Setting Up a Geocatalogue for the Geographic Institute of Burkina

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SUMMARY

Technological progress in the fields of data collection, data analysis, and the increasing benefits of the use of geospatial data in decision making processes, have contributed to a fast growth of the volume of these data. Meanwhile, the importance of geospatial data, has undoubtedly, generated an increasing number of users mostly inexperienced. All these facts have made the geospatial information to become an empowering element of the economic sector thus forcing every user to be able to research and understand those of his project. In the In this context, the use of standards in the production and the manipulation of data is indisputable, and offers a better management and monitoring. This assertion is supported by the ideology of the Spatial Data Infrastructure (SDI) which promotes the production of metadata to help an adequate management of geospatial data at production, and an advanced and complete understanding by the end users. This aspect of SDI called geocatalogue is a web site that allows visualizing, consulting, and managing geospatial data, through their produced metadata.

In this context, we have setting up a geocatalogue for the Geographic Institute of Burkina (IGB). The developed geocatalogue is constituted of three principal modules:

- Cataloguing for the edition of metadata according to the African metadata profile which is based on ISO 19115. This module is composed of six forms of which, five are used to describe a data, and the sixth is to gather up information to enhance the cataloguing.
- Searching and discovering of geospatial data through metadata consulting. This module is arranged in four types of research referred to as: “search by time interval”, “search by coordinates”, “search by theme” and at last “search on an administrative map”.
- Managing the metadata for a better use of the data of the Institute and, therefore, providing a quality service.
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1. INTRODUCTION

Geographic information is indispensable for decision making in the development projects. Appropriate use of this data requires knowing much about its availability, its location on its quality. The Access to geographic information has become a primary concern for both the user and the producer of spatial data. The number of producers is increasing; the number of users going beyond the simple framework of specialists, the diversity of means of production, the lack of culture of documentation and tools for discovery of data does not facilitate the research of resources. This usually causes the development of redundant data in the production.

The concern of the user is to know where and how to access to appropriate data among the important mass of existing data. A number of questions then arise: How to overcome this difficulty of spatial data accessibility? How should the metadata, tools to facilitate accessibility, be structured? What standards should we adopt? To solve this problem, it is necessary to develop a tool for cataloguing and searching through the metadata.

In this context, the Institut Geographique du Burkina (IGB) works for the generalization of information access for all its clients, through the establishment of the National Spatial Data Infrastructure (SDI), a tool to support widespread and direct access to geographic information. In order to solve the problem of metadata cataloguing and searching, the IGB has initiated the establishment of a tool under the project named: Spatial Data Infrastructure: establishment of a geocatalogue for the IGB. This project is intended as support for the effective setting up of the SDI of Burkina. The principal objectives of this project are:

(1) to give a solution to the paradox of the increase of the data production and the lack of documentation on them;

(2) to propose a methodology for this purpose, since its establishment is pioneer in Burkina;

(3) to develop a tool to ensure the edition, the feeding, the consultation, and the management of metadatabase.

We presents the results of this project in this paper. In the first part, we give some definitions associated with this project and present the proposed methodology. In the second part, we present the developed geocatalogue.
2. PROPOSED METHODOLOGY FOR THE DEVELOPMENT OF THE IGB GECATALOGUE

The establishment of such a platform requires a judicious selection and proper elements entering into its conception. Before presenting the adopted standards, we define first the metadata and the geocatalogue.

2.1 Metadata, Geocatalogue

Metadata is a set of information we may collect and make available to describe a resource. In this context, resource refers to the object described by the metadata, which can be: a set of data, service, document... Thus, information about data can answer the following questions: who, what, where, when, why and how ... Thus, with three levels of decreasing complexity [Operating, Exploration, Discovery], metadata inform about the nature and characteristics of data to which they refer to. They allow: research, selection, better use and intelligent archiving of the data.

The geocatalogue is a website to view, access and manage geospatial data and their metadata. The metadata in an online catalogue, help organizing and harmonizing the structure of catalogue. In addition, they avoid collecting redundant data. Thus, time and effort are saved.

2.2 Proposed methodology

The figure 1 illustrates the overall methodology followed to develop a geocatalogue for the Geographic Institute of the Burkina. In the first, the IGB’s capital (existing data) was studied and the standards for the metadata were chosen according to the African metadata profile. The existing tools for cataloguing were also studied. The analysis of these three components has led to the conception and to the development of the IGB geocatalogue, which allow acquisition, search and managing the metadata. More details are given in the next sections.

2.3 Adopted Standard

For information to flow, it must be understood and used at each stage of the transaction. For this, use of standard is inevitable. In defining the template of the IGB, we have used the profile of African metadata developed by CEA (Commission Economique pour l' Afrique), which in turn is based on ISO 19115 standard.

2.4 Defining the contents of the database

In general, the database contains the required elements of ISO 19115. Thus, it contains: Information on metadata, quality of identifying information of the data, the access procedure and constraints, spatial organization and finally the extension information and suggestions. This module (extension) is more of a range of suggestions than documentation. Indeed, it will allow any user to provide the elements it considers important to describe the data but which
the platform in its design did not anticipate. These elements of extensions will help improve
the platform.

2.5 Simulation of a relationship between a catalogue and a user

The graph below (Figure 2) models the reasoning of a client seeking a given data. It helps to
know the elements of interest of a user.

