

View Far, Think Local

or

How to Create an On-line Service of Administrative Boundary Data?

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Introduction

The profound changes in the society and economy in the CEEC countries and the accession process towards the European Union gave a major impulse to the modernisation process in the technology too. In the private sphere the market itself rules the modernisation, but in the public sector it is the responsibility of the government. The general lack of financial resources sometimes pushes the decision makers towards compromises, but with well-targeted actions much can be done. In Hungary such a priority is devoted now to the Information Society Technologies (IST), whereas within this and the forthcoming years HUF 40-42 billion (approximately 150-160 million Euros) will be invested into this field. This amount will be used both for supplying the necessary hardware elements to the widest circle of users and for the establishment of the general data infrastructure for providing services. This challenge should be adequately met by the GI community too, and promote the solutions, which can be based on the use and development of the National Spatial Data Infrastructure (NSDI).

Due to globalisation any investment should be done in harmony with the international trends, therefore the new technology requires the closest collaboration with the international partner organisations. The 4th and 5th Framework projects opened a good possibility for such co-operations, one of them in fields if GI was the Administrative Boundary Data Services (ABDS for the CEEC) project, completed on the 31st December, last year.

Why administrative boundaries?

In order to turn the overwhelming amount of data into information for the users, a kind of systematisation is required. This can be for example a thematic presentation, but considering that 80% of data can be linked to its location can be a geographically positioned one. The latter approach is offered by the Geographical Information Systems (GIS) where the systematisation is solved by direct linkage to the co-ordinates. However these entities are meaningful only for a certain circle of the users. For the everyday user and for certain types of information the location usually means indirect positioning, e.g. a settlement, a region, or a country; in one word an administrative territorial unit. Naturally, the administrative territorial units are represented by the co-ordinates of their boundaries; meanwhile these data may remain hidden for the user.

The Administrative boundary data – being the base information infrastructure for different kind of analysis when spatial reference is required – are core part of the NSDI. The number of potential users is practically indefinite, range from statistics to economic analysis, from environment to logistics, from business administration to marketing, etc. A

wide spread use of such kind of information can greatly contribute to modernisation of the whole infrastructure of a country, or a region. The provision and integration of such data and services seems indispensable for the modern electronic governance.

Key requirements

If someone is going to create a modern on-line service of any kind of data or information, there are three key issues that must be followed:

- Reliability
- Accessibility
- Interoperability

In this paper the term “reliability” is discussed from point of view of the data providers, while “accessibility” from point of view of the users. Interoperability is that general issue that concerns both of them.

Applying these general terms for the service of administrative boundary data reliability means that the administrative territorial units exactly correspond to their actual legal status. It means, that their changing mechanism must be traced, and those nodes are defined, which must be monitored for providing quick, in ideal case on-line information about the changes.

Wide-range accessibility depends on two factors: on the media of delivery and on the price. If the information is delivered via the Internet and if the service is relatively cheap we have a good chance for a wide range spread of information. (The free of charge delivery of certain products even can promote those, delivered against payment.)

An on-line service is interoperable when neither merging the different data sources nor the different user platform causes any disturbances in the system. It means that the data content should be harmonised, a well-chosen unique standard must be followed, accompanied with an adequate quality assurance and agreed data policy.

Data reliability

The ABDS for the CEEC project aimed at the preparation of an on-line service of administrative boundaries in eight CEEC (Bulgaria Estonia, Hungary, Latvia, Lithuania, Poland, Romania,) and in two EU countries (Finland, Greece). The provision of reliable, harmonised in content data required clarifying the following questions:

- What are the official data sources in different countries?
- What is the administrative hierarchy in the different countries?
- What is the legal background of different administrative territorial units?
- Who are the data owners in different countries
- What kind of data are available in different countries
- What are the formats and media of delivery AB data and their attributes?

Another important task was to define how to convert the raw data from different countries into a product, homogenous in quality?

The first important task was to decide that common level of resolution, which can be produced in every country and is good enough for derivation of different product. The database, corresponding to these criteria was called as consolidation level. It was agreed, that the service will be based on two consolidation levels:

- 2 m resolution – traditionally 1:10 000 scale – for those countries, where data are available in large scale,
- 10 m resolution – traditionally 1:50 000 scale – for other countries.

The second step was to decide the method of generalisation to be used for producing the product of the service. For this purpose a geometry driven approach was chosen, as it

- Guarantees the integrity and topological consistency at all resolution,
- Produce predictable and repeatable results,
- Minimise the deviation of the boundary lines from the original position,
- Allow on-line delivery of the tailored dataset,
- Allow parameterisation of the main rules by the users (scroll menu with visualisation of the effects of the chosen parameter),
- Allow the calculation of the deviation from the real area of the ATU.

