

THE ENHANCED INFORMATION SYSTEM OF THE CADASTRE OF REAL ESTATES OF THE CZECH REPUBLIC

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1 INTRODUCTION

The Enhanced Information System of the Cadastre of Real Estates of the Czech Republic („Enhanced Cadastre“) is nowadays the key development project of the Czech Office for Surveying, Mapping and Cadastre („COSMC“). Currently it also might be the most important Information Technology and Communication (“ITC”) project of the whole public administration in the Czech Republic. There have been many internal – “cadastral” - reasons for this project, which are discussed later. As the timing of the project falls into the time of the enormous changes in the world of ITC, which have started to influence the whole life of the society, the Enhanced Cadastre project is also the response of the COSMC to these new challenges

2 BACKGROUND OF ENHANCED CADASTRE

2.1 Cadastre of the Real Estates of the Czech Republic

The most important tasks of the branch of the COSMC are associated with the state administration of the Cadastre of the Real Estates of the Czech Republic („CRE“) and about 80% of the COSMC capacities are assigned to CRE tasks. The CRE is probably almost unique in Europe for the fact that it comprises both cadastre (a technical means) and land registry (a legal part) according a new cadastral legislation since 1.1.1993. Cadastral offices in cases of the entries of rights to the real estates (e.g. case of contract based transfer of the real property) act as a courts in many European countries. Entry into CRE is based on the decision of a cadastre office and new rights come into full force only after the entry into CRE is made. There is another type of registration into the CRE - record - when ownership and other rights are changed by the decision of court or other state administration bodies (heritage cases, restitution cases, results of land consolidation projects, etc.). Cadastral offices just check the technical correctness of documents in this case.

There was a huge increase of demands on the services of cadastral offices after the year 1989, ensuing mostly from the privatisation and restitution processes. In spite of the fact that even during epoch of centrally planned economy there was a system of real estate inventory with some cadastral features, it has been necessary to improve significantly this system in order to satisfy a new demands of the legal state and market economy. For these reasons a long term strategy of re-establishment of the Czech Cadastre was prepared in 1993 on demand of a Cabinet decree of the Czech Government.

2.2 The Conception of automated Cadastre of Real Estates (CRE)

This conception provides the strategic framework within which the modernisation of the cadastre has been taking place. The conception is supported by the Government of the Czech Republic (Decision 312, 16th June 1993). The conception of the CRE involves the establishment of the necessary legal environment for the cadastre, the establishment of procedural regulations and infrastructure, and the establishment of the cadastre based on two components of the Descriptive Information Files (legal and administrative part) and the Survey Information Files (map based description and cadastral map data). The conception also elaborates a step-by-step programme for the technical upgrading and data conversion from largely manual records to digital records (text and graphics). These aims of the programme may be briefly summarised as follows:

- Establishment of the necessary legal and regulatory framework,
- Procurement of the basic IT equipment for Cadastral Offices as a pre-requisite for the other tasks (1992-1994),
- Completion (data conversion) of the Descriptive Information Files at all cadastral offices. (1994-1998),
- Project of the Enhanced Information System of the CRE (1997-2000),
- Programme of horizontal control densification to allow new surveys to be tied to the national geodetic framework (1994-2000),
- Project of data conversion of the Survey Information Files into the Digital Cadastral Maps at all cadastral offices (1994-2006),
- Programme to support interaction with administrators of other components of the State Information System. (from 1998),
- Resumption of the new cadastral mapping project (after 2000).

Within this conception, there were recognised phases of the technical modernisation and other improvements needed to accomplish these aims, and the initial priority was quickly to put in place relatively simple technical systems to support the initial data conversion work, and support the immediate aims of the re-establishment of the cadastre, the support for restitution, etc. Later phases would build on this early work, improve data communications, system integrity, services and products and support electronic access through an enhanced version of the cadastre. This would ensure security of title, monitor and support land market activity, and ensure that a cost effective solution suited for the national needs is put in place.

