Use of Open Source Geospatial Software within the Remote Sensing Centre, QLD

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The Queensland Department of Environment and Resource Management's (DERM) Remote Sensing Centre (RSC) is a leading agency for remote sensing within Australia. The scope of the RSC operation is considerable, both in the terms of data and projects. The centre undertakes both the processing of raw remotely sensed imagery, as well as manual image interpretation, combined with significant field work to produce a variety of spatial products, All of these activities depend heavily on the core processing systems in place at the centre, which are largely built around open source solutions.

The move to open source software has been gradual and driven by needs that were not being met by propietry software. Initially, processing of spatial data was perfomed on Windows desktops using Erdas Imagine software. There were serious limitations performing batch processing in this environment and, as the the centre's operations grew, a move to a Linux based platform was desired. As Erdas Imagine is not supported on Linux, it was necessary to consider other processing options. With the incorporation of Cygwin, it became possible to develop and run processes regardless of the platform.

The centre has managed to move away from a dependence on proprietary software for the majority of its geoprocessing needs, indeed the centre's batch processing and automated processes are now entirely free of proprietary software. However, occasionally software such as Erdas Imagine and ESRI ArcGIS are still required. For example, the centre still has a major requirement for interactive raster editing for which no adequate open source solution exists and Erdas Imagine is still used.

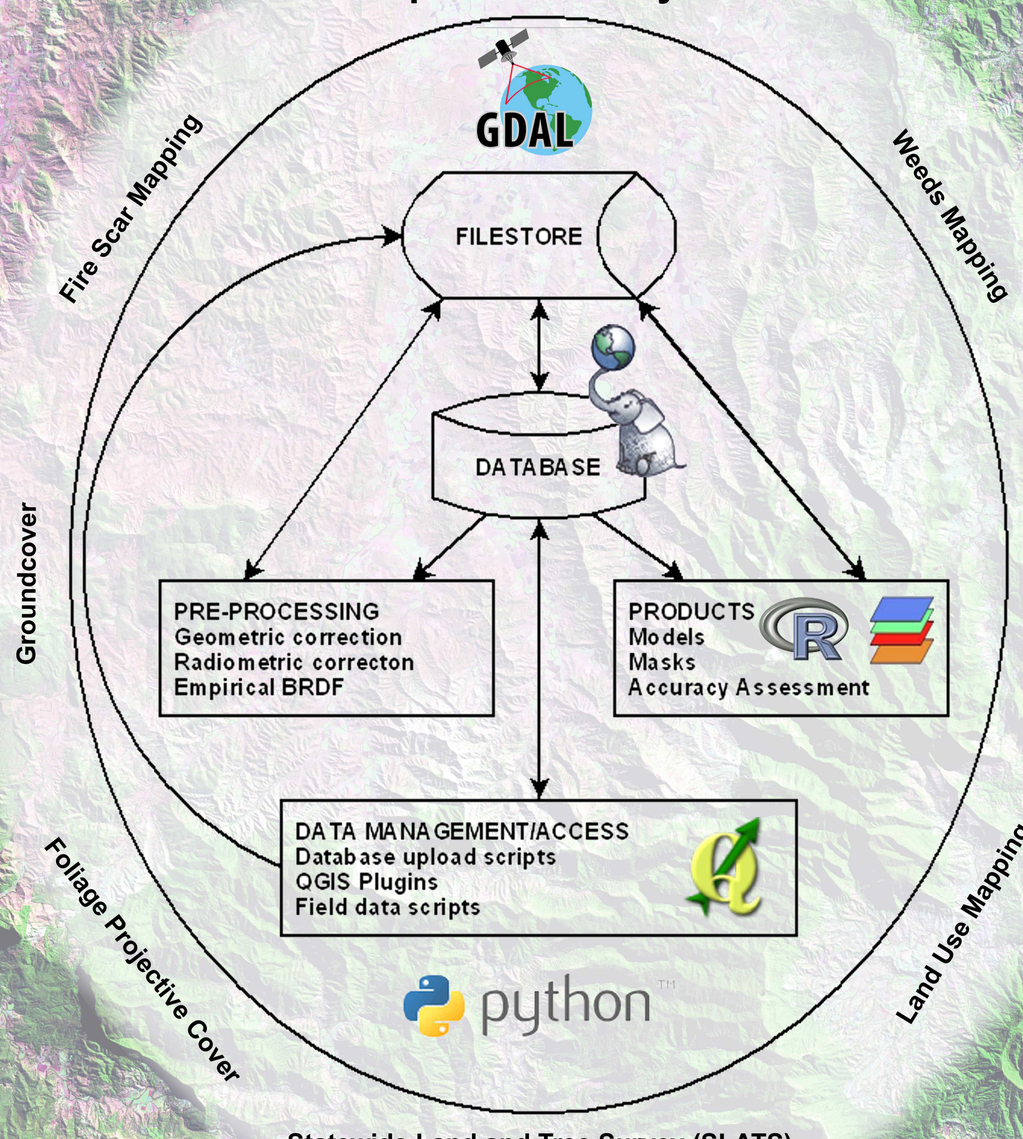
Obtaining approval for the implementation of open source solutions within the centre has been problematic. The culture within the department has historically supported the adoption of large proprietary software, due to the apparent support provided. Open source solutions were perceived by the department to be risky and avoided. However, our actual experience of support from the open source community has been excellent. The open source nature has allowed us to customise applications and develop fixes, some of which have been incorporated into the original software.