The administrative boundary data will be completed with different attributes closely related to the ATUs (area, population, housing, etc) and accompanied with metadata (data sources, update information, links to related on-line services and web-sites).

Interoperability

The interoperability in the ABDS service must be solved both at the provider and the user side. The organisational and data interoperability, which concerns the service providers, can be regulated by adoption of existing standards or by agreement of own rules. Aiming at an international service it was reasonable to take into account the current standardisation trends of CEN/TC 287, ISO/TC 211 and also those of the Open GIS Consortium. The data and the service model of the ABDS for the CEEC reflect therefore these principles.

To provide a common service of geographic information the data must be managed seamlessly in space and time as well as standardised by their content, structure and format. Requirements to the service portal and the data flow must be precisely formulated and correspond to the principles quoted below:

- The objects of the service and databases are the ATU-s (Administrative Territorial Units), which can be completed by attributes. The attributes and their values are related to the objects, which means an object oriented model of the database.
- The spatial schema follows the geometrical description and topological description: the ATU's are geometrically expressed with surfaces, delineated

by boundaries consisting of boundary lines and where the last are described by points. The points are given by their plain co-ordinates and optionally by their height.

- The topological description of ATU-s is done with faces, edges and nodes.
- In case of data quality the data origin, accuracy certification and actuality are involved into the database as attributes. There is additional information in the metadata.
- The thematic properties of ATU-s are the results of agreement between the countries. The thematic properties are the dominant attribute elements in databases.
- Data to be supplied in the service originate from primary data sources.
- The data management and service is based on the concept of distributed databases of the countries, at the so-called National Portals, established and managed by the National Focal Points. The International Portal is assuring the unique search facilities (an XML map browsing unit at scale 1:2 500 000 with metadata) and all kind of harmonised value added services, based on the seamless international data set.

In practical terms it means a separate data collection in every country in accordance to the strategic principles, the technical specifications and other adequate local running project in the country. The collected data will form the elementary database of the country, which must be transformed then into the master database, according to the specifications elaborated in the project. The master database is forwarded to the central node (international ABD portal) in order to be merged with data from the other partner countries. The national nodes will communicate with the international portal, which is intended to consist of two units, the data server and the client server. The client server will provide the facilities or browsing, querying and ordering the standards products, and also will contain a module for individual ordering, according to the specifications of the user.

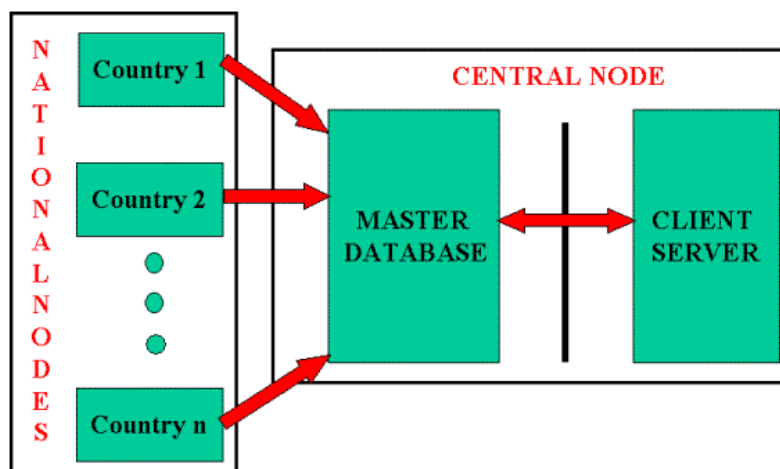


Figure 1: Architecture of the international ABD service

The change management procedure is very similar to the initial data collection, with the only difference that only change files are to be supplied to the international portal (change management procedure).

On-line service of administrative boundaries

The theoretical achievements if the project were tested in frame of the pilot service based on Hungarian data. In Hungary the source of AB basic data is the national cadastre of the Hungarian National Agency on Lands and Mapping. Data of more than 3200 settlements are stored and maintained in the nation wide network of 116 Land Offices. Therefore the initial step for the pilot service was to collect these data from the cadastral registers.

