Geoportal MTOP

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Keywords: geoportal, SDI, Metadata, standards

1. The project

The Ministry of Transport and Public Works, MTOP (Ministerio de Transporte y Obras Públicas) of República Oriental del Uruguay, has been developing the core of geographical information which will be the provider of the MTOP geospatial information to the Uruguayan Spatial Data Infrastructure (IDEuy).

This project has as its firsts objectives to organize, structure and publish all the information inside MTOP who responds to a spatial location in order to bring this information to the entire institution, to all the dependencies, as well as to the entire public.

1.1. Project development

IDEuy has been working since 2008. It had some rebuildings and different directors, but the structure, organization and politics of standards have been the same along the years. IDEuy suggests the use of free software and open data through a law enacted in 2008 (Ley 18381 "Derecho de acceso a la información pública"). IDEuy defines a structure based on cores which provides geographic data from different state institutions.

IDEuy diagram is displayed at Figure 1.

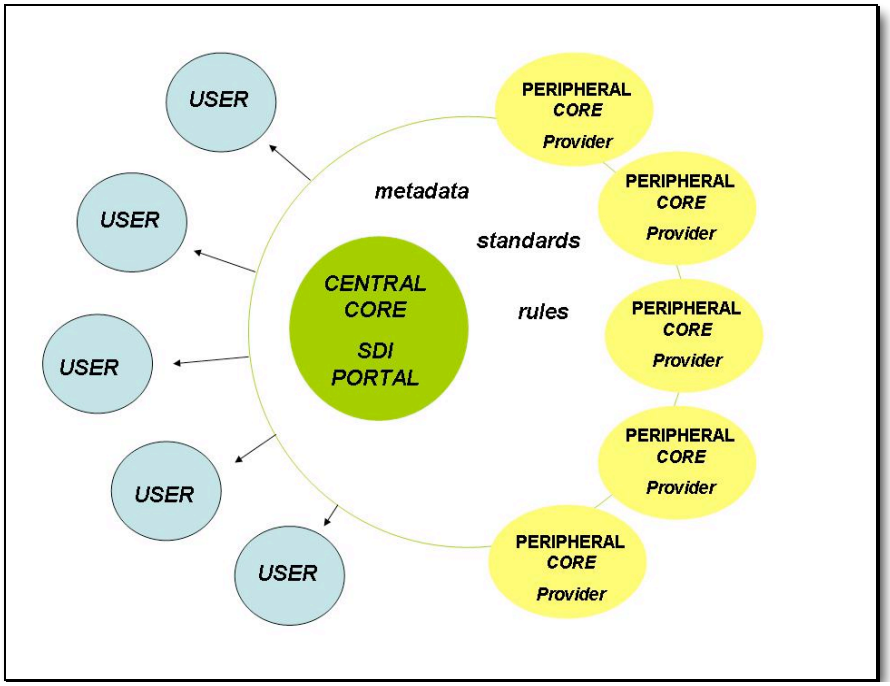

Figure 1. IDEuy diagram

In 2011, School of Engineering through an agreement signed with MTOP, studied the needs in the institution for implement a geographic information website to provide data to IDEuy, MTOP core.

In 2012 MTOP formed a team of professionals and assistants related to geomatics, such as Surveyors Engineers and Computer Engineers, because there was not enough trained staff to focus exclusively in this project.

After that, it has begun the work of writing the guidelines and schedule meetings with the most important actors inside the MTOP. Thanks to these meetings the team started to build the structure and determine the principal components of the information to generate the Feature Catalog for MTOP spatial information, according ISO standards (ISO/TC 211: ISO 19110, ISO 19126). Then, the team begins to develop a technological infrastructure to contain the different elements for the geoportal application, which provides services to access into the data stored in the spatial database. The geoportal has the ability to view, search and access to geospatial data or metadata. This applications are: Website (geoportal.mtop.gub.uy.), map server, metadata server and two maps viewers. Also can access to a lot of geoservices offered from the map server.

1.2. Standards and technologies

Since the beginning of the project, the MTOP uses free software and technologies for development.

To fulfill the functions of the geoportal, a database management system PostgreSQL with PostGIS extension is installed, where the spatial data are stored. The maps are available through GeoServer map server. As map viewer we used Mapbender framework which supports all of the Open Geospatial Consortium (OGC) standards needed. It is a Web-GIS client built with JavaScript, PHP, which offers a configurable user interface not dependent on any particular server maps. Its orientation is a geoportal client OGC services. Currently supports WMS, WFS-T and WMC. It includes a fairly comprehensive user support groups and services OGC (OWS). MapBender provides access to the components of a Spatial Data Infrastructure (SDI) to adhere to international interoperability standards for geographic information services via the Web. It allows to create a lot of applications or widgets without the need or, in some cases, very low programming tasks.

