

Integrated Land Information Services in Hungarian Land Administration

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Key words: key words, theme, etc.

SUMMARY

The Unified Hungarian Land Registry, in which cadastral mapping and land registry belong to the same organization (Land Office Network), has been operating since 1972. The 34 years experiences in the management of such an integrated system has made a good basis for the development of an integrated land information service on the Internet.

By the help of Computerization of Land Offices in Hungary (including land registry, cadastral mapping and network services) we have established a modern, GIS based land information service in Hungary. The base of the network service is an own-developed software system by FÖMI, which maps the whole object classes and procedures in Land Administration.

In the paper the architecture, the components, the model structure and the evolution of models will be drawn. The new network services will be examined, including:

- Uniform cadastral map service from heterogeneous systems,
- Message service for subscribers about changing in their land registry records (SMS, e-mail),
- Data mining on distributed and heterogeneous databases,
- Integrating of other geodata (e.g. orthophotos, topographic maps) into the services,
- Activities, which increasing the quality of land information services.

These new services improved the authenticity of land registry and public belief in LA. The Hungarian uniform land registry system and the experience and know-how in the maintenance and development of it, facilitated the planning and implementing of the new developments. By the expansion of quantity and quality of value-added services we made an important step to the accomplishment of a self-sustaining land administration.

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1. INTRODUCTION

In the mid of the 90's the Computerization Program of the Hungarian Unified Land Registry (TAKAROS) and establishment of TAKARNET intranet network (Network of TAKAROS) has made the foundation of the WEB-based land information services in Hungary.

In TAKAROS program a new land information system has been developed for the District Land Offices of Hungary. The TAKAROS system manages all the land registry business processes carried out at the District Land Offices, except the integrated management of cadastral maps together with land registry data, because this development has been unsuccessful.

TAKARNET network links all the institutions of the Hungarian Land Management Sector (Ministry of Agriculture and Rural Developments, County Land Offices, Institute of Geodesy Cartography and Remote Sensing (FÖMI) and the District Land Offices). Operation of TAKARNET network started in 2000, but only for internal users (staffs of Land Administration). Public access to TAKARNET (via Internet) for registered users has been available since 2003.

In National Cadastral Program of Hungary, 97 settlements have been surveyed accordingly to the Digital Base Map Standard (DAT) and its instructions (approx. 550 000 ha).([1], [2], [6], [8], [9], [10], [11], [12]). Then — for speeding up — the National Cadastral Program has been continued with the vectorization of the analogue cadastral maps (KÜVET and BEVET project). The cadastral maps in Hungary can be divided into three categories by the location. The cadastral map categories are:

- Cadastral maps of the rural areas of settlements, (KÜVET)
- Cadastral maps of the gardens within the rural areas of the settlements, (BEVET)
- Cadastral maps of the built-up areas of the settlements. (BEVET)

KÜVET project covers the vectorization of the first category (rural areas of the settlements). This project was finished at the end of 2005. In BEVET project the other two categories of the cadastral maps will be vectorized. The estimated finish of BEVET project is the end of 2007.

As shown in the last section, in the last years the amount of digital cadastral map data increased very quickly, while the land registry part of the unified land registry had been available in digital form since 1997. In these days Hungarian Land Administration essentially has two important tasks:

- To integrate and harmonize the new cadastral map data with land registry,
- To expand land information services for our clients.

Increment of quality and quantity of WEB based land information services is one of the most important step on the way of build-up of a self-sustaining land administration, which is the main goal of the Hungarian Land Administration.

2. THE UNIFIED HUNGARIAN LAND REGISTRY AND LAND ADMINISTRATION SECTOR

Legally the Unified Hungarian Land Registry has existed since 1972. Unified land registry means that cadastral mapping and land registry is the responsibility of one administrative organization, the Land Office Network of Hungary. Beside the unified land registry, land valuation, land use control, land protection comes within the tasks of the Land Offices.

The organizational structure of the Land Office Network is divided into three levels. On the top level the Department of Lands and Geoinformation at the Ministry of Agriculture and Rural Developments is responsible for the overall control and supervision of the Land Administration Sector. On the middle level there are 19 County Land Offices and the Land Office of the Capital (Budapest Land Office) and the Institute of Geodesy, Cartography and Remote Sensing (FÖMI). County Land Offices and Budapest Land Office are responsible for the county-wide coordination of land administration activities and supervision of the District Land Offices. FÖMI has a country-wide competence on surveying and mapping (mainly research and development) activities and acts like a central surveying organization, but it has not any supervision on County or District Land Offices. The 119 District Land Offices are responsible for the daily change management of the unified land registry and the other land administration activities and are supervised by the County Land Offices.

