gvSIG: A GIS desktop solution for an open SDI.

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gvSIG started in 2002 when the Regional Ministry of Infrastructure and Transport (CIT) of Valencia started to analyze the process of migrating the whole organization computer system to an open source system. The first phase was to achieve an analysis of different proprietary software applications used in all the organization areas, the main goal of this exhaustive analysis was to find open source projects equivalent to each proprietary application. When studying the GIS applications used in the CIT the conclusion of this analysis was that there was no equivalent in the open source world for these applications, mainly ESRI and Autodesk products, but there were many open source development projects that could be used to develop an open source GIS with big chance of succeeding.

After an extensive user survey regarding the actual needs of the many GIS users at the agency, it was determined that a full GIS was not necessary for 90% of the users. Instead they needed access to spatial data, simple query capability, the ability to overlay and check for consistency, and basic output. Therefore the CIT published a call for tenders to build such as thick client application, with main restrictions being that the software should be open source and available for testing in both Java and C++ versions, and on both Windows and Linux platforms. The winning bid, consisting of a working prototype, has since then been developed into a rather fully-functional GIS client. In the beginning, the development process was a 4-way effort between the government agency funding the project (CIT), the company selected to implement (Iver), a university consultant on interoperability matters (University Jaume I), and the wider open software developer community.

The analysis of the current software used by the technicians at the administrations showed that there was no equivalent in open source for the GIS and CAD software that fulfilled the requirements, the requirements were that it must be an easy-of-use application and, on the other hand, it had to be powerful enough to cover all the GIS users needs.

After this conclusion the following step was to find out exactly which were the user requirements, thus, an exhaustive analysis was made to ask users which tools were they using. This was the beginning, the first task, of what will become the gvSIG project. The final report with the GIS&CAD users needs with the evaluation from users lead to the conclusion that 90% of the users utilized 20% of the functionality from the proprietary software, so that was affordable and possible to develop a software solution in open source to share with the rest of the GIS community. The main characteristics of the project inherited from the migration process had to be:

- Platform independent.
- Modular; it must be developed using independent modules adding scalability value.

- License GNU/GPL as the open source license adopted.
- It must follow the current standards defined by the Open Geospatial Consortium (OGC).

First prototype of gvSIG was released on second of October of 2004, during the development process new stable versions have been released constantly, until the current 1.1.2 version.

gvSIG. GIS desktop application.

Nowadays gvSIG is considered a powerful SDI client. As a GIS application gvSIG is able to work with most of the known data formats, raster and vector formats like shapefile, dxf, dwg, dgn and most of the geospatial databases like postgis, mysql, oracle, sde… It provides the most common GIS tools like data loading, map navigation, query map information like alphanumeric information, distance measurement, thematic cartography, legend edition using the most common legend types, labeling, feature selection by many selection types, data tables with statistics, ordering, table relations, table linking, layout manager, geoprocessing tools, CAD, raster processing, etc. Its SDI client condition permits the connection, through the use of standards, to OGC Services like OGC WMS (Raster and vector data returned as georeferenced map images), OGC WFS (Advanced access to vector data), OGC WCS (Advanced access to raster information), accessing data and being able to overlap it and combine it in gvSIG map views. Discovery service client is also provided within gvSIG which can be use to localize data resources within an SDI. The discovery services implemented in gvSIG are Catalogue Service (it allows user perform searches looking for cartographic resources, user can search by keywords like name, theme, scale…) and Gazetteer Service (it's a service with a list of georeferenced terms, ie, a list in which each toponym has information about its geographic coordinates where it is located).

