THE GEOPORTAL IN LOCAL ADMINISTRATION

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ABSTRACT

Geographic information is essential in local administration. Therefore, those administrations that wish to offer a better service to their citizens will need a Geographical Information System (GIS) that centralizes and it manages all this information.

Spatial Data Infrastructures (SDI) are changing the concept of how spatial data bases are structured. The recent development of standards on metadata and communication protocols, allows the access to different remote geographic sources. The union of local administration data with GIS from other organisms would provide great benefits.

This way, the concept of geoportal appears as an application in Internet that allows making queries, to obtain geographic information of any type, to access the metadata, etc. In this paper the application of geoportals on local administration and the main services that it would offer to the citizen are reviewed.

1. INTRODUCTION

The modernization of the local authorities in Spain is a current necessity. This is specially important in the local entities of smaller size that in turn occupy most of the surface of the nation (86% of the municipalities have less than 5000 inhabitants and they occupy 71% of the area, in spite of representing the 15% of the population, Table 1).

In this sense diverse initiatives appear from the national authorities to promote the Society of the Information, as the project PISTA (Ministry of Industry, Tourism and Trade). This project seeks to give to small Local Entities the necessary infrastructure to facilitate its presence their in the Net.

On the other hand, 80% of the information that is managed at every governmental level, can be georeferenced: “everything and everyone is someplace” [1,5]. Therefore, having Systems of Information that allow to keep in mind the geographical position of the events that happen in the real world, should facilitate their analysis and treatment. In this sense Geographical Information Systems (GIS) appear as the tool to use.

Traditionally these systems have been used in an independent way by each organization, even at internal level [6]. This way, it’s possible to find city councils where the same information is manipulated independently by different departments without contact between them, causing duplicity and errors in its administration.

In this context, distributed geographical information systems appear as a series of specifications for the administration of heterogeneous geographical databases, which are integrated by standardized communication protocols. This Spatial Data Infrastructures (SDI) provide new perspectives in cartography as well as Geographical Information Systems
(GIS), they allow to have in an integrated way geographic information from different locations, as well as mechanisms for their discovery and use.

<table>
<thead>
<tr>
<th>Inhabitants</th>
<th>Municipalities %</th>
<th>Population %</th>
<th>Area %</th>
</tr>
</thead>
<tbody>
<tr>
<td>More than 50000</td>
<td>1.44 100.00</td>
<td>50.63 100.00</td>
<td>4.72 100.00</td>
</tr>
<tr>
<td>20000-50000</td>
<td>2.39 98.56</td>
<td>14.30 49.37</td>
<td>6.10 95.28</td>
</tr>
<tr>
<td>5000-20000</td>
<td>10.23 96.17</td>
<td>20.01 35.07</td>
<td>18.19 89.18</td>
</tr>
<tr>
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<td>12.20 85.94</td>
<td>7.72 15.06</td>
<td>17.80 70.99</td>
</tr>
<tr>
<td>500-2000</td>
<td>25.63 73.74</td>
<td>5.44 7.34</td>
<td>27.43 53.19</td>
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<tr>
<td>Less than 500</td>
<td>46.40 48.11</td>
<td>1.90 1.90</td>
<td>25.45 25.76</td>
</tr>
<tr>
<td>Without</td>
<td>1.71 1.71</td>
<td>0.00 0.00</td>
<td>0.31 0.31</td>
</tr>
</tbody>
</table>

Table 1: Population and municipalities at Spain (2001). National Institute of Statistics

This way, geoportals appear as web tools that allow the access to these distributed databases in an easy way for the user. They are specially interesting at Local Administrations because they permit the citizen to know an amount of information about his town in an quick and easy way (not only that information managed by his city council) and they would let doing some formalities, as it’s pursued by PISTA project, but from geographical point of view.

In this paper general SDI characteristics are covered, as well as geoportal concept. At last, some services that geoportals could give are reviewed.

2. SPATIAL DATA INFRASTRUCTURES

2.1. The concept

A Spatial Data Infrastructure (SDI) is a set of technologies, policies and agreements destined to facilitate the availability and the access to the spatial information [8].

That is to say, a SDI doesn’t substitute Geographical Information Systems, it’s to establish some communication protocols which allow to “communicate” different systems to share information. This simple concept has really deep implications. In the first place it invites to promote the free exchange of information, instead of being inscribed in an organization. Also, it permits that the information is stored in that place where can be upgraded. In other words, the administrators of this information take charge of maintaining it up-to-date and well documented, and the rest of agents are “consumers” of this information. This is only possible with the existence of two fundamental elements: a service of discovery of information and a metadata catalogue for each repository.

The first one is known as gazetteer, it is a engine to search information that should go through the metadata to return those groups that are agree with the selection. The metadata, therefore, is the way for the localization of the information and thus, their correct definition is essential. In this sense, different organisms as International Organization for Standardization (ISO) or Federal Geographic Data Committee (FGDC) at USA, have proposed the items that must be specified to document the geographical information. In addition, these specifications are being adapted to the reality of each country, arising this way in Spain the Spanish Core of Metadata (NEM).

