



Twenty-Fifth Annual ESRI International User Conference  
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**GIS at the Brazilian National Agency of  
Petroleum, Natural Gas and Biofuels: a  
New Approach**



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**GIS at the Brazilian National Agency of Petroleum,  
Natural Gas and Biofuels: a New Approach**

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**ABSTRACT**

This paper describes the new approach in GIS planning and implementation processes at the Brazilian National Agency of Petroleum, Natural Gas and Biofuels (ANP). This agency has as its mission to regulate the oil, natural gas and biofuels industry in Brazil. The new solution adopted is based on the ArcGIS integrated family of geospatial information system products running with the support of an ORACLE relational database. These geoprocessing tools link, via a 100 Mb/s fiber optical private connection, the ANP corporate database with a geospatial database (geodatabase) and the Exploration & Production Database (BDEP), providing, at a first moment, web mapping facilities through an Intranet geosciences' portal called SING (acronym of Geosciences Information System in portuguese), which is a portal to the BDEP data and a server-client schema to the ANP upstream sector.

**INTRODUCTION**

The ANP is an autarchy of the Federal Public Administration. Its basic purpose is to promote the regulation and the control of the activities related to the petroleum industry, in agreement with the established in the Law n<sup>o</sup> 9.478, of 06/08/97, also known as "Petroleum Law". To accomplish this attribution satisfactorily, ANP must count on a data processing structure represented in the Figure 1 below.

In this figure it should be noticed two different physical addresses: one at the right representing the ANP main office building ("ANP/UPSTREAM") and one at the left representing the ANP branch where the Exploration and Production Database (whose portuguese acronym is BDEP) is located (ANP/BDEP). Linking those database facilities there is a private fiber optical cable of 100 MBytes per second. Another remarkable fact related to this figure refers to the database technology used: ORACLE. The 8<sup>th</sup> article of the just cited law 9478 includes, among the several attributions of ANP: " to organize and store the data and information relative to the activities of the oil and gas industry in Brazil. . . .".