• Raw Data
The centre obtains and processes large quantities of data from various sources. For eexample, Landsat satellite data for the entire state of Queensland, consisting of 88 scenes, is obtained at least once annually. This data all requires geometric and radiometric correction. The centre also obtains extensive field data annually, along with various other satellite and remotely sensed data on lesser temporal and spatial scales, such as Quickbird, LiDAR and SPOT.

• PostGIS
PostGIS was selected as the spatial database for the centre. Currently, the database stores references to the centre's extensive archive of satellite imagery; contains thumbnails of satellite imagery and field photography; and records of more than 100,000 field observations. The introduction of the database has revolutionalised access to much of the centre's data, which was previously largely inaccesible.

• Quantum GIS
Quantum GIS (QGIS) is gradually being adopted at the centre for various functions, in particular, as a framework for accessing and retrieving the centre's spatial layers from PostGIS. Various Plugins have been developed by the group to facilitate previewing and downloading satellite imagery, as well as retrieving information from raster data, such as pixel values and raster processing history. QGIS is also gradually being adopted by operational staff for some GIS operations, however, it has still not replaced major proprietary software for most GIS analyses and raster editing processes.

RSC Open Source Systems



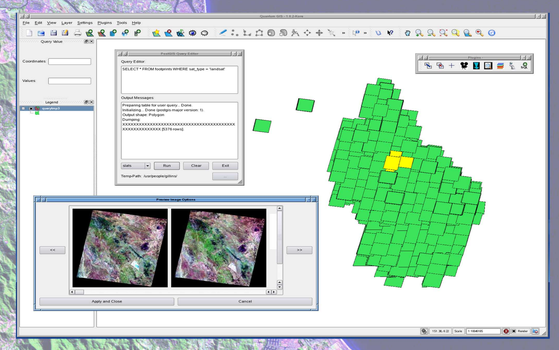


Figure 1. Quantum GIS screen. Displaying a number of plugins, some developed on site, used at the centre.

• GDAL/OGR
GDAL is used as the interface to all raster data formats. It is extensively used in automated processes within the centre, both processing and operational, and is a principle component of one of our most important in-house software solutions, PyModeller. The group is also gradually moving into automating various vector processes using the OGR library. OGR library has recently been used to automate components of various accuracy assessment processes, something that was previously done either manually or using Arc Macro Language (AML).

• Python
Python is the primary scripting language used within the centre. Prior to Python's introduction, a combination of shell utilities and C programs was used for all processing. The benefits of Python are that it extensible and is widely used in the geospatial community, supporting a variety of bindings. Python has the added advantage of being a high level language, easy to learn and, as such, is suitable for use by operational staff with limited programming experience.

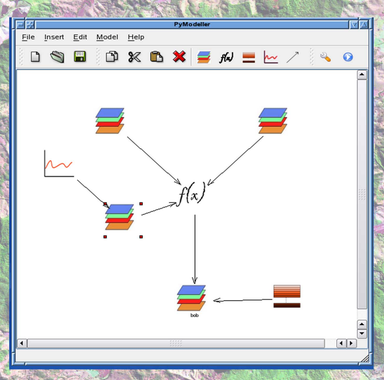


Figure 3. PyModeller screen. Model building screen for Pymodeller illustrating a theoretical model incorporating a number of rasters, a time series and a colour table.

• PyModeller
PyModeller is an in-house software package developed using GDAL and Python as an alternative to Erdas Imagine Modeller. The open source framework on which PyModeller was developed allows it to be easily extended and makes use of the large number of existing Python scientific libraries, such as Numpy.

• R
The centre has a culture of supporting open source software, and the group regularly uses other open source for non-geospatial purposes. Of particular note, the R statistical package is used for much of our statistical analysis and fits well within the open source framework.

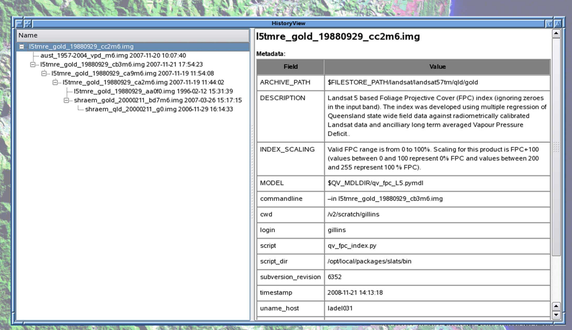


Figure 2. History view screen. History view is a custom script designed using GDAL and python to track and record the processing history of the centre's raster products.

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