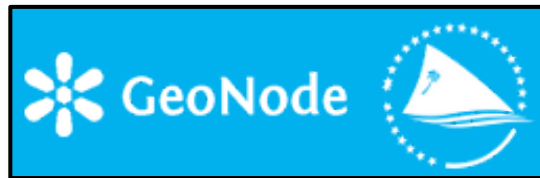


# Geonode Adoption in SOPAC/SPC



**Sachindra Singh**

ICT Systems Developer

Technical Support Services

Applied GeoScience and Technology Division (SOPAC)

Secretariat of the Pacific Community

*Draft*

*Monday, May 2nd, 2011*

## **Synopsis**

When it comes to development initiatives regarding SOPAC division's past and projected geospatial data holdings, SOPAC Technical Support Services (ICT's) primary concern is the continuation of pre existing investments in this arena.

SOPAC ICT developed a Singular GIS Data Repository (SGDR) that brought together the Geonetwork deployment (2007-) and the EDF MapServer Deployment (2005-) under a common data platform, search mechanism and user interface.

The common data platform that SOPAC has adopted, and will have to support for the foreseeable future, is based on Geoserver and PostGIS database. The SGDR currently only caters for search and viewing interactive web maps, there is no way for GIS personnel to upload new datasets or download maps – without creating Mapserver files and scripts. As such the SGDR is not used to store working datasets, and only holds the final output; which ICT has to post-process and upload. This has led to only out-dated or legacy data being available on the SGDR, as ICT doesn't have the resources to load the continuous stream of datasets produced within the various programmes and sections.

The next logical step for ICT is to implement measures that would enable GIS personnel themselves to easily upload their datasets on the SGDR, create and search within maps/layers online. Additionally they should be able to download datasets in a variety of formats, work on it on their desktop tools (e.g.: MapInfo, ArcGIS, Quantum etc.) and upload it again for re-sharing across SOPAC.

To this end, SOPAC ICT has been exploring a suitable solution, which plugs in to our existing SGDR architecture, and provides a SDI (Spatial Data Infrastructure) for the division. The core requirement of web deliverables for the divisions current projects, eg: Pacific Risk Exposure Database, Compendium Project, EEZ (Maritime Boundaries) etc. is highly suited to a SDI-aware platform. An SDI-aware solution will also enable SOPAC ICT to plug-in additional functionalities, such as Risk Modelling outputs, as all data would be hosted on standards-based platforms.

The best solution for SOPAC at this stage, keeping in mind interoperability with our existing SGDR and other project requirements, is Geonode. Geonode is an open-source stack which comprises of the following components and layers, in order:

1. Geonode Client (Django/Python frontend web application)
2. Geonetwork (cataloguing web application for spatially reference resources)
3. Geoserver (server based geospatial data collaboration)
4. PostgreSQL Database (and optionally PostGIS – spatially aware database)

Geonode is not a replacement of SOPAC division's existing stack, but an extension. Neither Geonetwork nor Geoserver/PostGIS will be replaced, the only functionality Geonode will enable is interactive web mapping, searching layers and exporting datasets to Google Earth, PDF's and OGC complaint formats. All metadata cataloguing are projected to continue as normal on the Geonetwork platform.

Components Geonetwork, Geoserver and PostgreSQL/PostGIS are already deployed within SOPAC, in some capacity or other, and plugging Geonode layer on-top of the stack is not only a natural progression path for the division's SGDR, but also critical to enable greater sharing of GIS data outputs within projects, and reducing duplication of GIS work.

### **History of Web Mapping and Online GIS Services in SOPAC Division**

A brief history of online open source geographical systems and services within SOPAC is outlined below to give a better context to the role, vision and requirements of the Geonode web-mapping stack.

#### Internet and Open Source

*1994* – SOPAC adopted cc:Mail and SunOS – the first regional organization to have an electronic communication system in the Pacific region

*1994* – SOPAC was one of the two founding members of PICISOC (Internet Society Charter for Pacific Islands)

1996 - USP [The University of the South Pacific] and SOPAC [known as South Pacific Applied Geosciences Commission, now a division of SPC – Secretariat of the Pacific Community] were the first to connect to the Internet in the South Pacific (initially by dialling and overseas ISP, later by PEACESAT) using SUN Sparc Systems. SOPAC also offered subsidized internet access to government organisations during this period.

2002 – SOPAC adopted open source *tiki-wiki* as a web presence and collaboration platform

2000 – 2004 – SOPAC migrated fully to open source services such email systems, GNU/Linux file shares, BIND, etc.

2006 – SOPAC adopted open source online library systems (Koha) and e-learning platforms (Moodle)

#### Mapserver

2005 – SOPAC deployed and trained users in 14 Pacific Island Countries on UNM Mapserver as part of EU/EDF Pacific Islands Vulnerability project.