From above listed tasks, the second one, the completion of the databases of Descriptive Information Files („DIF“) was the most important and demanded by the whole society, as the DIF play the crucial role for the security of titles, for taxation system, for land market etc. This project had progressed quite well and was accomplished successfully by the end of 1998. The increase of the volume of the database of CRE can be described by following table:

Central Data Base of CRE	Number of records in millions						
	by 31.12.						
	1992	1993	1994	1995	1996	1997	1998

Total number of records	29,1	32,1	38,1	45,9	53,5	64,8	78,4
From it about parcels	12,7	14,0	15,5	17,3	18,9	20,4	21,0
Owners	15,1	15,4	16,0	16,5	16,9	17,6	18,0
Legal relations	1,3	2,7	6,6	12,1	17,7	23,9	27,9

Once the Data Base of DFI of CRE is completed, the next important project is the implementation of the Enhanced Cadastre. In 1993-94 a programme supported by both State budget and Phare ensured the purchase and installation of Local Area Networks (LAN) and network management software within the district cadastral offices. These systems are able to manage the basic land ownership information and support the data conversion into the Descriptive Information File (DIF) component of the Cadastre of Real Estates (CRE). There is also the Central Database of DIF, located in Land Survey Office, the historically the first one (origins in 1976), from which the systems of local data bases had to be derived. As that system had to be put into the operation very quickly, there had been no time for a substantial modernisation and therefore this system is unable to provide clients of CRE with smooth services, e.g. on-line access to the cadastre information. The current technology installed in the cadastral offices is only capable of supporting a relatively low level of data integration between the SIF/DIF, and from a security and integration point of view, the COSMC is aware that the development capability of the current system is severely limited.

3 REASONS FOR THE ENHANCED CADASTRE PROJECT

The initial reasons for this project can be therefore summarise as follows:

- current systems at both central and local levels suffer from following shortcomings:
 - limited capacity, not sufficient after completion of DIF databases,
 - costly maintenance of different environments at central and local levels, central data base is close to the end of life (operating and database management systems are not supported any more),
 - no possibilities to reach the same time of maintenance of central data base and local data bases. Central data base is upkept by the batch processing of change records, sent from local data bases twice a month,
 - insufficient security,
 - no possibilities for the remote access of clients,
 - insufficient compliance with standards, caused by the obsolete data structure (originated from the first one from 1976),
- renewal of technical infrastructure is needed anyway – the oldest PCs are from the 1993 year,
- the completion of the conversion of DIF enables for the first time in the history of the CRE a quite new solution – the remote access to the CRE data.

At the time of the commencement of the Enhanced Cadastre project the following main objectives of this project were outlined as prerequisites for the solution:

- to provide improved tools for the state administration of CRE,
- to remove all shortcomings of current system (capacity, security, standards),
- to provide an integrated environment for DIF and SIF and support for the other documentation of CRE,

- to provide unified environment for both local and central levels, interconnected by WAN,
- to ensure an improved accessibility for users / clients:
 - on-line access to cadastral information in country-wide scale, uniform information at given time from both local and central databases,
 - a possibility to get information about ownership from the whole territory in justified cases (e.g. police, courts, tax offices, etc.).

At the same time the main expected benefits of CRE EIS projects were defined in the spheres of:

- a reliable, improved, secure and long lasting tool for the support of carrying out the state administration of the CRE,
- a remote access to CRE data, which ensures the possibility to get a real time information. That means the lower necessity to deal with Cadastral Offices,
- the compliance with national data standards which ensures a smooth exchange of data with interested parties,
- a facilitation of the co-operation with the other state administration bodies - impact on taxes, land consolidation projects, courts and police dealing etc.
- a fast and smooth availability of cadastral data supports the development and operations of the real estate market, financial operations (e.g. granting of mortgages) etc.,
- an open and flexible solution, capable to accept changes in administrative division of country, legislation, etc.

4 PRINCIPAL FEATURES OF THE ENHANCED CADASTRE

The architecture and design of the Enhanced Cadastre has been determined after the thorough assessment of several possible solutions, which took place in stages of Global and Detailed Analyse. Not only cadastral bodies, but also relevant ministries were addressed during these stages and possible solutions were discuss with them.

