

## **SPECIFIC APPLICATIONS AND GIS DATABASES FOR LOCAL ADMINISTRATION CASE STUDY: FLOREȘTI COMMUNE, CLUJ COUNTY**

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### **ABSTRACT**

The implementation of GIS technologies in the public administration domain comes from the very need for a fast analysis, objective and interdisciplinary instrument, as a support for optimal decision at the administration unit level. Based on the study case of the city of Florești, we developed an efficient model of GIS technologies integration into the information system of a city hall - AEDILIS.

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The current public local administration in Romania is undergoing an extensive process of reorganization, dictated by the prolonged transition from one political system to another. This reorganization is materialized by the transposition of the administrative act on new legal coordinates, restructuring the bureaucratic system, remodeling the patterns of management of the administrative territory, changing priorities in the sense of increasing the productivity of the budgetary resources etc. All these processes of reorganization have been carried out, and continue to be carried out, through obsolete patterns of data and information management. As a result, one can ascertain that the trend of restructuring the local administration has not included the aspect of managing data and information, a fact which has caused great damage to the quality of the administrative act. These damages affect the fairness of the undertaking of measures, because of the incomplete information regarding the population, built base, status of the plots and the owners, shortcomings in the accurate evaluation and the collection of taxes, impossibility to define an explicit direction of development etc. The perpetuation of this status in many of the local administrations, for lack of funds or reticence to innovation and technology, will inevitably lead to the amplification of the state of uncertainty, incapability and unconcern towards the administrative act.

On the other hand, the large volume of data and information which needs to be managed within an administration, their pronounced dynamics, the perishable character of the data, as well as the high number of statistic reports which the local administration, through its services, is required to transfer to the statistics department or the county council, further complicates the administrative act in its classic version.

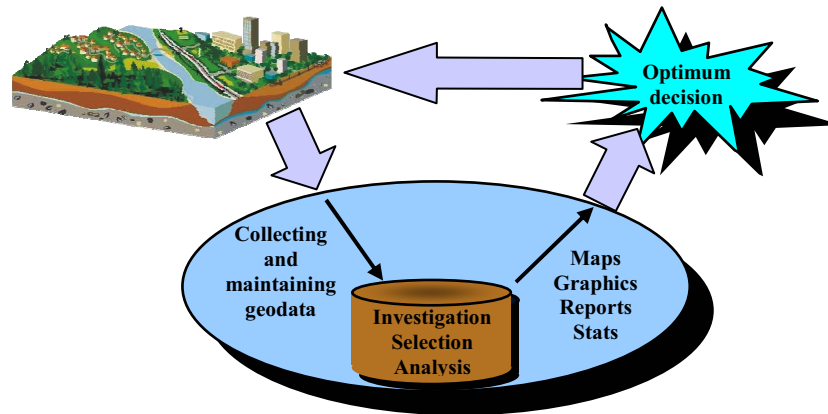
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What direction should be followed in order to modernize the aspect of data and information management? Of course there are numerous solutions, but it is also interesting to see their costs and ability to adapt to the specific needs of the administrative system. The IT systems of the GIS category are one of the most effective solutions for the assumption of the task of managing data and cartographic, alphanumeric or other types of information from the local administration.

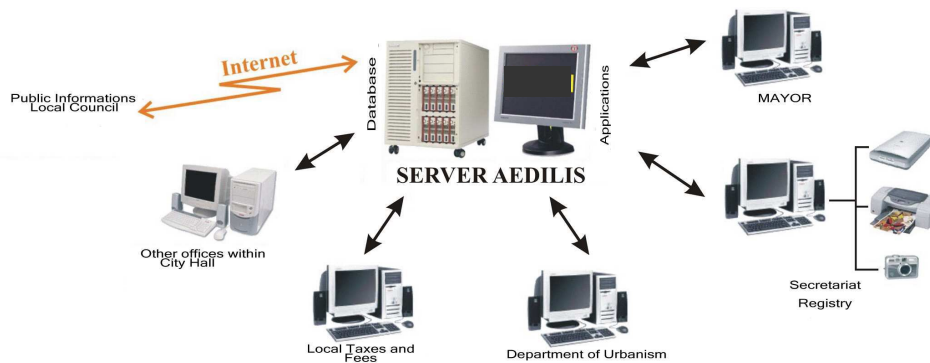
The IT systems from the local administration must combine the following characteristics: to offer fast and controlled access to data, to offer accurate information in real time, to allow the control of management, to include mechanisms of registration and to facilitate exchange of information with other organizations. The suggested system, Aedilis, has been projected and designed to this purpose, and is a modern tool of recording and processing both graphic and attribute data.