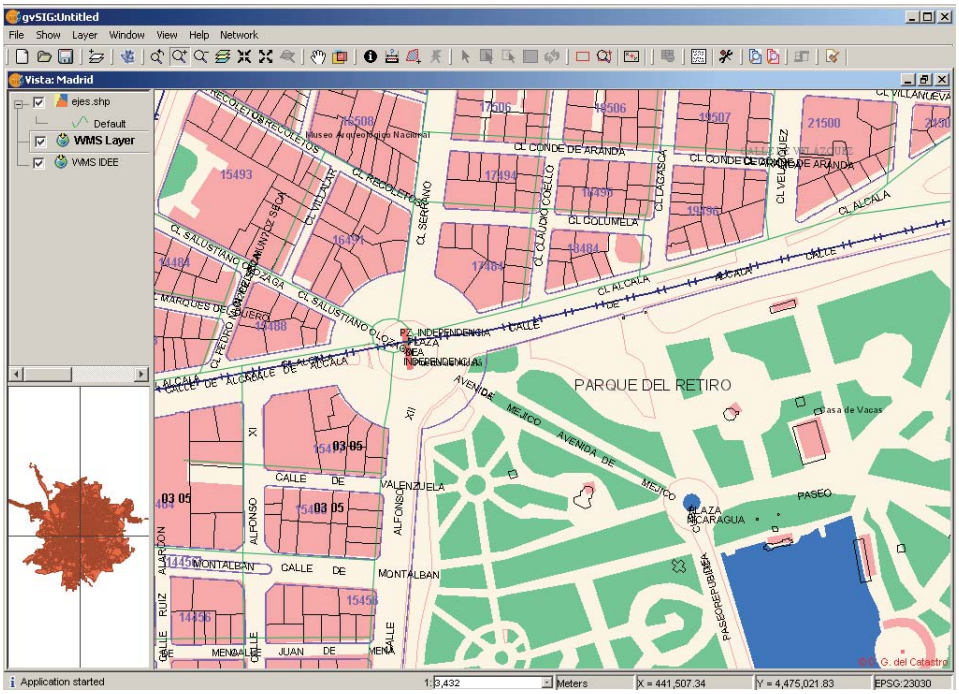

Figure 1 . View overlapping local and remote data from Cadastre WMS and IDEE WMS.

Integrating advanced CAD tools.

CAD application is software for Computer Assisted Design, CAD software is used in many fields: from architectural and industrial design until cartography edition, *Conselleria de Infrastructuras y Transporte* technicians used the CAD proprietary software (AutoCAD and MicroStation) for cartography edition. In this migration to OS, it was decided to integrate such a tools within gvSIG to get rid of the proprietary software and license costs. At this moment started another phase called “Integrating CAD, geoprocessing and topology tools in gvSIG”.

The main goal was not implementing a standalone CAD application but integrate the required CAD tools within gvSIG, these tools let users edit cartography data rigorously. In this way users didn’t need to edit cartography data in CAD programs, create topology and then analyse these data in GIS applications, but with these tools everything was integrate in the same application, all the technologies needed are available in gvSIG. The 1.0 version released of gvSIG incorporated the functionality for vector data edition. Since then users can modify, create and delete elements, users can edit, for instance, a shapefile, a layer from a spatial geodatabase or a CAD-format file. gvSIG provided with tools for inserting elements like points, polygons, lines, ellipses, etc., and tools to modify its rotation, symmetry… Next versions will include frequently used CAD tools like lengthen, cut out…