National Cadastral Program Non-profit Company (NCP) is an important part of the Hungarian Land Management Sector, but legally is not a part of the Land Administration. It has only financial reasons, because the state (or a governmental institution) has no possibility to borrow and has no money for financing the National Cadastral Program. Therefore the state has established NCP, which raised state guaranteed loans. NCP is owned by the Ministry of Agriculture and Rural Developments.

3. INFORMATION SYSTEMS IN HUNGARIAN LAND ADMINISTRATION

The base information system of the Hungarian Land Administration is the above mentioned TAKAROS system. TAKAROS covers all the business processes related to the unified land registry. The system is working at the District Land Offices, except the two District Land Office of the Capital. This fact has historical reasons. In the mid of the 90's the Hungarian Land Administration Sector had possibility to receive a support from the Swiss Government to establish an IT system at the District Land Office of the Capital. This system (called INFOCAM/BIIR) has been developed and is working at an District Land Office of Budapest. The land registry part of INFOCAM/BIIR system has many similarities with TAKAROS, but TAKAROS has not solved the integration of cadastral map with land registry, while INFOCAM/BIIR has done it. Since the development and maintenance of INFOCAM mapping system had been finished, Budapest Land Office decided the establishing a new cadastral

mapping system for the newly opened District Land Office of Budapest. This mapping system is based on the solutions of Autodesk Topobase system and it came into action at the beginning of 2007. Topobase system is not fully integrated with the Land Registry database (BIIR)

There is another important information system called FÖNYIR, which is working at the District Land Offices. FÖNYIR is a land user registry system, based on the land registry data stored in TAKAROS. This system is very effective in the management of land users for different purposes (e.g. land use control, control of agricultural subsidies from European Union). FÖNYIR has been developed by FÖMI.

The information system of County Land Offices (META) was developed three years ago. META is responsible for management of the county level land administration (state acceptance of cadastral maps, county level harmonization and supervision of land registry activities).

3.1 TAKARNET network

The basis of all WEB-based land information services is the TAKARNET network, therefore it is investigated in more detail.

TAKARNET connects all actors of the Hungarian Land Administration Sector. Physically TAKARNET is a typical star-network (see Fig 1.). The District Land Offices connect to the County Land Offices with relatively low-capacity lines (32-128 KBit/s) and the County Land Offices are connected to the TAKARNET Centre (at FÖMI) with higher capacity lines (256-448 Kbit/s). There is a special high-capacity line between the TAKARNET Centre and the District Land Offices of Budapest (2 Mbit/s), because of the high rate of property transactions in the Capital. The registered users have access to TAKARNET via Internet through firewalls at TAKARNET Centre.



Figure 1.: Physical structure of TAKARNET network

Logically the District Land Offices are managing independent land registry databases, only the information system (TAKAROS) is the same. The Capital Land Office is an exception, because the information system (INFOCAM/BIIR and Autodesk/Topobase/BIIR) is different (see section 3.). The structure of the land registry databases fortunately is not so inhomogeneous. The structure of land registry databases of TAKAROS system (from land office to land office) is the same. At the Capital Land Office the INFOCAM/BIIR database has some differences in structure with TAKAROS databases, but these are not essential.

Situation in the case of cadastral maps is more complicated. In the frame of National Cadastral Program DAT databases issued for 97 settlements (approx. 550 000 ha). For the management of these databases the National Cadastral Program Non-profit Company has made developed a software, called DATView. DATView is a map manager software, but does not integrate cadastral map data with the land registry, which is the base condition of the unified land registry. In the other two programs of NCP (KÜVET and BEVET, see section 1.) the format of the digital cadastral maps is ITR (Interactive Mapping System). ITR is a very popular Hungarian map producer software, but the inner graphic format of the software is a spaghetti structure, therefore the land registry database could not be linked to graphic data. For solving this problem of heterogeneous graphic data FÖMI has developed a software (DATR), which fully accomplishes the ideas of an unified land registry, and , as the graphic engine of TAKARNET services, aggregates graphic data from heterogeneous sources (see section 4.).