To create, edit and publish geographic metadata it uses GeoNetwork platform, suggested by IDEUy. Also, the standards suggested by the IDEuy and the Uruguayan profile of Metadata, acording ISO 19115, ISO 19139.

2. The data

In the MTOP are 6 National Bureaus. The total staff at 2013 was 3200 according to the annual report of that year. In turn, each Bureau have different assignments which shows a great heterogeneity in MTOP functions.

The collection of information, its standardization and the definition of responsibilities are a long and laborious process. Knowing and understanding the MTOP´s difficulties and needs about generation of spatial data is essential to being able to establish the starting point of the project. So, a series of activities to achieve this goal were performed.

The team begins the project with the Bureau of Surveying (DNTopo) which manage the project development. One of the major challenges is to change the way of work with geographic information. While the different Bureau are used to work with reference to the territory, GIS concepts, spatial database, geographic information layer, etc. are often not easily handled. This provokes many issues, so this project developing has to agree in some aspects to the effect that all users can meet your needs trough the geoportal and the spatial database. This is undoubtedly the major challenge to the project.

DNTopo has also undertaken to meet their specific purposes, doing several high resolution photogrammetric flights, generating altimetric information, basic cartography and orthophotos of some areas of interest.

The MTOP principal function resides in the administration, maintenance and management of the national routes. So, one of the most important actors is Bureau of Roads (DNV). Between 2002 and 2008, DNTopo carried out a survey of all national roads. This allows DNV to use this surveyed geometric data and put together all databases, either spatial as others. This background information is useful to other authorities and staffs working with the roads. For example, the Logistics and Planning Bureau (DINAPLO) has annual surveys of the cargo on the routes, so having organized information is a great contribution.

MTOP Geoportal allows access to the geographic information of Bureaus. This information is about aerial transport (heliport, airport), terrestrial transport (routs), rail transport (train track, train stations), fluvial transport (ports), logistic information, etc. The web site is published in 2014 and we are working on publicizing the Geoportal.

3. Geoportal MTOP components

As described, a geoportal must have some principal components. The website geoportal.mtop.gub.uy has a link for each of these components, displayed at Figure 2.

Figure 2. Geoportal web homepage

In the Figure 2 can be seen the homepage with accesses to the applications. The first,

"Visualizador de Mapas" is a link to a map viewer which contains all the spatial information compiled in the fist stage of this development.

The principal map viewer is displayed in Figure 3.

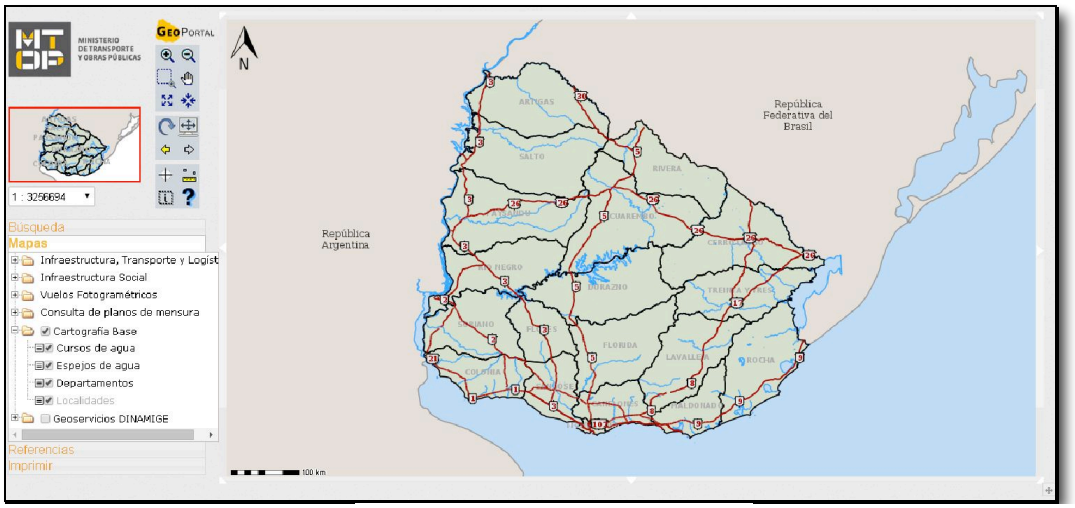

Figure 3.Principal map viewer

Another map viewer is *"Planos de Balnearios"* which shows the information of cadastral maps of seaside resorts on the coast of Canelones, Maldonado and Rocha State departments. In this application you can search the original survey maps by name of seaside resort. This search shows all published maps in high resolution JPG format, facilitating the information access. At Figure 4 is a view of "Planos de Balnearios" Map viewer, and Figure 5 displayed the result of a research in the application.