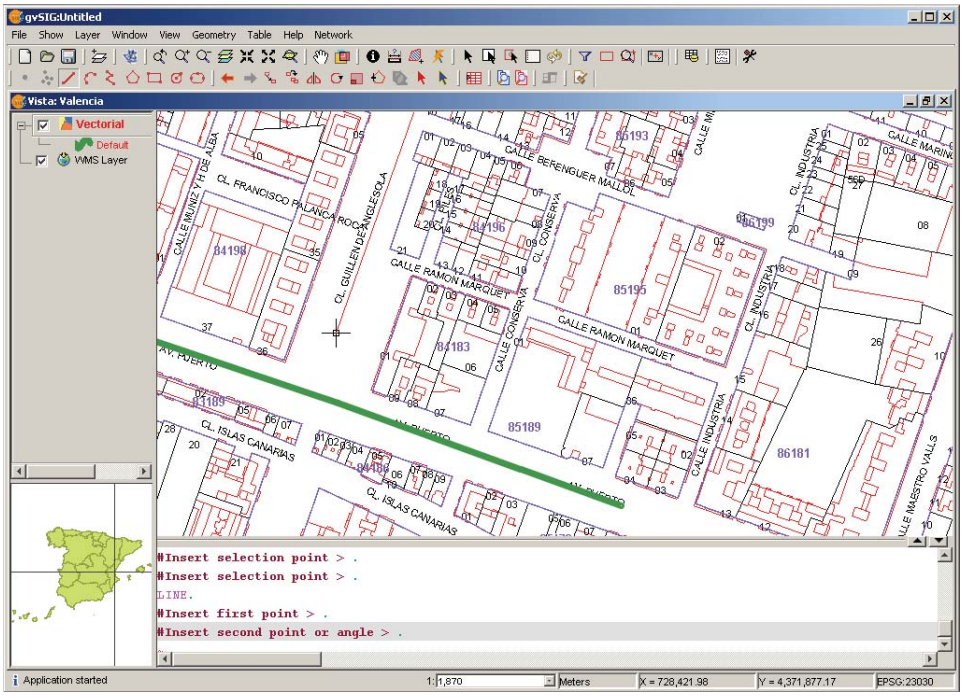

Figure 2. Data editing overlapping WMS Cadastre layer

Integrating advanced Raster tools.

Nowadays gvSIG provides some of the typical tools of raster GIS, with the current version we can add some of the most common formats to work with raster information, georeferencing images, set image transparency, adjust bright and contrast, highlight, etc.

gvSIG is being kept on adding new raster functionality like visualization and visual analysis like histograms, masks, colour tables, image processing, spatial analysis

functions... In the same way gvSIG aimed to integrated both: raster and vector worlds, implementing an advanced module to vectorize and rasterize data.

A parallel project of huge interest is the project being developed by SEXTANTE team, SEXTANTE (Sistema Extremeño de Análisis Territorial) is a project developed by the University of Extremadura and financed by Junta de Extremadura. Initially it was an application over the SAGA SIG core. The intention was migrating all this functionality to gvSIG, this effort was a success, SEXTANTE Extension of gvSIG is already available to download, including functions oriented to morphology and hydrology fields. All the available functions developed are listed in the gvSIG web site documentation.

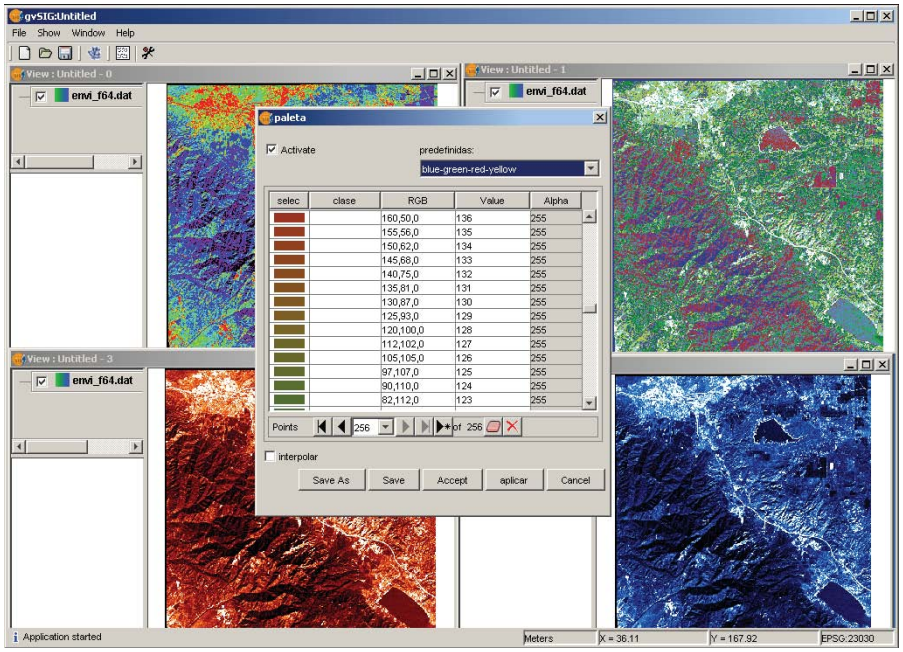

Figure 3. Colour tables applied over an Envi image.

Integrating other advanced tools.