Because of the structure of the network, each query on any land registry and/or cadastral map data runs across the TAKARNET Centre, where it is noted and registered in a central database. Registered users have access to the network via Internet at the TAKARNET Centre. Each transaction is registered and invoiced for the users.

4. DATR, THE IT SYSTEM FOR A UNIFIED LAND REGISTRY

As shown in section 3.1 the digital cadastral map data in Hungarian Land Administration are very heterogeneous and the integrated management of them with land registry database (officially) has not been solved yet (except INFOCAM/BIIR). Therefore the Centre for Land and Geoinformation Developments and Operation at FÖMI has developed an information system, which satisfies the requirements of an integrated land registry system. ([3], [14], [15]).

The base of the developments has been the following visions:

- In the unified land registry cadastral maps are the geometric attributes of land records registered in land registry,
- The system should provide authentic updating of land registry and cadastral maps together,
- The developments should be independent of any commercial GIS software,
- The system should cover all the business procedure in District Land Offices,
- The system should fit into the existing IT systems in Hungarian Land Administration.

The name of the developed system is DATR (DAT-based Mapping System, DAT is the Hungarian abbreviation of Digital Base Map). The system is using the standardized cadastral database model, which has been defined in MSZ 7772-1 standard (Digital Base Map, Conceptual Model, Hungarian Standard). DATR is fully integrated with TAKAROS land registry system. All cadastral map data are stored in the same database where the land registry part is put down, therefore the system uses only one database scheme and enforces the integrity of the two parts. For enforcing the authenticity of the integrated land registry database any change in the system must be carried out within a database transaction, which also is registered. Therefore the graphic user interface of the system has no any map editor function (map editing is available only through database transaction). The development team measured the needs of GIS capabilities in such a system and then found that the standard graphic functions of an operating system are enough to represent geometric data stored in the database. Therefore DATR is using this environment, which means that the system is independent from any commercial GIS software. DATR system supports real-time queries from TAKARNET network and aggregates all types of data including land registry and cadastral maps.

4.1 Core data model of DATR

The core data model of DATR is very similar to the Cadastral Domain Model defined by our Dutch colleagues. ([4], [13]) The data model is adequate to execute, supply and monitor all the functions, constrains and procedures operated in the Hungarian Unified Real Estate Registry. The core data model of DATR is shown on Figure 2.