![Graph showing the relationship between a catalogue and a user](image)

- **Figure 1. Principal steps for the geocatalogue conception**

2.6 Adopted Software

We focused our choice on open source tools that compete more and more against proprietary
software in terms of efficiency and cost. We chose Maplab for administering mapping data,
PostgreSQL as a database management system, NetBeans IDE as development platform and
Apache as a web server.
2.6.1 Maplab
For the administration and delivery of online mapping data, it is used in our case to know the cartographic data in the region of Burkina Faso. It supports vector and raster data and interfaces with most PostgreSQL / PostGIS. It is associated with Mapserver for publishing maps on the web.

2.6.2 Database Management System: DMS
We choose PostgreSQL because it is an open source and freeware, and is almost as powerful as Oracle which is a proprietary product.

2.6.3 Development platform
NetBeans IDE is an Integrated Development Environment. Its platform is a powerful tool for the achievement of java applications, web ... with technologies such as: JSP; HTML. JSP technology enables the development of interactive Web applications. It is part of a 3-tier architecture: a server supporting Java Server Pages can serve as an intermediary (generally referred to as application server) between client browser and a database (usually referred to data server) allowing transparent access to it.
2.6.4 Web server
The three best-known web servers of the market are: Apache, Microsoft and Zeus II. The choice fell on apache not only because of its status as free and open, but also its vast market share and its expanded use.

3. PRESENTATION OF THE GEOCATALOGUE

The developed IGB geocatalogue is composed of three main modules namely: "Cataloguing", "Searching" and "Managing". The cataloguing module allows editing metadata records. The searching module allow to search according to criteria, to retrieve metadata records for consulting. The last module allows management of the metadatabase. The interface modules of the developed geocatalogue are described in the figure 3.

<table>
<thead>
<tr>
<th>Welcome</th>
<th>Cataloguing</th>
<th>Searching</th>
<th>Managing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cataloguing</td>
<td>Connexion</td>
<td>By coordinates</td>
<td>Connexion</td>
</tr>
<tr>
<td>Searching</td>
<td>Inscription</td>
<td>By time interval</td>
<td>Managing</td>
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<tr>
<td>Managing</td>
<td>Choice of data type</td>
<td>On a map</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Forms of cataloguing</td>
<td>By a theme</td>
<td></td>
</tr>
</tbody>
</table>

Figure 3. Architecture of the developed geocatalogue

3.1 Cataloguing Interface

Its access requires an account. If the user doesn’t have an account, he should subscribe in order to have one. The user’s authentication grants access to a page that allows you to specify the category of the data to document. After this step, we have access to various forms of introducing data into the database. The figure 4 shows the categorization mentioned above through the entry forms of metadata.
3.2 Administration Interface

This interface was designed with the tool “phpPgAdmin” which allows the realization of interface to administrate a database developed under "PostgreSQL". The administration interface provides firstly a home page containing links to other modules of the geocatalogue. The figure below (figure 5) shows the administration home page.

However, only an administrator rights can access the menus of proper to administration. Thus, to access, you must enter the details of the administrative account by clicking first on “PostgreSQL” as shown in the figure 6. This click gives access to the authentication page of the administrator. Accessing this page, you can undertake several actions on the tables of the database based on the administrator privileges.

Figure 4. Organization of the edition platform

Figure 5. Home page interface for database administration
3.3 Search by time interval

User can search metadata based on a time interval corresponding to a period of updated data. Through this research, he can consult all the metadata records that meet these criteria of timeliness. If the search is unsuccessful, he may opt for older data or newer with the constraint of cost. The figure 7 shows the search interface by time interval. In this research, we can specify a theme, a keyword and an area as criteria.

3.4 Search by coordinates

This search form allows, knowing the site localization, the theme and a keyword of up to track, to verify if the data meets these criteria exist and whether they include or are included in the site localization.

This search form allows, knowing the extent of site, a theme and a keyword of the data to search, verify if the data meets these criteria exist and whether they include or are included in the extent. The extent of site is specified by introducing the max and the min geographic coordinates of the site (Figure 8).
3.5 Search by theme

This form allows previewing data by specifying a theme of data existing in the IGB (Figure 9). Once the theme is specified, a list of available data is presented. The corresponding metadata can be consulted just by cliquing on the data name.

Clicking on a topic, there is a preview of data the theme, with a field for entering the name of the data to extract metadata. The figure below presents a sample (figure 10).

3.6 Search on map

This search allows to know all available data within an administrative unit of Burkina, particularly in the departments. Thus, through a map library with navigation tools (zooming, selection …), we can select an administrative entity on a global map of Burkina or on maps of its different regions. When we select a department with the information button, a report of all the available data in the department is displayed at once. If the user is interested by one data, he should copy its name and paste it in the "data name" field and search the metadata by clicking on the button "Metadata". The figure 11 shows the interface for the search on map.
4. CONCLUSION

Research, analyze, use, save and reuse of geospatial data is not always an easy task. Given this, the idea of creating a platform for capturing and managing metadata is imperative for the discovery of spatial data of the Geographic Institute of Burkina. This initiative supports the
ideology of the National Infrastructure spatial data by using the profile of African metadata. By offering users the geocatalogue, we have contributed to better meet the information needs, and those of an intelligent archiving.

This project contributes to shown the benefits of the principles of documentation in the production and monitoring data from the Geographic Institute of Burkina. We have also benefited from the principles and language of programming. Indeed, through these choices, we could provide greater stability to the input module.

We expect the effective use of the developed geocatalogue by the interne and extern IGB’s users in order to see the real contribution of this project. The dissemination of metadata on the Internet will create new opportunities both in terms of reduced search costs and in terms of new market potential for greater accessibility and understanding of geographic information.

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