**Fig.1. The flow of geo-information in the context of the decision-making act**

The starting point is the idea that geographical data such as information regarding plots and the occupancy and use of the plots are crucial to the practical activities of all fields connected to public administration: urbanism, tax administration, agriculture, environmental protection, civic protection etc. Also, there are attribute data which show up as information in different contexts, such as the identification data of the owners.

The AEDILIS system contains a unique database which is used jointly by the particular applications. The principles which regulate the functioning of the whole system are rendered as restrictions and recommendations of design and development, grouped by their field of application: on the database and the applications, respectively. These principles are valid for any implementation with the same purpose.



**Fig.2. The central position of the AEDILIS system inside the mayoralty's information system.**

The model of the application was built and tested using graphic data taken from the General Urbanism Plan (PUG) of Floresti commune verified and updated on the field. The extensive development of the commune over the last few years has created the need, within the Floresti mayoralty, to implement a specialized information system, based on GIS technology, modular and easy to use. The following potential applications have been considered: records of building authorizations, records of constructions and real estate in general, records of the agricultural fields and other records connected to the agricultural roster, records of population, administration of the public domain, records related to the tax base, digital PUG, functional mapping and releasing urbanism licenses, real estate advertising, miscellaneous statistics and balance sheets.

From a technical point of view, AEDILIS is an original software system created through sequential developments of applications which include GIS-type procedures and functions implemented in the context of using intranet and internet environments. The database engine used is MySQL, and the assembly languages in which the programs were written are PHP and Javascript. The Aedilis applications work like normal web pages, are launched from a web browser such as Internet Explorer, from which they contact the Apache web server which contains the database and the applications.

## 1. CHARACTERISTICS OF THE GIS – AEDILIS DATABASE

The AEDILIS database contains both the graphic data as well as the attributes. The digital map is built by interpreting and reproducing in the application window the tables which store graphic objects and metadata with their drawing characteristics. The link between the graphical objects and the attributes is ensured through a code, the cardinal of the link being 1:1. The attributes are organized in related tables, an example of which can be analyzed in the figure 3.

The most important requirements which have to be met by a GIS database for use in the local administration are:

- respecting uniqueness – a single database, without redundant information;
- simple mechanisms of interconnectedness based on codes with comprehensible meaning – for example a simple and efficient link key can be formed from the address by collating the street name and house number, as can be seen in the following picture;

- independence of the data from the frame – in order to avoid incompatibilities of frames one must use data conversion programs from different sources towards a simple representation, in the Aedilis case, all the information from the database are of text type;
- maintaining the historical character – all modified data must first be saved in an archive, together with the time stamp, the user who made the change and the reason;
- using Romanian letters – it is the only way to obtain properly ordered reports;
- specifying, according to each relation between tables, of the type of behavior – aggregation or composition between data, for example the relation between the attributed of a plot and its owner behave as an aggregation of data – accordingly, if he sells the land this does not mean that he is deleted from the database, because he can own another plot, however, the relation between a graphic object and its attributes is in most cases of composite type, since deletion of the graphic part dictates the deletion of the corresponding attributes and vice-versa.

The screenshot shows a web browser window with a URL 'Editare atom de date - Cladirii locuinte-'. The main content area displays a table with columns: Nr. Crt, Id, Denumire, Categorie, Tip, Unic, Lungime, and Descriere. The table lists 18 attributes for residential buildings. Three pop-up windows are overlaid on the table, each showing metadata for a specific table:

- Tabela: Adrese domiciliu**

Denumire	Categorie	Tip
Ap.	PREDEFINIT	TEXT MIC
Bloc	PREDEFINIT	TEXT MIC
Cod poștal	PREDEFINIT	TEXT MIC
Județ	ENUMERARE	Județe
Localitate	PREDEFINIT	TEXT MIC
Nr.	PREDEFINIT	TEXT MIC
Scară	PREDEFINIT	TEXT MIC
Sector	PREDEFINIT	TEXT MIC
Strada	PREDEFINIT	TEXT MIC
Țara	PREDEFINIT	TEXT MIC
- Tabela: Adrese comună**