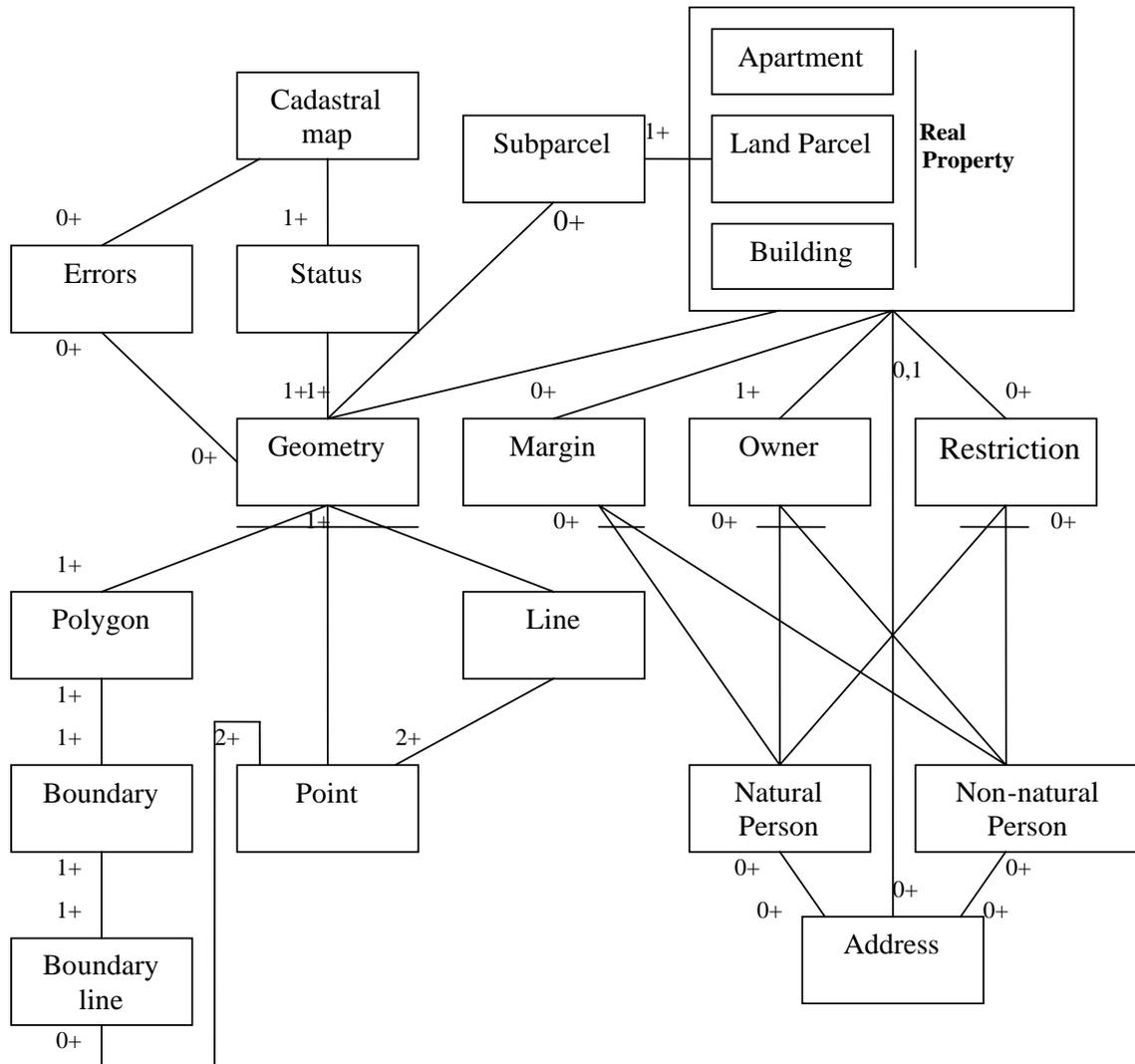


Fig. 2.: Core data model of DATR

As shown on Figure 2., there can be three types of real property: apartment, building and land parcel, but a real property must be one of them. In our unified land registry the apartments has no geometric representation, only the land parcels and buildings have.

In the part of geometry an object can be point, line or polygon type object. Therefore if a cadastral map object has no connection to the land registry (e.g. railroad), there is no relation between the real property and the geometric tables (0+ indicates, that there are zero or more relations to the tables). Structuring of geometric tables is unambiguous.

Object called Margin has a very special role in the land registry. Margin provides the ordering principle of land registry. If the Land Office receives any application related to the real property, the Land Office must register it and Margin shows the flag of the application on the real property. Of course there could be zero or more margins on the real property (0+). The margin also registers the person who made the application, therefore there is a link to the natural or non-natural person.

The role of the owner is unambiguous. One real property must have at least one owner (1+), which can be a natural or non-natural person.

The real property could have an address or not (0+).

There could be rights (e.g. easement, mortgage) and restrictions related to the real property. The Restriction object makes for this purpose. The Restriction can be connected to a person too. Each person (natural or non-natural) — who has any connection to the Land Office — is registered in the database with his address too. This core data model has been physically achieved in DATR system and is able to manage the cadastral map data and land registry in an integrated way. ([15])

5. INTEGRATED LAND INFORMATION SERVICES

In the last sections the IT environment of the Hungarian Land Administration Sector has shown, which provides a flexible and effective background for land information services. The base of the land information services of the Hungarian Land Administration is the TAKARNET network (section 3.1). This environment provides for our clients a vast number of information about the products and services of the Land Office Network.

5.1 Services on TAKARNET

Connection to TAKARNET is not a very simple procedure. Only authorized artificial/natural persons can have access to the network, who licensed by the Ministry of Agriculture and Rural Developments. Therefore the main clients in our WEB services are lawyers, notaries, banks and surveyors. But fortunately the number of licenses to the system is increasing very fast.

5.1.1 Base services

TAKARNET services for registered users via Internet were started in 2003. These services contain only the country-wide queries of land record's data registered in land registry. Search can be based on the lot number or the address of the real property.

Our experiences showed that the lot number based search is much more effective than the address based looking for, because of the different type of address registration. The address

handling is one of our weaknesses in the unified land registry, therefore the standardization or legal regulation of addresses is very important in any register in Hungary.