Figure 4. "Planos de Balnearios" Map viewer

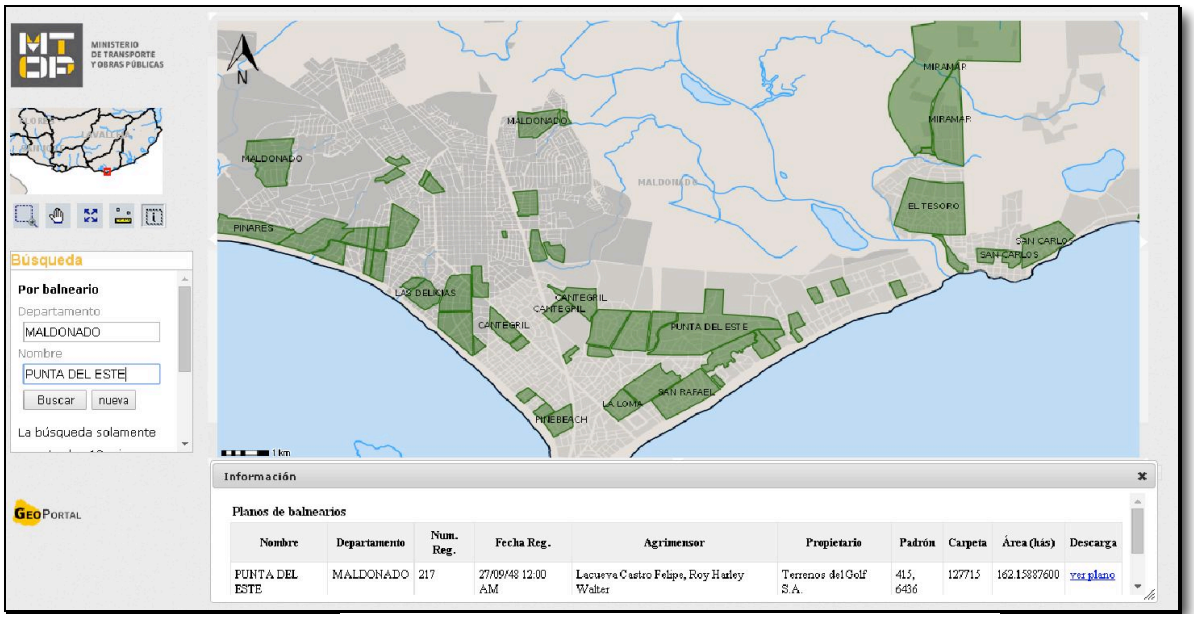

Figure 5. result of a research maps by name of seaside resort

Following this, there is an access to the Metadata Server where the information can be searched, accessed and be distributed thanks to the interoperability of the data provided by the OGC standards utilization. To this service use Geonetwork open source, which is based on the principles of Free and Open Source Software (FOSS) and International and Open Standards for services and protocols (ISO/TC211 and OGC). Its supports a lot of schemas, including the selected for the project, ISO19115/ISO19119/ISO19110 following ISO19139.

Finally, is possible to access some geoservices: WMS (Web Map Services) and WFS (Web Feature Services).

"Geoservicios Web" is displayed in Figure 6.

Figure 6. Geoservices page

4. Conclusion and future work

Is a hard work introduce this kind of knowledge in spatial information into an organization which has a few workers with experience in GIS and not many in Spatial Data Infrastructure. But this project has been well received inside the organization, so we hope this work could continue growing a lot more with a political support.

In this way, the team is working on value added applications, like the incorporation of all the cadastral surveys into a map viewer which allows to search and view the information in JPG format, like the map viewer for seaside resorts.

Another application under development is a geographic searcher for passenger transport in interdepartmental services. It will be using the open data generated by MTOP in Bureau of Transport which contains bus stops, points of interest and timetables. It will be searching between two points and depending on the city, the transport line and the hour, it brings you a timetable and the bus stops or bus combinations to take you to your destination. Today, a similar application is available at the Municipality of Montevideo but only with metropolitan bus-line data.

The spatial information is constantly actualized and new information is generated. MTOP looks for participation of all of the actors involved with the geospatial information.

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