Nr. Crt	Id	Denumire	Categorie	Tip
1	4	Cod poștal	PREDEFINIT	TEXT MIC
2	2	Nr.	PREDEFINIT	TEXT MIC
3	1	Stradă	ENUMERARE	Străzi
- Tabela: Proprietari**

Denumire	Categorie	Tip	Unic	Lungime
Adresă domiciliu	ASOCIERE	Proprietar - adresă domiciliu	-	-
Cnp/cui	PREDEFINIT	TEXT MIC	da	14
Nume/denumire	PREDEFINIT	TEXT MIC	nu	18
Tip proprietar	ENUMERARE	Tip proprietar	-	10

Fig. 3. Defining attributes through metadata, example for residential buildings.

An important specific problem related to the GIS databases from the local administration is related to the precision of the data. Special applications can be created to manage data in course of correction. For instance, the progressive land registrar, we believe that the local officials shouldn't wait for the completion of the land measurements in order to begin building the GIS database of its administrative territory, but can adopt a system of self-correcting starting from the current urbanism plan, doubled by corrections on the field and the assumption of correct coordinates as measurements advance.

In the specific case of the three villages of the Florești commune, the option of progressive land registrar was chosen. To this purpose, the following layers were vectored: functional areas, restricted areas, parcels separated into yards and gardens, green plots, empty plots, industrial plots, constructions separated into houses, apartment buildings, garages and dependencies, institutions, commercial plots, street network, alleys, main road, hydrographic, fountains and hydrants, main electric networks, interest points. Concerning the attributes, the data from the agricultural registrar, the population records registrar, the owners' registrar and the tax statements are being inserted.

## 2. SPECIFIC GIS APPLICATIONS IN THE LOCAL ADMINISTRATION-AEDILIS

AEDILIS is an open, modular system. It consists of applications which are specific to solving specific problems and, as new problems are identified, we can elaborate new applications to be integrated in this system.

Access of users to the applications is hierarchized and secured. A user from the urbanism department will have full rights in the application which manages the construction authorizations, for example, but he will only be able to view information regarding population records. Practically, each official from the mayoralty will have modifying rights only over the date of which he is in charge, on the basis of the job description.

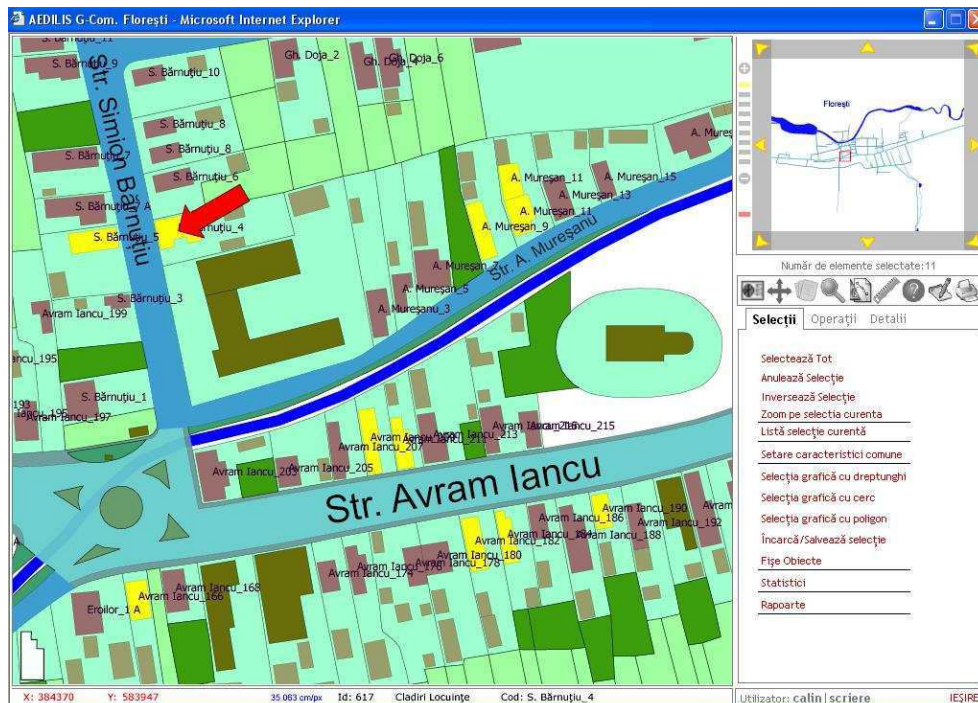


Fig. 4. Using the combined code „streetname\_number”.

