OpenSource@DEWA~Europe/GRID-Geneva: An exploration of GIS Open Source tools

Gregory Giuliani[1]

Abstract

DEWA~Europe/GRID-Geneva is currently exploring new tools and methods in GIS technology, as part of its capacity building and IT support activities: Open Source software.

1. Introduction

The last 15 years or so have witnessed great developments in GIS technology and geographical information science. Growing user needs have resulted in a number of high-quality improvements, which are largely responsible for the vast increase in the GIS technologies and a strengthened marketplace.

2. Background

The vast majority of industry solutions are aimed at supporting basic needs of capture, archival and visualization of spatial data. Recent technological advances have concentrated on issues such as user-friendly interfaces, interoperability across data repositories and spatial extensions of database technology. These developments have largely ignored recent advances in GIScience, including research areas such as spatio-temporal data models, spatial statistics, dynamic modeling, neural networks for spatial data, etc.

Moreover, GIS software development is bound to witness substantial change in the upcoming years, induced by technological advances in spatial databases. Current and expected advances in database technology will enable, in the next few years, the complete integration of spatial data types in database management systems. This integration is bound to change completely the development of GIS technology, enabling a transition from the large systems of today (which contain hundreds of

[1] UNEP/DEWA~Europe/GRID-Geneva, Chemin des Anémones 11, CH-1219 Geneva, Switzerland

functions) to a generation of spatial information applications, with smaller systems tailored to specific user needs. Coupled with the data handling capabilities of a new generation of database management systems, rapid application development environments will enable the construction of "vertically-integrated" solutions, directly tailored to the users' needs. Therefore, an important challenge for the GIS community is to find ways of taking advantage of the new generation of spatially-enabled database systems to build "faster, cheaper, smaller" GIS technology.

3. The interest of Open Source technology

One of the possible responses to this challenge would be to establish a co-operative development network, based on open source technology. In a similar approach as the Linux-based solutions, the availability of GIS open source software would allow researchers and technical developers access to a wider range of tools than what is currently offered by the commercial companies. A second important reason for developing open-source spatial analysis tools is the need to resolve the "knowledge gap" in the process of deriving information from images and digital maps. This "knowledge gap" has arisen because our capacity to build sophisticated data collecting instruments (such as remote sensing satellites, digital cameras, and GPS) is not matched by our means of producing information from these data sources. To a significant extent, we still fail to exploit the potential of the spatial data that are collected. For example, there are currently very few techniques for image data mining in satellite imagery archives, and thus we are failing to fully exploit the information available in large earth observation data archives.

4. Technical know-how at DEWA~Europe/GRID-Geneva

To a large extent, our technical development and applications are based on Internet technologies. Open standards (developed by the Open GIS Consortium [1]) and Open Sources software[2] are important building blocks for an emerging generation of analytically powerful, web-delivered spatial information solutions. With open standards, the software components required to develop and deliver geoprocessing applications to the Internet user community are freely available.

The components for constructing Internet-based GIS include a powerful operating system (such as Linux[3]); several web serving technologies (Minnesota MapServer[4], Apache[5], PHP[6]); a web accessible and spatially-enabled database (PostgreSQL[7] with PostGIS[8], MySQL[9]); and geoprocessing tools to support spatial analysis functions such as vector overlay, geocoding and raster modelling (libraries like GDAL[10]).

For the moment, our office has developed two major Internet-based GIS applications:

- The GEO-Data Portal[11] which is the authoritative source for data sets used by UNEP and its partners in the Global Environment Outlook (GEO) report and other integrated environment assessments. Its online database holds more than 400 different variables, as national, subregional, regional and global statistics or as geospatial data sets (maps), covering themes such as Freshwater, Population, Forests, Emissions, Climate, Disasters, Health and GDP. One can display these as on-the-fly maps, graphs or data tables and download the data in different formats.
- The UNDP Country Profile and DRI Analysis tool[12], which is an application made for the Disaster Reduction Unit of UNDP.

5. Conclusion

Open Source is a new and promising way in GIS technology and can "open the door" to a generation of analytically powerful, web-delivered spatial information solutions. DEWA~Europe/GRID-Geneva is at the forefront of this development, capitalizing on its technological expertise and long-standing experience in GIS and IT.

Internet resources

[1]Open GIS Consortium: http:www.opengis.org
[2]FreeGIS: http://www.freegis.org
[3]Linux: http://www.linux.org
[4]Minnesota MapServer: http://mapserver.gis.umn.edu
[5]Apache Web Server: http://www.apache.org
[6]PHP: http://www.php.net
[7]PostgreSQL: http://www.postgresql.org
[8]PostGIS: http://postgis.refractions.net
[9]MySQL: http://www.mysql.com
[10]Open Source GIS: http://opensourcegis.org
[11]GEOData Portal: http://geodata.grid.unep.ch
[12]UNDP Country Profile and DRI Analysis tool: http://gridca.grid.unep.ch/undp