sup>44</sup>OpenStreetmap conference: <http://www.stateofthemap.org/>

<sup>45</sup>Free our data campaign: <http://www.freeourdata.org.uk/>

<sup>46</sup>Oxford Archaeology: [thehumanjourney.net](http://thehumanjourney.net)

# Spanish Local Chapter Update

*Jorge Gaspar Sanz Salinas, Lorenzo Becchi, Lluís Vicens, Marc Compte, Pedro-Juan Ferrer*

The Spanish Local Chapter is not yet official but recently started taking its first steps. Actually it is basically identified by its mailing list.

## Introduction

The Spanish Local Chapter started on March 2007 in Girona within the first Spanish FOSS4G<sup>47</sup> Meeting called **I Jornadas SIG Libre**.<sup>48</sup> An unplanned meeting was organized by Luis W. Sevilla (gvSIG development Chief<sup>49</sup>) and Lorenzo Becchi (Ominiverdi.org<sup>50</sup>) and many meeting participants joined the debate.

After this first meeting a mailing list was been created and some activities started as an effort to have a Spanish language community with the main objective to spread the word about FOSS4G and share ideas, technical problems, etc.

The Spanish Chapter is not yet an official organization.

## Activities

### Mailing list

The creation of the list, at the beginning of March 2007, was the first activity of the starting group and will serve as a point of discuss for Spanish speaking FOSS4G users and developers. At this moment the list counts 134 subscribers and we hope, as other activities become better known, the Spanish speaking community will get more involved in the list.

## Spanish GIS Book

The biggest effort has been focused to create a Free GIS Book in Spanish. At this time a **PSC** (Project Steering Committee<sup>51</sup>) has being defined and some important steps have being accomplished. There is an almost stable **table of contents**<sup>52</sup> for the first version of the book, a small group of people<sup>53</sup> contributed, led by Víctor Olaya (SEXTANTE<sup>54</sup>) and some technical facilities provided by OSGeo (a mailing list and SVN repository for the book sources).

The book will be written in LaTeX and the timetable is expected to be followed.

Of course, more authors are always welcomed. If you have some Spanish material that fits some chapter or section of the book, or you think that new contents should be added, please, feel free to join the mailing list.<sup>55</sup>

## OSGeo portal translation

Since May 2007, the main web pages of the OSGeo site were translated into Spanish. This effort from the Spanish Local Chapter tries to bring the Foundation to Spanish speaking people. If you want to help with the translation, improving pages, or translating new ones, contact Jorge Sanz. You can see the progress of the translation at the Portal Translation Status page of the OSGeo wiki.<sup>56</sup>

## II Jornadas de SIG Libre

The GIS & Remote Sensing Service (SIGTE<sup>57</sup>) of the University of Girona, Spain is working to organize and prepare the **II Spanish FOSS4G Meeting** that will be held in **Girona** during **March 3th, 4th and 5th 2008**. The previous meeting<sup>58</sup> was without doubt an unprecedented success, pointing out the high level of participation and also the high level and quality of the communications presented during the event.

<sup>47</sup>FOSS4G in this article refers to the concepts of open source software for geoinformatics, not specifically the annual FOSS4G conference

<sup>48</sup>I Jornadas SIG Libre: <http://www.sigte.udg.es/jornadassiglibre2007>

<sup>49</sup>gvSIG Project: <http://www.gvsig.gva.es>

<sup>50</sup>Ominiverdi group: <http://www.ominiverdi.org>

<sup>51</sup>PSC: [http://wiki.osgeo.org/index.php/Libro\\_SIG\\_PSC\\_candidaturas](http://wiki.osgeo.org/index.php/Libro_SIG_PSC_candidaturas)

<sup>52</sup>Book contents: <http://wiki.osgeo.org/index.php/Contenido>

<sup>53</sup>Book authors: [http://wiki.osgeo.org/index.php/AsignaciUn\\_de\\_capStulos](http://wiki.osgeo.org/index.php/AsignaciUn_de_capStulos)

<sup>54</sup>SEXTANTE GIS project: <http://sextantegis.com/>

<sup>55</sup>Libro SIG list: [http://lists.osgeo.org/mailman/listinfo/libro\\_sig](http://lists.osgeo.org/mailman/listinfo/libro_sig)

<sup>56</sup>Web site translation status: [http://wiki.osgeo.org/index.php/Portal\\_Translation\\_Status](http://wiki.osgeo.org/index.php/Portal_Translation_Status)

<sup>57</sup>GIS & Remote Sensing Service: <http://www.sigte.udg.es>

<sup>58</sup>I Jornadas SIG Libre: <http://www.sigte.udg.es/jornadassiglibre2007>

One of the main purposes of this meetings is to present and show new or existing Open Source GIS software (and its capabilities or improvements). We are also really interested in showing real applications and experiences using any Open Source GIS & Remote Sensing software, 3D visualizations tools, etc. and their degree of presence in the professional world, pointing out advantages and disadvantages.