The main goal of gvSIG was covering the requirements of most of the technicians at the Conselleria, this result we can consider to be reached with the current gvSIG version 1.1.2. Furthermore, there were users at the Conselleria, forming that smaller percentage having real needs for more advanced vector tools for their daily work, those tools are currently being developed within the coming advanced modules. Some of this new functionality have been appearing in the last gvSIG versions, where we find functionality like network topology creation, best route calculation, OGC service publishing wizards, etc.

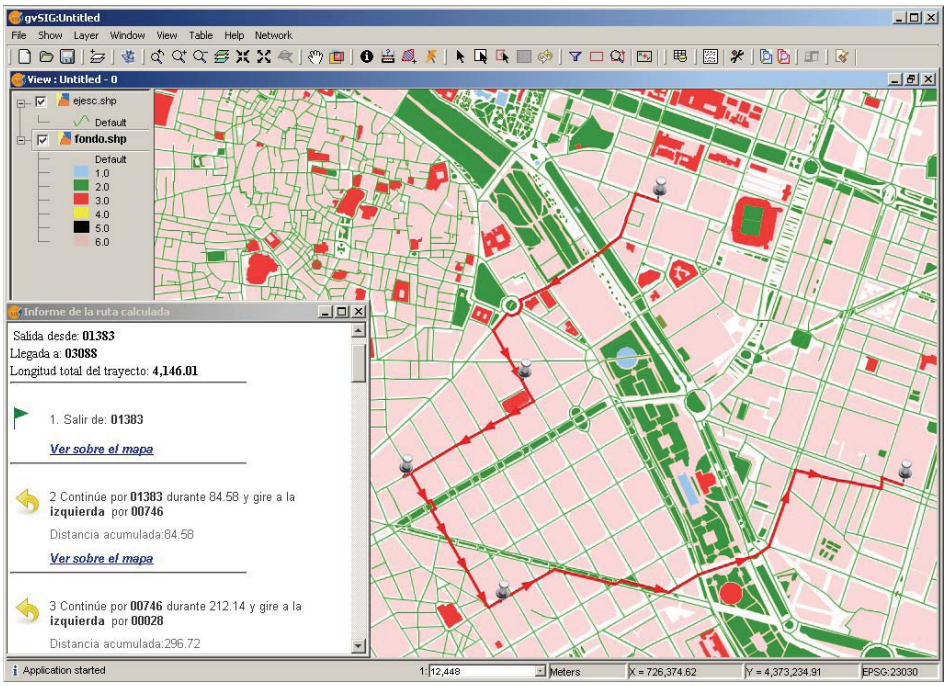

Figure 4. Route calculation with gvSIG

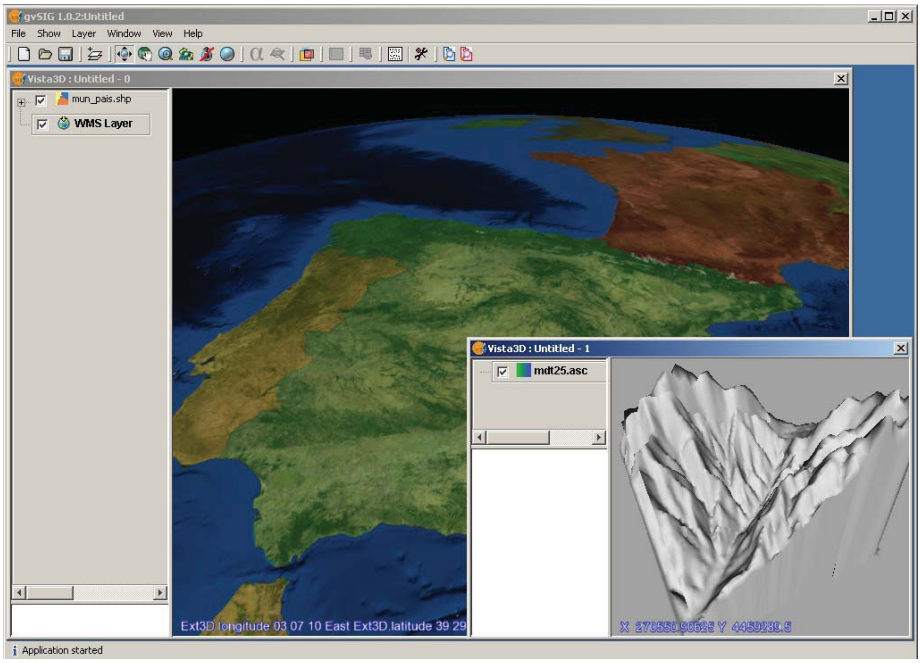

Figure 5. 3D Extension

gvSIG Mobile

In the beginning of 2008, a smaller version of gvSIG was adapted for use in mobile devices. It was gvSIG Mobile. It supports shapefiles, ECW, WMS and images, and is able to make use of GPS systems. Some GPS support tools in gvSIG Mobile are: Connection to internal and external receivers, position and coordinate information, centre automatically, saving Tracklogs and Waypoints and Satellite constellation.

In the current version, only the visualization of layers and the generation of GPS tracklogs/waypoints are supported. There is an extension available for gvSIG Desktop which allows cartographic information to be exported from gvSIG Desktop to gvSIG Mobile.