4.1 The architecture of the Enhanced Cadastre

A client / server architecture has been chosen. There will be relational data base servers at all cadastral and branch offices and also at central system of the Enhanced Cadastre. WAN of the Enhanced Cadastre will interconnect the central and local workplaces. The local workplaces – cadastral and branch offices - will be, in the compliance with the legislation, the primary points of the administration (maintenance) of CRE. All changes will be in the real time replicated into the central database, which will be therefore up-to-date. The reasons for such a solution (the optimum in the Czech conditions) can be summarised as follows:

- the majority of demands at the local level can be satisfied from the local databases – minimising of the traffic on the Net,
- the pure central or distributed solutions are very vulnerable and increase the demands on the traffic on the Net,
- the central data base will be updated in the real time and will serve as the only point of connection with remote users – security reasons,

- as the graphical data (of Digital Cadastral Maps) will be stored also in the relational data base form, this solution enables to store all graphical data at central level, too – affordable demands on the traffic on the Net for updating of graphical data,
- the central data base will serve as the means of data exchange with the other state administration bodies (register of inhabitants, companies, etc.),
- the central database will serve as back-up for local data bases and vice versa.

The WAN of Enhanced Cadastre is based on ATM and Frame Relay services, leased from the Czech Telecom. Its logical topology is formed by the double star with main centre in Prague and the centres of the second order in the locations of the regional cadastral offices. The initial CIR is 32 kbps for local lines and from 256 to 1024 kbps for lines from regional offices to Prague. There will be a connection to the network of governmental bodies in Prague.

The whole environment of Enhanced Cadastre will be administered with the utilisation of software for the system management.

4.2 Functionality of the Enhanced Cadastre

Based on preliminary results of the project and tests carried out up to now, it can be concluded that all objectives of the project will be met.

The Enhanced Cadastre supports the whole administrative process at the cadastral office, inclusive of the accounting system and output of statistical data. Enhanced Cadastre enables to represent the state of art of CRE from the past and, strictly for the internal use and restricted number of employees, also from the future, e.g. results of projects of subdivision plans.

The most important features of the Enhanced Cadastre are as follows:

- a sufficient capacity for the increase of volume of cadastral data, ensuing mainly from on-going digitising of cadastral maps,
- a full integration of DIF, SIF and other parts of cadastral documentation; even graphical data will be stored in data base environment,
- a full compliance of data structure of Enhanced Cadastre with National Standards of State Information System,
- a smooth mutual data exchange with other relevant registers of the State Information System,
- a uniform application software environment for both local and central data bases,
- the central data base will be upkept through the replications of changes from local databases in real time; graphical data will be stored in the central data base, too
- the central data base will be the only point of connection for remote clients and via the central data base a country wide search and provision of cadastral information from the whole territory of the Czech Republic will be possible;
- the Internet is the environment for remote access of clients to cadastral data. The utilisation of Internet as a tool does not mean the open access to cadastral data. Client has to conclude a contract with the COSMC, in which, according to the nature of client, its remote access rights and authorisation are assigned. Each single client will receive its password. In the case that a client needs a multiple access, the proxy server must be used at the side of the client. From the technical point of view,

the remote access means will enable to retrieve essentially the same extent of information, inclusive of digital map data, as at the desks of cadastral offices. A simple browser is enough to retrieve the cadastral data, no special software is needed. Each client will get an account, the delivery of data by remote access will be charged,

- the security of system will be at C2 level with the E2 degree of warranty.

4.3 Technology infrastructure of the Enhanced Cadastre

With the only exception of different hardware for the central system and local workplaces the Enhanced Cadastre is based, on the unified technology tools for both levels:

- Oracle Enterprise Edition with Oracle Spatial Data Cartridge as a database engine,
- Oracle Application Server for the presentation on the Web,
- Bentley MicroStation SE, GeoOutlook and PowerScope as tools for different level of work with graphical data,
- CA Unicenter TNG for System Management,
- two clusters composed of two Compaq Alpha Servers GS60 with Digital Unix system, CheckPoint Firewall for central system of Enhanced Cadastre,
- Wintel platform (Intel based application and database servers and workstations with Windows NT operating system) for the local level of cadastral offices.