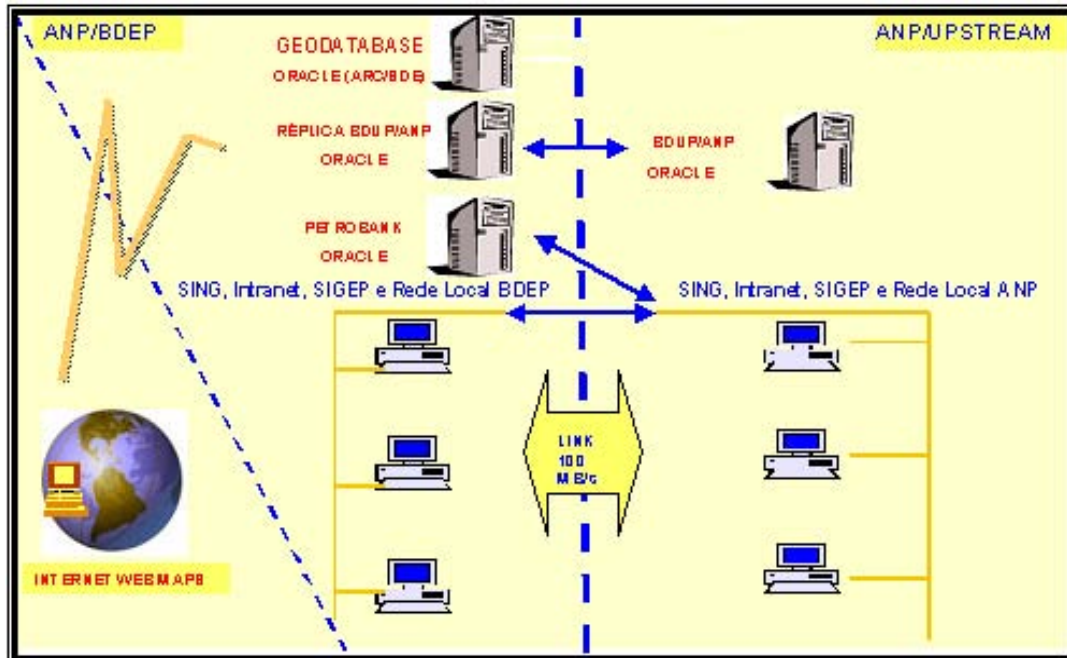


Figure 1: ANP database and geoprocessing structure

### PREVIOUSLY GIS SOLUTION ADOPTED

The solution initially adopted at ANP to fill these attributions was based on geoprocessing tools (Geographic Information Systems - **GIS**). The tool proposed was the Intergraph's GeoMedia GIS family of products. The initial configuration intended to cover one main area, **client-server** installation. The structure of this network was composed of an ORACLE georeferenced database, common to all users, a corporate SQL-SERVER database and by Microsoft Access databases developed and stored by the users themselves.

This installation was accomplished in two phases: i) the server installation which consisted of an "on the job training" for the GeoMedia Professional and the specification of customized procedures for the creation of features from any kind of database and text files. This solution took about three months to set up an initial configuration of the georeferenced database and ii) the client installation which consisted of the GeoMedia installation in each user (total of 11 users), followed by the presentation of a quick overview and a tutorial of the system and the connection of the user to the ORACLE georeferenced database. The user was then encouraged to follow the tutorial by himself, at his own pace (self-learning). This procedure did not take the user out of his professional environment for a course. This second phase took about 4 months.



## **TURNPOINT: BDEP INTERNET WEB MAP IMPLEMENTATION**

The Exploration and Development Database (BDEP) uses PetroBank technology (previously owned by IBM and at this time by Halliburton) to store the raw and processed data concerning to the oil and gas industry in Brazil. BDEP inaugurated in December of 2003 a Web Map Internet site based on ESRI's ArcIMS technology, aiming to present the whole data stored in it.

After this successful application, an internal discussion was held at ANP in terms of the need of standardization of the corporate GIS solution to be adopted. This discussion accomplished the goals stated at the "ANP's Decennial Plan for Geology and Geophysics Studies Applied to the Petroleum and Natural Gas Exploration", document released in 2002:

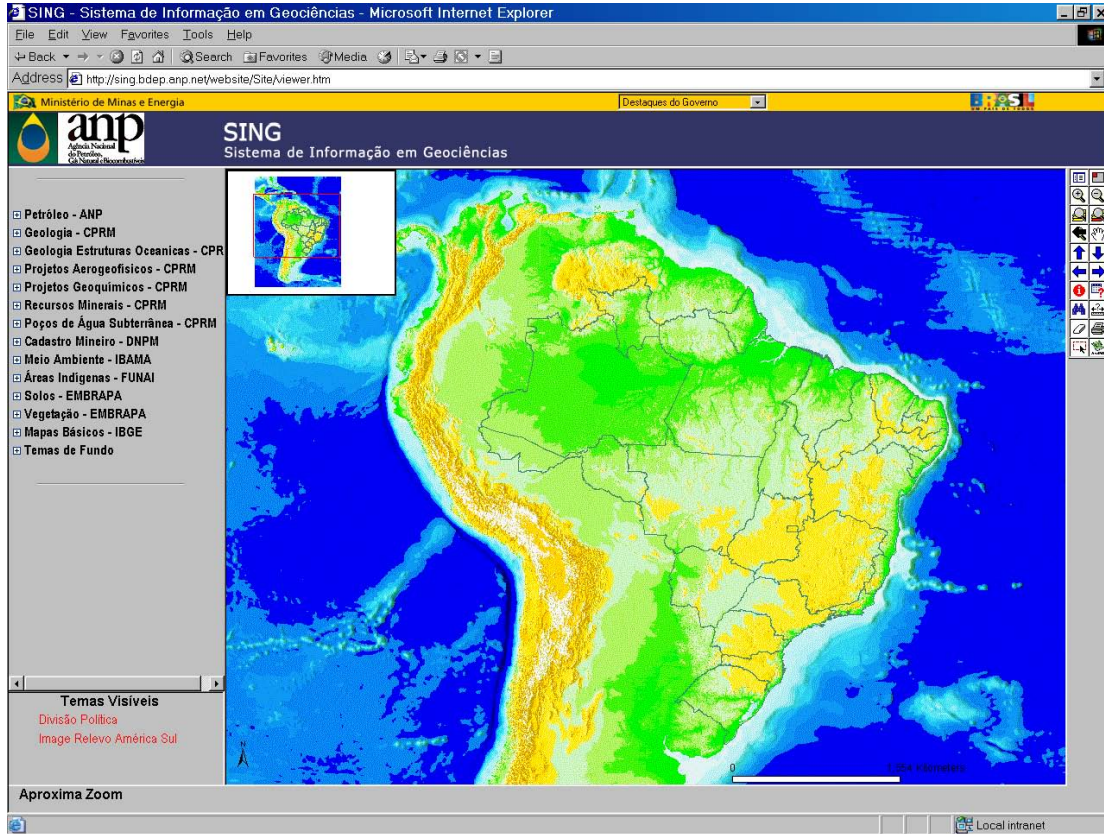
- to increase the geologic know-how;
- to evaluate the brazilian oil and gas basin's potential;
- to reduce the exploratory risk;
- to increase the attractiveness of the new exploratory block concessions;
- to increase the exploratory activity level.