Moreover, during this II Spanish FOSS4G Meeting<sup>59</sup>, we are trying to emphasize the discussion about free geodata, open standards for open source

software, the role that Public Administration could (or should) play in the adoption of GIS Open Source Software solutions.

Taking advantage of Tyler Mitchell's attendance during the meeting, an official presentation of the OSGeo will be done. In addition, some discussion group sessions regarding to the Spanish Local Chapter are also planned.

We are exploring some ideas and the active participation of the community is the key to keep the wheel moving on.

## Ottawa Local Chapter

*Jeff McKenna, Dave Sampson*

### Background

The Ottawa Local Chapter of OSGeo was formed in July 2006 in Ottawa, Ontario, Canada. The group is a union of two previously existing groups: the Ottawa GRASS Users Group (OGUG) formed in June 2005, and the Ottawa MapServer Users Group (OMSUG) formed in winter 2003. Both groups were already very active in the FOSS4G community, with OGUG continuing development and use of the Public Geodata License in English<sup>60</sup>, and OMSUG hosting the 2004 Open Source GIS Conference in Ottawa<sup>61</sup>. The Ottawa OSGEO Chapter was formed by the combination of those original two groups, but also includes active local users and developers of at least the following OSGeo projects: GDAL/OGR, GRASS, Mapbuilder, MapGuide, and MapServer.

### Mission

The OSGeo Ottawa Chapter exists to provide support for local users of Open Source Geospatial software, and to promote the goals and projects of the Open Source Geospatial Foundation. The Chapter is

focused on the National Capital Region around Ottawa with face to face meetings providing networking, support and educational opportunities to the local members.

### Chapter Co-Chairs

- Dave Sampson, Natural Resources Canada
- Jeff McKenna, DM Solutions Group

### Current Activities

Meeting approximately once a month, the Chapter regularly enjoys presentations and discussions on various FOSS4G subjects, as well as refreshments. Recent presentation topics include the Nunaliit Atlas Framework<sup>62</sup>, as well as GeoServer's functionality<sup>63</sup>.

### Important Links

- Mailing list - [http://lists.osgeo.org/mailman/listinfo/Ottawa\\_users](http://lists.osgeo.org/mailman/listinfo/Ottawa_users)
- Chapter home page - [http://wiki.osgeo.org/index.php/Ottawa\\_Chapter](http://wiki.osgeo.org/index.php/Ottawa_Chapter)

<sup>59</sup>II Jornadas SIG Libre: <http://www.sigte.udg.es/jornadassiglibre/>

<sup>60</sup>Public Geodata License: <http://cemml.carleton.ca:8080/OGUG/pgl>

<sup>61</sup>OMSUG: <http://www.omsug.ca/osgis2004/>

<sup>62</sup>Nunaliit Atlas: <http://nunaliit.org/>

<sup>63</sup>GeoServer: <http://www.geoserver.org/>

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## Developer Announcements

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# So simple to install

deegree releases 2.1 demos as WAR archives

*Dr. Markus Lupp (aka Markus Müller)*

## About deegree

deegree<sup>64</sup> is a Java-based Open Source / Free Software framework for the implementation of Spatial Data Infrastructures (SDI). It contains the services needed for SDI (deegree Web Services) as well as portal components (deegree iGeoPortal), mechanisms for handling security and access control issues (deegree iGeoSecurity) and storage / visualization of 3D geodata (deegree iGeo3D).

deegree is conceptually and interface-wise based on the standards of the Open Geospatial Consortium (OGC) and ISO / TC 211. At the time of writing it is the most comprehensive implementation of those standards in one Open Source framework. The framework is component-based to a high degree, allowing the flexible creation of solutions for a wide variety of use cases.

deegree is the official reference implementation of the OGC for the Web Map Service and Web Coverage Service standards. It is published under the GNU Lesser General Public License.

<sup>64</sup>deegree web site: <http://www.deegree.org>

<sup>65</sup>deegree SVN: <http://deegree.wald.intevation.org/>

## Release management in deegree2

With the 2.1 release a number of changes took place concerning code management in deegree:

- deegree moved from CVS to SVN<sup>65</sup>
- a stable branch was introduced that is used as the base for releases
- a testing process was installed that results in more stable releases
- demos (packages containing a specific, pre-configured component that is part of deegree) are managed in the SVN and are published as WAR-archives.