The interface of any GIS application, in the usage of the public administration must be simple and accurately specific for the problems which might arise. To support and effective use, there are procedural rules and mechanisms such as: validation of the data upon introduction, simulation of the uniqueness for the automatic code fields, usage of the predefined enumerations and work with lists and fast searches.

A major principle which must be abided by is concurrent access. Respectively, for the possibility to work operatively, one must solve the problems of expectancy in the concurrent work both from the point of view of access to multiple sessions of a data application as well as in case different applications access the same data. For example, the data of a land owner can be used at the same time by several applications, such as: records of the construction authorizations – if we assume that the owner asks for such an authorization at that time, population records as head of the household where he lives, in case of a statistic/report also performed at the present time, and at the local tax department, where he has to make a statement of acquiring, for instance, a new real estate asset. It is obvious that this owner's personal data must be stored in a single place, and also from a single application will be performed any possible changes of his address, in that should be the case.

The screenshot displays a complex query builder interface. The main window is titled "Căutare în stratul -Cladiri Locuințe- Web Page Dialog". It contains several panels for defining query criteria:

- [6] Administrare interogări:** Includes fields for "Interogare" (set to "\_NOUĂ"), "Denumire", and "Descriere".
- [5] Interogarea în curs de construcție/editare:** Contains three criteria:
  - 'Cladiri locuințe.an construcție' STRICT MAI MIC CA 1970
  - 'Cladiri locuințe.dotare canalizare' EGAL CU 'nu'
  - 'Adresă imobil.stradă' ÎN MULȚIMEA ('Avram Iancu','Simion Bărnuțiu')
- [1] Operand\_1:** A tree view showing "Cladiri locuințe" and "Adresă imobil" with sub-attributes like "Stradă", "Nr.", "Cod poștal", etc.
- [2] Operator:** Set to "ÎN MULȚIMEA".
- [3] Operand\_2:** A list of names with checkboxes, including "Simion Bărnuțiu".
- [4] Condiția în curs de construcție/editare:** Set to "Adresă imobil.stradă ÎN MULȚIMEA".

A "Rezultatul interogării - Web Page Dialog" window is open, showing a table of search results:

Id.ș.	Cod	Id. a.	An construcție	Regim înălțime	Tip locuință
1	Avram Iancu_405	1	1932	P	casă
8	Avram Iancu_381	8	1951	P	casă
18	Avram Iancu_351	18	1953	P	casă
21	Avram Iancu_345	21	1967	P	casă
37	Avram Iancu_299	37	1939	P+2	casă
45	Avram Iancu_285	45	1935	P+2	casă
50	Avram Iancu_267	50	1931	P	casă
53	Avram Iancu_261	53	1959	P+1	casă
59	Avram Iancu_247	59	1953	P+2	casă
155	Avram Iancu_340	155	1941	P	casă

Fig. 5. Performing a complex interrogation according to the values of the attributes

In a general diagram of functions which a specific GIS application must perform we can mention:

- establishing, in accordance with the problem which needs to be solved, of the active layer and the chain of relations of the tables of attributes involved;
- mechanisms of localization, search and interrogation according to the values of all the attributes;
- mechanisms of selection and logical operation with selections of objects;
- operations of editing: adding, deleting, modifying with restrictions imposed by the particularity of the problem;
- possible complex specific operations in which information from other layers interact, for instance for automatically releasing an urbanism certificate;
- the possibility of carrying out reports and statistics on objects from the active layer;
- printing the map at different sizes.

### 3. PERSPECTIVES

Despite the fact that the standards of application of GIS in public administration are poor, the AEDILIS system has proven (Zotiĉ and Haidu, 2006) and continues to prove through this paper that this shortcoming can be overcome by a flexibility in the organization of the database which is capable of serving multiple applications: records of constructions, records of construction authorizations, records of population and others. The next phase of development of the AEDILIS system intends to implement new functions particular to the *statistic analysis* and the *spatial analysis* dedicated to applications from the field of local administration.

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