In 1994, derived from a work group on GRASS software, the OpenGis Project was formed. At this time it’s known as Open Geospatial Consortium (OGC) and it’s an international partnership of agents that pursue the development of standards in the world of GIS [9]. Governmental institutions, software corporations, universities, organisms, technological laboratories and so on participate at OGC. It has developed different protocols and communication languages with different intentions. The most significant are:

- **WMS “Web Map Server”**. This protocol allows getting from a server, a raster image from some layers, as well as alphanumeric information associated to them. This it is a service implemented already in many webs and it’s specially oriented to simple solutions. Its main disadvantage is in the transmission of vectorial information, since when becoming to a raster image, all possibility of manipulation is lost.
• **GML “Geography Markup Language”**. This language specification is derived from the eXtensible Markup Language (XML), oriented to represent spatial elements such as points, lines and polygons. By means of this specification, it is possible the publication of vectorial objects and its interchange.

• **WFS “Web Feature Server”**. Using GML, this service allows to receive vectorial information of the requested layers. It is possible to edit the graphical remote shared information using transactions, in the same way it’s habitual in the world of the alphanumeric data bases.

• **WCS “Web Coverage Server”**. This service allows to accede to continuous information (raster) but maintaining all its characteristics and resolution. That is to say, instead of obtaining an image of a series of layers (WMS), the information in all its dimensions is obtained. It is oriented for example to the service of multispectral images, where the geometric, spectral and radiometric resolutions are essential for their correct treatment.

• **CAT “Catalog Interface”**. This protocol specifies the way catalogues of metadata have to be queried. Therefore, it is possible to integrate in an only network different “services” of geographic information. Thus, for example, a possible user could consult a service of aerial images (provided by a national organization like the Spanish National Geographic Institute, and he could overlay on it with the information of city-planning programmed by his city council, and finally, he could look for a catalogue to find some cartography on flood risks for his zone of work.

### 2.2. Levels of application of a SDI

The Spatial Data Infrastructures have been classified vertically, from the local scope, to the global one [8]. That is to say, an SDI formed by city councils of a province and an SDI formed by the different states from the European Union are not in the same level.

This vertical and horizontal organization allows to order the different initiatives and to locate them properly. Thus, the query from a national SDI about local data will be propagated by the different SDIs from any province and towards the catalogue services of the different municipalities. If this search is inscribed in a certain spatial criterion, this consultation will only include the SDI affected by this criterion.

On the other hand, this pyramidal vision, allows to structure the information based on its degree of precision [8]. Thus, a query to a national SDI will not be able to return information with the same precision than a municipal SDI. It will be decision of the administrators, to choose the level of detail of the information that they wish to query.

In this sense, the efforts in cartography and more concretely the automated generalization of spatial information, will allow in a future to have an only database with the maximum degree of precision, which will be generalized at the level of detail required by the scope of each SDI.

### 2.3. SDI opportunities at Local Administration

Cartographic competences in Spain are distributed at the different administrations by their field of action and their scale. This way, central government is in charge of creation of the official cartography at scales smaller than 1:25000, covering all the territory. Each region (a group of provinces) has competences for the accomplishment of cartography on greater scales than 1:25000, in general being centred in the 1:10000 and certain cases the 1:5000. The city councils, at last, are in charge of creating the cartography that they could need for their own management, usually using the scales used by the Cadastre: 1:5000 at countryside and 1:1000 or 1:500 at urban cartography.

On the other hand, in addition to the “official” cartographic series, which serve as cartographic document base, some institutions make thematic series with diverse purposes: geologic maps, uses of the land, environmental risks, etc.

All this information, properly stored and structured as a National Spatial Data Infrastructure could be widely exploited at local administrations at their daily work. For example, the Virtual Office of the Cadastre is a successful web service used by many local administrations (Figure 1).

Equally, the integration of Local Administrations at SDI’s would allow a better knowledge of the land by the
combination of information from different municipalities under the same environment. It is especially interesting at urban planning at regional or provincial scope.

Figure 1: The Virtual Office of the Spanish Cadastre

3. GEOPORTALS

In Internet, a portal is a web site that allows accessing to diverse contents such as news, services, search engines, hyperlinks to other web sites with the same thematic and so on. A geoportal is a web portal specially oriented to access to geographic information [6].

This way, the main objective of a geoportal will be the discovery of information. To achieve this, it is necessary to implement a search engine to the metadata of available information, using thematic (by attributes), spatial and temporal criteria. A geoportal can be understood as a way to access a SDI. That is to say, through a unique web tool, it is possible to access to the distributed geographic information.

On the other hand, geoportals that offer accessing to catalogues and others that offer some services such as route planning, proximity or other spatial analysis' are distinguished [4]. The first ones allow the interactive visualization of different layers offered by the SDI, as well as they allow querying some alphanumeric information related with these layers. The last ones are a next generation from the catalogue geoportals and are focused on resolve more specific necessities taking advantage from the GIS functionalities in a remote way.