All these measures aim at a more professional and open development of the project.

## deegree 2.1 rc1 demo releases

On June 11th (in time for deegree day) the 2.1 release candidates for the following demos were published:

- deegree Web Map Service (the designated official Reference Implementation of the OGC for WMS 1.3 and WMS 1.1.1)
- deegree Web Feature Service (WFS 1.1.0)

- deegree Web Coverage Service (the designated official Reference Implementation of the OGC for WCS 1.0)
- deegree iGeoPortal
- deegree Catalogue Service – Web (CS-W 2.0 ISO application profile)
- deegree Web Perspective View Service / Web Terrain Service (WPVS/WTS)

The publication as WAR-archives including pre-configured data sources makes the installation and deployment of the demos very easy. WMS, WFS, WCS and iGeoPortal can be installed **within seconds** assuming that a Servlet Engine like Tomcat is already installed.

For installation of the Catalogue Service, setup of a PostgreSQL/PostGIS is necessary. For the WPVS/WTS an OpenGL-enabled graphics card is necessary.

Great effort was also put into the creation of documentation for these six demo releases.

The demo releases can be accessed online<sup>66</sup> and downloaded from [www.deegree.org](http://www.deegree.org).

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# Open Source GIS: A GRASS GIS Approach, 3rd Edition

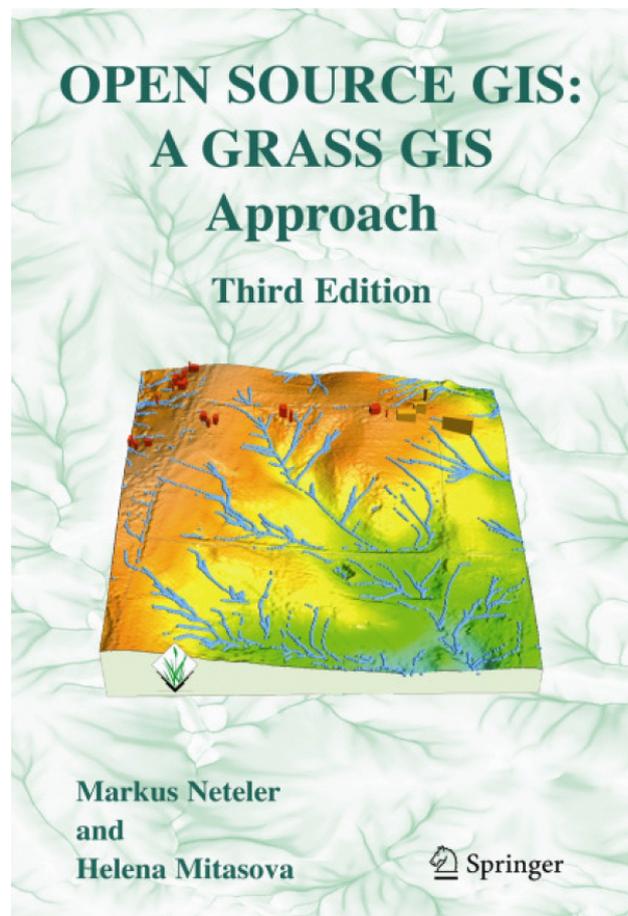
*Markus Neteler, Helena Mitsova*

With this third edition of **Open Source GIS: A GRASS GIS Approach**, we enter the new era of GRASS 6, the first release that includes substantial new code developed by the International GRASS Development Team. The dramatic growth in open source software libraries has made the GRASS 6 development more efficient, and has enhanced GRASS interoperability with a wide range of open source and proprietary geospatial tools.

Thoroughly updated with material related to the GRASS 6, the third edition includes new sections on attribute database management and SQL support, vector networks analysis, lidar data processing and new graphical user interfaces. All chapters were updated with numerous practical examples using the first release of a comprehensive, state-of-the-art geospatial data set.

Open Source GIS: A GRASS GIS Approach (third edition) preserves the continuity of previous editions by maintaining the proven book's structure and continues to target professional audience composed of researchers and practitioners in government and industry as well as graduate students interested in geospatial analysis and modeling.

Written for: Professionals, researchers and practitioners, graduate students. For more information see the [GRASSbook.org](http://GRASSbook.org) website.



<sup>66</sup>Demo releases: <http://demo.deegree.org/>

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