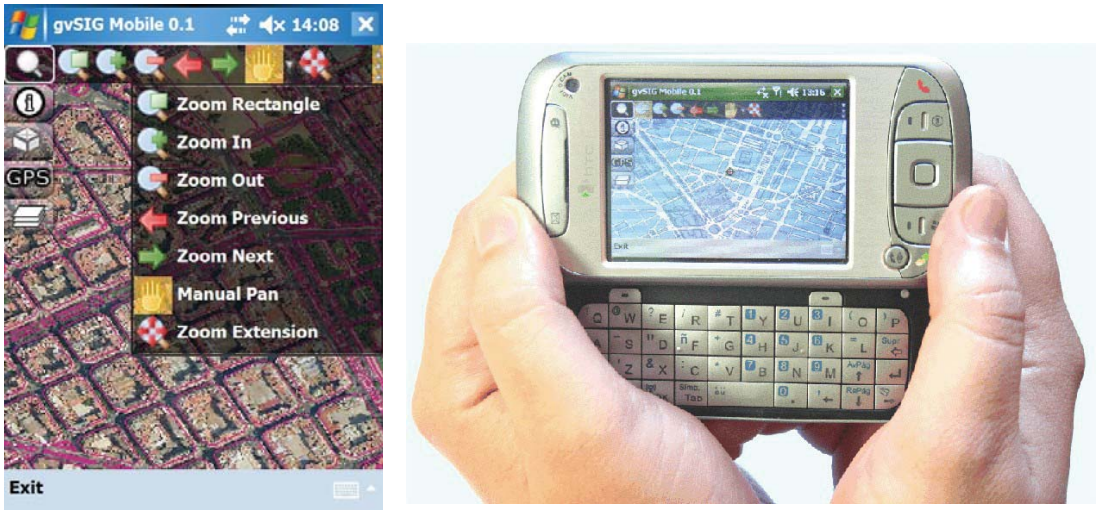

Figure 6. gvSIG Mobile

Future work

gvSIG is an European Commission project, it is a long term R+D+I project with funds to work in the integration of new functionality in the next few years.

Furthermore gvSIG own nature, an Open Source GIS, lets collaborators number grow constantly. If at the beginning the main collaborators were three organizations: CIT, IVER and University Jaume I, nowadays are many the administration organizations and other private companies that are providing support at national and international level. Some of this entities are Instituto Cartográfico Nacional de España, Laboratorio Nacional de Geomática, IRSTV from France, Cartheme in Switzerland, el Instituto Geográfico Agustín Codazzi de Colombia, Join Research Centre from the European Commission,Instituto de Desarrollo Regional de Albacete, Universidad Politécnica de Madrid, Universidad de Alcalá de Henares, Universidad Politécnica de Valencia, Prodevelop, Fujitsu, Andago and Confederación Hidrográfica del Guadalquivir.

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M. Gould, C. Granell, M. A. Esbrí, G. Carrión. *The role of free software thick clients in SDI: Case of gvSIG. 12th EC-GI&GIS,* Innsbruck, Austria, 21-23 June 2006.

gvSIG Project . http://www.gvsig.gva.es/ , https://www.gvsig.org