The best property of these tools is the simplicity of their interface, since they are handled from a simple web navigator. Any user, without communications, cartography or data base knowledge is able to see in a few mouse clicks some geographic layers spread over different servers and to obtain the information that he needs. This characteristic makes geoportals very suitable to publish geographic information to the citizens in general, without avoiding that more technical users can work with other “heavy clients” to query and search the SDI.

In Spain, one of the best supplied geoportals is the correspondent with the SDI from Catalonia (IDEC). This portal takes information from the Catalanian SDI (reference cartography, orthophotographies, environmental and city-planning cartography and so on), as well as cartography supplied by the Spanish SDI from the National Geographic Institute (IGN). Figure 2 is a screenshot from the map server of the IDEC. Roads are provided by the IGN, with the localization of fire stations and police stations, above regional and municipalities limits.
4. GEOPISTA PROJECT

From the Spanish National Federation of Municipalities and Provinces (FEMP), through the Industry, Tourism and Trade Ministry, is promoted the GEOPISTA project [10]. It tries to develop a Territorial Information System to small and medium city councils using Open Source tools. At this initiative take part some ministries of central government, organisms such as Main Office of Cadastre, IGN and city councils.

In the first place, it tries to develop a data model that covers the different activities from a city council, as well as the storage of its cartography under a GIS. Once defined, it's implemented on different Database Management Systems like Oracle, SQL Server or Postgres, giving special cover to this last, because it is free software. In addition, different applications to query and manage different tables of the database have been created. These tools work about various tasks of the city council such as city wealth, urban facilities or urban planning, as well as importing tools from CAD formats. Finally, GEOPISTA uses an OpenSource map server to publish cartography in Internet [3,7].

This initiative tries to establish a set of technologies for the entrance of the GIS and the space databases in the smallest city councils with fewer resources. It is completely based on OpenSource solutions and it establishes the appropriate tools for the development of new functionalities that increase the benefits of the system. This last one is especially interesting, because it presents a frame on which to contribute from academia to enterprises, since it will have all the technology well documented and prepared for its customization.

5. WEB SERVICES AT LOCAL ADMINISTRATIONS

It is usual to find city councils that offer information services at their web pages. World Wide Web is a very effective medium to transmit information to their citizens. Furthermore, web pages offer more interactivity than traditional publications through opinion forums, news alerts, etc. This way, local government could "be more near" from the citizen, giving an image in its management of transparency and effectiveness [2]. One example: the Monorail Project in the city of Seattle (USA), where a web site is created specifically for this urban project, it is aimed to ask for the opinion of the citizens, to propose railway new line, or to show agreement of them with the existing services (Figure 3). These types of initiatives are in favour of a city council that listens to its citizens in the decision making.
Another interesting example is the City Council of Barcelona (Spain), which implements through its web portal a service of attention to the citizen, by means of forms delimits the nature of the claim, to be able to send it to the appropriate department.

The web could be used as a medium of transmission of news, economic results, cultural events and so on. However, it is possible to increase of the services offered with other like management of administrative tasks, diligence of documents for some procedures, updating the information from council databases, visualization of urban-planning information, state of traffic, etc.
In this sense, there are many services with a geographic component, which could be implemented in a geoportal as an excellent way of presentation. A little review of possible services could be:

- Traffic: Positioning of roadblocks by works or cultural events, alert of zones with a special danger of accidents, etc (Figure 5).
- Urban services: Location of water points against fires, location of bins for refuse collection and any sort of municipal facilities.
- City-planning: Visualization of the classification of the land in the General City Plan, scheduled areas for their urbanization, protected zones, parcels that are in construction or repairing, etc.
- Medical care: Location of medical services, pharmacies as well as those that are on duty at one particular date.
- Tourism: Street directory, location of cultural interesting spots, shopping centers, leisure zones, etc.

![Estat del trànsit](image)

Figure 5: On line traffic state of the city of Valencia, showed at City Council web.

6. CONCLUSIONS

Nobody can doubt that the arrival of Internet has been a revolution in the form of obtaining and sharing data. In the scope of the Geographical Information Systems, that revolution is still taking place and mainly it is due to the SDI’s. The concept of cartography as an information that is possible to share and to query in a transparent way still is not diffused. In this sense, the geportals will provide the access of any user to information, before only used by specialists. In addition, they will mainly avoid the duplicity of the cartography and they will avoid that the same sector of the territory will be represented in different cartographic series, with the public cost that represents.

At local administrations, different SDI’s and projects as GEOPISTA are going to provide new tools for land administrators, giving a more global point of view. In addition, they will give to citizens a proper vision of municipal management, as well as their nearby reality.

In addition, it is possible to emphasize the importance of the use of open standards (OGC) for the cartography transmission, without worrying in which platform or software has implemented each one of the servers. Finally, the spread of GNU movement allows having new versatile solutions of software, with a wide community of users.

7. ACKNOWLEDGMENTS

This work has been partially supported by the research project “Information and Management in Local
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