Queries on land registry data can be in two different forms. Review of a land record means the supplied information contain only the effectual data on land record, while the full query means that all available information (including deleted records) is serviced. This service is available for all real property in Hungary for registered users.

5.1.2. Expanded integrated services

After the Hungarian Land Administration Sector started TAKARNET services for registered users in 2003 — and received the great interest on them — decided the expansion of the services.

The first development on this theme was the cadastral map service from INFOCAM/BIIR database, which was started in the mid of 2005. This service uses the DATR graphic engine, and its architecture shown on Figure 3.

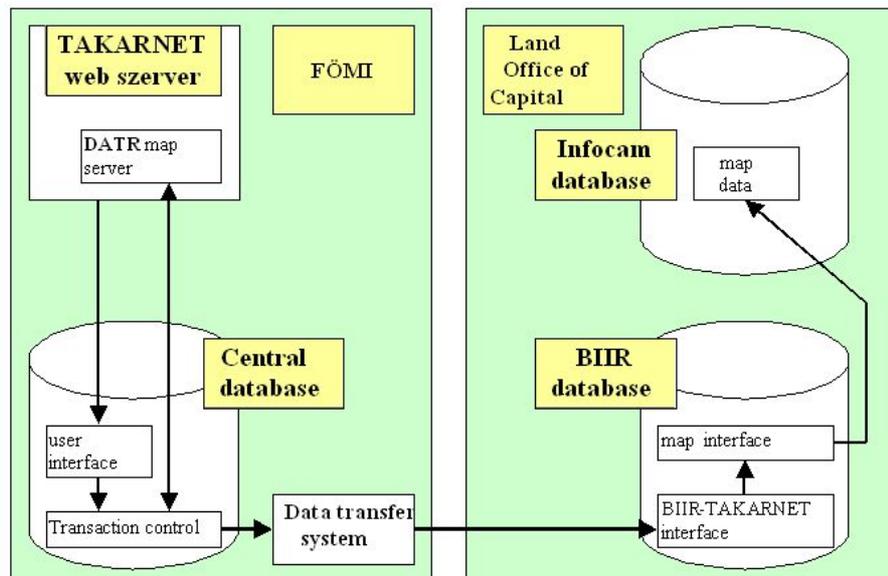


Figure 3.: Integrated service from INFOCAM/BIIR system

As shown on Figure 3., TAKARNET has direct access to the INFOCAM cadastral map database and the land registry database (BIIR) respectively. This structure provides the integrated cadastral map and land registry data services via TAKARNET network.

Cadastral map service is only available in raster (PDF) form, because of the legal restrictions, but as shown on Figure 3., the cadastral map data are flown in vector form to the TAKARNET server, so the vector form service is available in any moment. This TAKARNET service module has been developed by FÖMI. ([14])

After the completion of KÜVET project in 2005 (see section 1.) the needs of delivery of ITR format digital cadastral maps on TAKARNET also arose. To fulfill this requirement, FÖMI has made another DATR based interface, which provides a uniform cadastral map service on TAKARNET. The architecture of ITR based service is shown on Figure 4.:

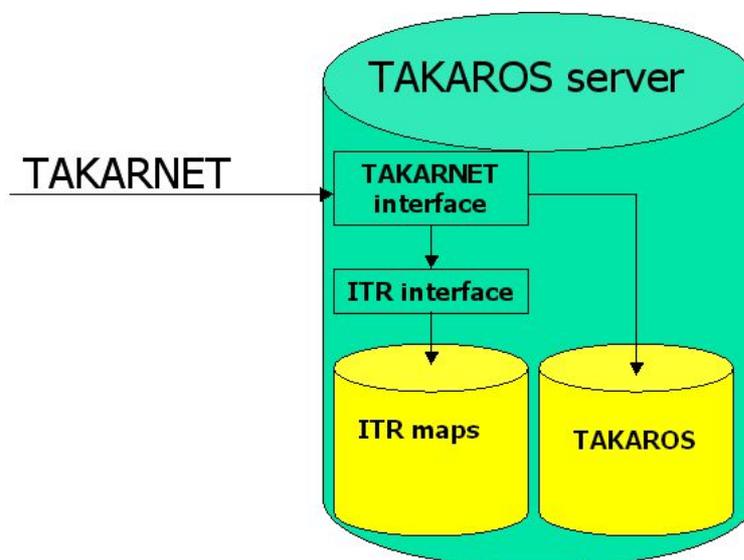


Figure 4.: ITR based map service on TAKARNET

It is very important, that ITR maps are in spaghetti form, so they have no any database connections to the land registry, but the DATR graphic engine has solved this problem.([14])

The interface for the newly developed Autodesk Topobase platform at the District Land Office of Budapest (see section 3) is under construction. This interface solution will also use DATR graphic engine and the integration of cadastral map and land registry data services will be solved by the similar way as well.