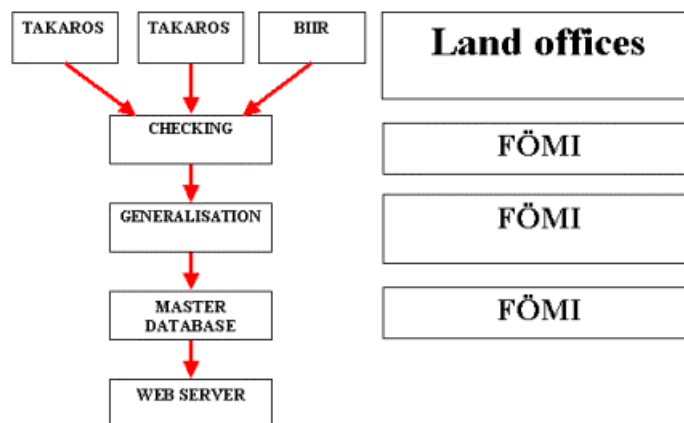


Figure 2: Dataflow in the Hungarian ABD pilot service

The existing countrywide intranet system, called TAKARNET between the Land Offices and the FÖMI (Institute of Geodesy, Cartography and Remote Sensing) made possible the easy information transfer to FÖMI, which is the National Focal Point with national and provisionally international ABD portal. (In case of Budapest the similar in functionality system is called BIIR). Because of the technical differences of BIIR and TAKARNET the cadastral data filtering for ABD content must have been organised in different way, in case if BIIR the task was solved by developing a special Interface, while in case of the country-side land offices manually. The Hungarian ABD master database then was compiled according to the specification fixed by the project consortium. We developed as well an uploading module for ensuring the communication between the data and client server.

In order to fulfil requirements of interoperability, for map browsing we tested an XML/VML based software Axiomap 1.2, which is commercially available and very cheap. Besides of the map based browsing the Axiomap offers possibilities for different queries based on the attached attributes taken from the Hungarian Central Statistical Office. We provided a gazetteer-type searching unit too. For the better orientation of the client metadata descriptions were included as well. A prototype of the pilot ABD services elaborated on the Hungarian example has been presented successfully at the project closing review meeting in Prague, January 18-19, 2001.

The pilot ABD service was good enough for testing our methodology in case of a separate country, but naturally the specific problems of integration of databases taken from the partner countries remained still open. However, the generalisation methodology was successfully tested by every participant using their own national data, moreover, a pilot project has been started for elaboration of methodology of integration of state boundaries into the service by the Romanian and Hungarian parties.

Future of the service

The preparatory phase of the project was finalised by the signature of the Memorandum of Understanding at the Prague closing review meeting. It describes the technical, organisational, and some other aspects of the future service. It also regulates the relationship between the SABE and the future ABDS. The ABDS will be not a competitive product to the SABE, but rather a complementary one, as regarded the geographical scope, the technological innovation and the resolution of the data to be supplied. On one hand the experience of SABE in managing of such kind of databases, on the other hand the geographical and resolutorial extension and the technological innovations of the ABDS open together a good base for joint thinking and actions at European level, too.

In the same time in Hungary we shall continue the development of the fully on-line service of AB data approaching step by step their real-time handling and delivery.

Conclusions

The “Administrative Boundary Data Services for the CEEC project implemented a work in harmony of general trends of Geographic Information Infrastructure and the Information Society. Its main objective, to define framework for implementation of a new ABD service in the region was achieved.

Answering to the question in the title of this paper the creation of an on-line service of boundary data seems to be just the implementation of some “simple “ steps:

1. View far and think over what a modern service should be look like in 5-10 years? What are our personnel/professional expectations? These “strategic” objectives must be clearly pronounced: reliability, accessibility, and interoperability.
2. Think local: Align all available resources. ABD data exist in every country; turning them into spatial information is an important task for the general development of the infrastructure and in addressing to the widest circle of users. You just have to find where they can be taken from, and organise the team that can implement the task.
3. It is a good idea to survey what the current users need now. But viewing again far, with new products we can equally show them, what they may need in the future. Moreover, the technology developed for a “narrow” application like the delivery of AB data can be adopted then for other GIS purposes too.
4. Look around and rely on other’s experience! Many similar solutions already exist.

In case of the ABDS for the CEEC project these principles were implemented in the following way: available data their source and providers were clarified in the “Inventory” working package. On our opinion data reliability can be assured by using administrative boundary data with legal background taken from the primary registers rather than the topographical ones. The methodology of turning these data into information was scientific selected by testing the existing generalisation/simplification methods. In order to satisfy all kind of possible demand, a wide range of standard products of different resolution was defined for the service, including a product tailoring possibility by the users.

The positive experiences of the pilot project have proven, that we took a promising step towards the implementation of a modern international on-line service of the base data infrastructure. Our results were highly appreciated by the European Commission. The public report of the results of the project “ABDS for the CEEC”, including the names of representatives of participating countries and organisations, technical details and the demonstration copy of the pilot service can be visited at our web site.

References

Kavouras, M., “Interoperability and Project ABDS Project Related Activities” - report for the ABDS project, manuscript

Mihály Sz., Tóth K., “Promising Steps towards an International On-line Service” <http://www.ddl.org/figtree/pub/proceedings/korea/full-papers/session5/mihaly-toth.htm>

Tóth K., “ABDS for the CEEC project – edited public report” <http://abds.fomi.hu>