#### Geonetwork

2007 - Geonetwork deployed within SOPAC by Ocean and Islands programme . The reasons behind OIP discarding MapServer and adopting Geonetwork as their GIS platform are due to the following factors due inadequate resources and capabilities to (especially for metadata cataloguing in UNM Mapserver. SOPAC's Geonetwork holds the following spatial data, catalogued by country:

- Bathymetry
- South Pacific Sea Level Data
- Marine Minerals
- Scientific Cruises Data
- Maritime Boundaries & Pacific Islands EEZ (Exclusive Economic Zones)
- Satellite Imagery
- Aerial Photographs
- Ocean Measurements

#### Singular GeoSpatial Data Repository

2010 - SOPAC ICT unified and catalogued SOPAC's and member countries diverse spatial data collection under a standardised, secure and user-friendly system, with the goal of having a common platform - that was based on UNM Mapserver and partially on Geoserver/PostGIS. The development initiative brought together Mapserver,

Geonetwork and networked shared folders datasets under a single user-interface and search system.

## **Vision**

SOPAC's ICT envisages that the following project's geospatial data requirements for online visibility/hosting and collaboration to be an ideal fit for Geonode web-mapping stack.

## Compendium Project

The Applied Geoscience and Technology Division (SOPAC) Compendium Project is a digital collection of the entire body of knowledge of SOPAC's work in the Pacific Region from the time of its inception in 1972 to 2010. The Compendium packages together various datasets and information on SOPAC's work for each of its member countries.

The Compendium exercise is two fold in its purpose:

- to inventory, collate, and hand over to island member states a copy of the Commissions holdings of intellectual property belonging to each in the event of transferring the lot to SPC; and
- to provide a basis / benchmark for island member states to monitor and measure the performance of the recent creation of the new Applied Geoscience and Technology Division of SPC

## Exclusive Economic Zone (Pacific Islands Regional Maritime Boundaries)

PIRMB Project, is providing assistance to the pacific island countries to deal with the critical issue of delineation of their maritime boundaries with a focus on:

- Providing maritime boundaries related data and information for its member countries to assist in preparation of claims for delimitation of their EEZ;
- Developing comprehensive data-sets which facilitate definition of the legal and administrative offshore limits for member countries, in accordance with the provisions of UNCLOS;
- Building national capacity within member countries to undertake these assessments;
- Providing advice and assistance to member countries on relevant provisions of UNCLOS;

- Acting as an information and data repository.

Majority of output under this sector had been mainly concerned with the development & definition of territorial sea baselines, maritime zones and outer limits in accordance with the provisions of the UN Convention on the Law of the Sea (UNCLOS).

#### PacRisk (Pacific Risk Exposure Datasets)

Asian Development Bank, in association with the World Bank (as part of the Pacific Catastrophe Risk Assessment and Financing Initiative), are funding TA 6496-REG to develop exposure databases - information on the built environment – for the Pacific.

Such databases will –

- support greater resilience to climate impacts and natural disasters through facilitating decision-making processes on hazard exposure and risk reduction.
- support an assessment of the feasibility of a regional pooled catastrophe insurance and risk analysis scheme.

Risk analysis and loss estimations require the infrastructure and asset data to compute vulnerability to buildings and other infrastructure in a particular region based on the attributes of these assets.

Once vulnerability, fragility and replacement are costs are assigned, an asset inventory becomes an exposure database.

From 2009 to 2010 almost 100 personnel through-out the region were involved in data collection using GPS, Satellite, Surveying technologies in a number of Pacific Island countries. A vast quantity of data was collected in each country such as – buildings, underground pipe networks, road networks, power distribution networks.

SOPAC is currently looking at the prospect of using Risk In a Box - *Risiko* modules for PacRisk project, which is developed by AIFDR (Australia Indonesia Facility for Disaster Reduction)

#### HYCOS Catchment & Rainfall Maps (Catalogue of River Maps)

SOPAC and Pacific HYCOS (Pacific Hydrological Cycle Observation System) are putting together a database which provides a snapshot of the type of rivers that are found within the Pacific, called Catalogue of Rivers in the Pacific. It will look at all countries which have significant rivers and streams within the Pacific including, PNG, Solomons, FSM, Palua, Samoa, Vanuatu, Cook Islands, and Fiji. It will compromise of basic

information characterising the type of rivers, the setting, and the available data records. It will specifically look at case study catchments/rivers which are supported under the Pacific HYCOS project.

These catchment maps would be uploaded to Geonode, and highlight the river and rainfall stations, and are deemed critical maps for location of HYCOS base stations. Some soil and geology maps are pre-existing and are also being presented. One of the requirements is that these maps would be housed on Geonode and then made available to general public with the reference to the documentation on catalogue of rivers in the Pacific.

### Legacy UNM Mapserver Datasets

SOPAC's core work programmes involves the production of a lot of geographical information systems output; and these are mostly some combination of digital maps and geo-referenced datasets. GIS specialists within the work programmes utilize a diverse set of toolsets to create, manage, analyze and display geospatial data on digital maps, which are acquired from diverse sources.

SOPAC adopted MapServer as a GIS platform for SOPAC/EDF8 Islands Information Systems Management Project during 2003 - 2007; and deployed it in-house and across 14 Pacific Island Countries. While MapServer deployment across the Pacific was recognized as having huge potential, at the end of 2009, approximately 8-10 of these deployments are non-functional. A survey done by GIS Sector in SOPAC in late 2009, showed the major reasons for these as: lack or high cost of internet connection, installation problems, defective hardware and departure of trained personnel within the member countries.