5.1.3 Other expanded services

The service part of the TAKARNET system is handling by the Centre for Land and Geoinformation Development and Operation at FÖMI. Our clients (lawyers, notaries, banks etc.) wanted to expand our services for administrative way too. Therefore the expanded (today base) services developed by FÖMI, contains such additional deliveries like:

- billing information,
- downloadable standardized document for applications,
- country-wide queries based on the ownership rights,
- land record change monitoring.

At billing information service the client can monitor his account on TAKARNET services. Standardized documents facilitate the case handling at the Land Offices.

Country-wide queries based on ownership rights are only available for authorized bodies (Tax Office, National Intelligence Agency etc.), but technically it is a completed procedure, since the system have to mine in 119 different databases (fortunately the structure of them is the same (except the Land Office of the Capital)).

Land record change monitoring is our brand new service on TAKARNET. The needs of this service have been arisen from the request of our client too. For example if there is a mortgage on a real property, the beneficiary of it is interesting on any changes in the land record of the real property. Therefore FÖMI developed this service for the registered users of TAKARNET, and the automated monitoring service is available in e-mail or SMS form.

TAKARNET also provides some public interest information about the Hungarian Land Administration. These services contain the official book, money article, statement of expenses of Land Offices. The address-list, phones, faxes, e-mail, the time interval of customer service, act and decrees on Land Administration also comes within the TAKARNET services.

6 FURTHER PLANNED LAND INFORMATION SERVICES

In the last sections the paper focused only on the data services from land registry. Fortunately the Hungarian Land Administration Sector's activities do not cover only the unified land registry. At the central surveying and mapping organization (FÖMI), there are different types of databases (1:10 000 scale topographic maps, remotely sensed data, digital orthophotos, digital elevation models), which can easily and effectively combined with cadastral, land registry data. Our experiences in the utilization of digital orthophotos and the high resolution (5m GRID) digital elevation models have shown, that these products can be effectively used in any land related planning and procedure. The flexibility and expansibility of DATR system could provide the widening of land information services on TAKARNET network in the future.

7 CONCLUSIONS

In this paper the authors presented the IT developments in the Hungarian Land Administration in the last years. These developments showed that the future ways of the land administration are the widening of land information services. These new services improved the authenticity of land registry and public belief in Land Administration. The Hungarian uniform land registry system and the experience and know-how in the maintenance and development of it, facilitated the planning and implementing of the new developments. By the expansion of quantity and quality of value-added services we made an important step to the accomplishment of a self-sustaining land administration.

The expansion of land information services by the combining land registry data with “non-traditional” geodata (e.g. digital orthophotos, DEMs, satellite images), should lead to a more colorful and popular services.

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BIOGRAPHICAL NOTES

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Gyula IVÁN (41) has a degree in civil engineering (faculty of surveying and geodesy) from Technical University of Budapest, HUNGARY. He is currently the head of Department of Geoinformation Developments in the Centre for Land and Geoinformation Developments at FÖMI. He is a member of the Hungarian Association of Surveying, Mapping and Remote Sensing, and holds the secretary position of Geoinformation Department within the Association. He is a member of the Geoinformation Sub-committee of Committee of Geodetic Sciences at the Hungarian Academy of Sciences.

Gábor SZABÓ

Gábor SZABÓ (36) has a degree in coding and code planning mathematics from Roland Eötvös University of Budapest. He is currently the chief developer and system administrator of TAKARNET system. He has planned the structure of DATR system.

Zoltán WENINGER

Zoltán WENINGER (50) has a degree in mechanical engineering (faculty of system organizing). He is currently the head of Centre for Land and Geoinformation Developments and Operation at FÖMI. He has participated in the establishment of computer based land registry from the beginning.

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