According to these premises, the GIS system chosen is based on the ESRI family of geoprocessing software tools: ArcGIS, ArcSDE and ArcIMS with their respective extensions: Spatial Analyst, Geostatistical Analyst, 3D Analyst, etc...

## **NEW GEOPROCESSING STRUCTURE: INITIAL SETUP**

As explained before, this project emerged from the need of a larger integration among the ANP and BDEP databases through a link of 100 MB/s and in the creation and modelling of a geodatabase (database of georeferenced features) related to the previous databases. These implementation aims to the setup of a dynamic digital atlas, which must reflect the user's necessities.

At a first moment, this dynamic digital atlas is available through an intranet geoscience's portal called SING (acronym of Geoscience Information System in portuguese), which must reflect the integration cited above. The Figure 2 below shows the SING initial page snapshot.



**Figure 2:** intranet SING snapshot

The initial content of the intranet SING site contain vector maps such as:

- a. ANP's petroleum information: exploration and production wells, stick-map of the seismic acquisition navigation, polygons indicating magnetic and gravimetric projects, oil and gas exploratory blocks, under concession and offered in future bids, oil and gas production blocks and sedimentary basins limits;
- b. state and cities political boundaries;
- c. bathymetric lines;
- d. roads and rivers features;
- e. geologic and geophysics information, such as: economic geology, structural geology, tectonic geology, aerogeophysics projects, geochemical samples and underground water wells;
- f. mineral concession information;
- g. environmental (conservation) units;



- h. indigenous demarcation lands;
- i. soil and vegetation features.

The data described above, among letters e. and i., is acquired by other Brazilian governmental institutions, and depends on agreements between ANP and these institutions to be disseminated in the Internet.

The SING also contains raster information, such as:

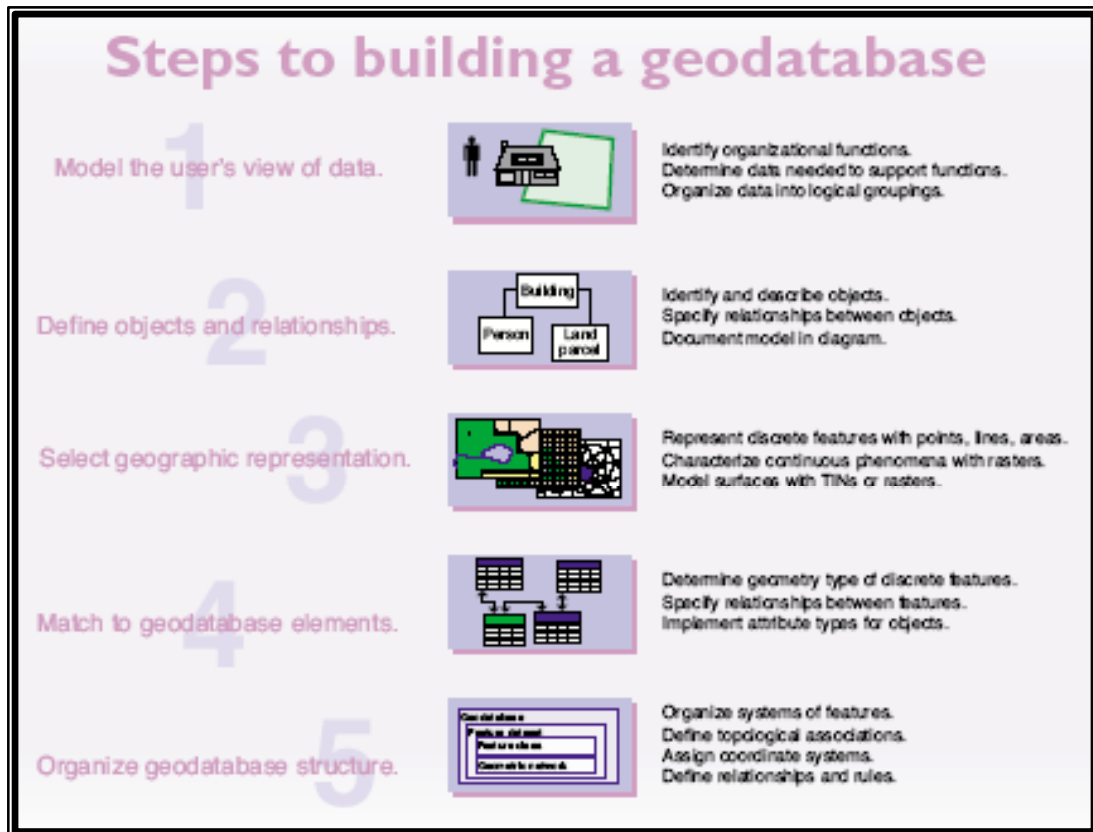
- a. Landsat mosaic images get from NASA site, with pixel resolution of 14.8 meters, covering the whole Brazil's surface;
- b. grey scale SRTM Digital Terrain Model (DTM) get from NASA site, with pixel resolution of 90 meters;
- c. colored South America DTM get from the US Geological Survey, with pixel resolution of 800 meters.

### **NEW GEOPROCESSING STRUCTURE: NEXT STEPS**

The next step will consist of the modelling of the former geodatabase created from the geospatial features found in the GIS environment at ANP. It should be emphasized that this geodatabase, at this moment, is a mere collection of the existing GeoMedia features and shape files features translated to ESRI's ArcSDE ORACLE database. The Figure 3 below shows a typical workflow in building a geodatabase. In ANP case this workflow will be shortened to the fourth and fifth steps indicated in that Figure. Although this is not the traditional design framework normally used, it will accomplish ANP needs at this time.

The Intranet SING portal will also play another important role: as a background to discuss, among the ANP geoscience technicians, the new data that should be added to the geodatabase and to the tabular databases. Experienced users will access directly, via ArcGIS, both the features in the geodatabase and the features organized and put available through the SING portal. It represents a great advance to the jobs performed by ANP technicians.

The last step will be the availability of the SING portal in the Internet, intended to the whole society. This phase will be the highest point to be reached in terms of geoscience's knowledge dissemination.



*Figure 3: geodatabase building workflow*

### TECHNICAL CHALLENGES IN THE SETUP OF THE NEW GEOPROCESSING STRUCTURE

In implementing a new geoprocessing structure, the following points will represent challenges that should be surpassed:

- interoperability of data and systems;
- access, view and share of geospatial data;
- web (intra/internet) geospatial data dissemination: confidence and access speed;
- geospatial data management and integrity;
- geospatial data storage;



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- centralized versus decentralized approach for geospatial data use;
- interconnection with other databases and information technologies systems;
- handle of a great amount of raster data;
- metadata creation and recovering.

### **CONCLUSION**

The objective of this project at this moment is to disseminate the geoprocessing culture in ANP with a corporative view. What is understood as geoprocessing in this initial phase is the recovery, presentation and some simple spatial analysis of georeferenced data. In supporting the users in their native work places, the need for more sophisticated geoprocessing functions will naturally arise. This is the main objective of ANP new geoprocessing project.

The Brazilian government, as a whole, is in the middle of a true technological revolution which is better known by the label *e-government*. The ANP geoprocessing project represents a small, but no less important, part of this changing, adding efforts to other initiatives like internet electronic forms and all the ***any2any*** improvements. Availability of georeferenced geosciences information through an Internet portal can be given as an example.



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