Over 2010, SOPAC ICT has attempted to unify and catalogue SOPAC's and member countries diverse spatial data collection under a standardised, secure and user-friendly system, with the goal of having a common platform that was based on UNM Mapserver and partially on Geoserver/PostGIS.

Since uploading new and in-progress datasets onto UNM Mapserver is a very involved and tedious process, Geonode stack is a user-friendly platform which can be utilized by the divisions staff and GIS personnel from member countries to easily upload their datasets over the web.

### Raw Satellite Imagery

SOPAC frequently purchases high-resolution satellite imagery from commercial space imagery vendors such as Digital Globe (EarlyBird, QuickBird, WorldView satellite products) After undergoing image rectifications and stitching, these images are left in a

file share. Geo-referencing the images and cataloguing in Geonode would be ideal so that users don't have to download a lot of large files onto their desktop before deciding if it can be useable in their current task – users would be able to browse imagery online before downloading for use.

## Requirements

1. Conversion of MapInfo files to ESRI Shape on-the-fly using ogr2ogr utility – as a significant percentage of SOPAC's and the Pacific Regions GIS output are in MapInfo file structure.
2. Conversion of ESRI Shape to WGS84 projection (coordinate reference system) on the fly using *proj4* utility: e.g.: *+proj=longlat +ellps=WGS84 +datum=WGS84 +no\_defs*
3. Geo-referencing scanned maps and charts within Geonode (essential for Compendium outputs)
4. Ability add a layer of geo-tagged photos (essential for the Pacific Risk Exposure Database)
5. Extensible and flexible metadata fields and entries – different projects within the division have diverse cataloguing requirements – administrator users should be able to dynamically define text fields (e.g.: roof types, building codes etc.)
6. LDAP integration (mapping of users and roles from ActiveDirectory to django-admin) for in-house security; plus normal Django users for external users
7. PostGIS database backend - using *shp2pgsql* - needed for scalability of large datasets, and ability to execute complex spatial queries
8. Rest interface for maps/data – easier browsing and navigating maps, without search, thumbnail gallery
9. Comments and ratings – for collaboration and peer review of working and finalized datasets
10. DVD/USB packaging (WAR's, Django and SQLite runs offline over portable medium in read-only mode)
11. ~~Remote OGC web services integration – for loading and querying Geonode stack datasets from external web and desktop GIS clients~~

## Action

To counter some of the core issues and fulfil urgent requirements, SOPAC division developed some additional utility applications to enable staff to upload their working datasets easily onto the test Geonode deployment on the local network. These utilities were developed in a completely disconnected manner and Geonode Django client code was not modified in anyway – this ensures that SOPAC division can continue to use the latest version of Geonode client without having to merge custom changes to the core Geonode codebase.

The following prototypes are under active development -

1. Geonode Desktop Toolset - cross-platform Python QT desktop application which enables users i.) to batch convert and load data layers onto a Geonode deployment, ii.) Convert MapInfo files to Shape files, iii.) Export shape files projection/datum to WGS84 using *proj4* library (development stage)
2. Online MapInfo to ESRI Shape batch convertor – users upload a zipped file containing many MapInfo file (\*.map | \*.dat | \*.tab | \*.id) datasets to a web interface, the server converts them to Shape file outputs using *ogr2ogr* library (production stage)
3. Map Gallery/Interface – generates a static html front-page consisting of pre-generated map thumbnails and metadata using *webkit2png.py* and Geonode REST data interfaces (development stage)



## Requirements pending further discussions

### Litea Buikoto, SOPAC:

Comments and Rating

Extensible and flexible metadata fields

Interoperability with risk assessment products

Geo-tagged Photos in maps (for Pacific Risk Exposure Database)

### David Winslow, Geonode:

LDAP integration, with the option to have additional, non-LDAP-based users in the GeoNode site.

Support for generating an "offline" GeoNode containing a read-only copy of all data from the original GeoNode site.

Database backend for the GeoServer configuration, to better handle large numbers of data sets.

Automatic syncing of a WMS (such as MapServer's) with the GeoNetwork catalog withing GeoNode.

Nicer search results, with map/data thumbnail image and cleaner interface.

### Sachindra Singh, SOPAC:

MapInfo Files Upload (conversion on-the-fly using ogr2ogr) – for the time being they are using another page for conversion - <http://dev.sopac.org.fj/ShpConvertor/>

Streamlined upload of Shapfile Secondary Components (eg: shx dbf, prj auto-selected in upload form after shp file is pointed at)

PostGIS Integration (for scalability and db queries from other web/desktop tools)

DVD Packaging (WAR's, Django and SQLite runs offline over DVD in read-only mode, ala PDN DVD) - this is essential for our Compendium Project

LDAP Authentication (mapping of users and roles from ActiveDirectory to django-admin)

OGC Webservices Integration (WMS, WFS, WCS)

REST interface for Search Results (to integrate Geonode search results with other web portals + thumbnail generation for data+map sources)

### Abigail Baca, GFDRR/WB:

Risiko, or Risk in a Box integration