5 COURSE OF THE ENHANCED CADASTRE PROJECT

The preparatory works for the Enhanced Cadastre project started in 1995 and 1996, when the “Strategy of the COSMC in the field of cadastral information systems” and “Introductory study of Enhanced Cadastre” were worked out. As in-house capacities of the COSMC have not been sufficient for such a vast ITC project, a leading Czech software house APP Czech were chosen based on the result of an open tender for the System Integrator of the Enhanced Cadastre in 1996. The COSMC however decided, for some serious reasons, to keep itself a responsibility for a procurement of the needed hardware and basic software (e.g. database and operating systems). The System Integrator has the right to determine technical specifications of procured technical means.

The project itself started in July 1997 – half a year later then originally expected, as there were some (unjustified and unsuccessful) complaints against the result of the tender. The original time schedule foresaw to put the Enhanced Cadastre into operational run at all cadastral and branch offices by the end of 1999 year. The project had kept the pace with the schedule for more than one and half year. Some discrepancies between the interim results of the project and time schedule appeared in spring 1999, and these discrepancies were based on following facts:

- there were unexpectedly serious mistakes in first releases of the application software that prevented a smooth testing,

- when the COSMC and its experts had the opportunity to see and assess the system as the whole for the first time, it was found out that some functions did not meet expectations in spite of the fact, that they corresponded to the accepted Design of the system,
- there were some delays in the procurement of basic software and hardware, caused by the extremely long progress of some tenders, as additional time was needed to cope with complaints of the unsuccessful bidders. The worst case was the tender for the hardware for the cadastral offices, which lasted in total unbelievable 14 months!
- the decision (may be a little too ambitious) to solve all known weaknesses of the old system by the Enhanced Cadastre all at once has made this project really very complex one.

In late spring of 1999 it became obvious that Enhanced Cadastre project needed some additional time as the COSMC was not willing to compromise on the quality of the system. Therefore there was a decision made in the mutual agreement with the System Integrator to postpone the roll-out of the Enhanced Cadastre in order to ensure the needed quality of the system. An emergency procedure, enabling to correct mistakes and incorporate necessary changes into system simultaneously was agreed. According this agreement, the incorporation of changes and the correction of mistakes have been made in several stages according the importance of the applications in the question. At the same time, corresponding versions of the sub-system of migration (see below) have been delivered. The postponement of the roll-out of the Enhanced Cadastre has proved to be very beneficial for the project. At the same time it brought the necessity to incorporate changes ensuing from the Y2K problem in the old system. Its operational run after 1.1.2000 had not been expected originally and it meant the additional burden for the ITC teams of the COSMC.

Nowadays, the application software of the Enhanced Cadastre has been tested intensively at 13 pilot and test workplaces. Two cadastral offices run concurrently the old and new systems for the test purposes as an integrated test of Enhanced Cadastre. There has been a distinct progress in the quality of the system, although some improvements are still ahead of us. As the technology infrastructure of the Enhanced Cadastre is concerned, all parts were contracted and installed, at least partially (at some cadastral workplaces). All remaining parts will be installed by the end of June 2000 at latest.

According to the current time schedule of the Enhanced Cadastre project – the realistic one – the commencement of the roll-out is planned in the beginning of June 2000. There will be three more versions of the application software of the Enhanced Cadastre till the commencement of the roll-out. The roll-out will take place in nine waves of 10 – 15 workplaces till the end of October 2000. The trial partial run of the remote access services will start in August 2000. The part of the preparation towards the Enhanced Cadastre is also the training in the new system. The training will be carried out in two stages. Firstly, about 60 trainees will be train by the System Integrator. Then, step by step, these trainees will train employees of cadastral offices at the time of migration towards the new system.

The system of migration the cadastral data from the old system to the Enhanced Cadastre is relatively independent, but a very important sub-project for the success of the Enhanced Cadastre. It is very complex and has to incorporate a vast control system, as the Enhanced Cadastre uses completely new data model and structure. The system of migration has been tested and improved continuously since April 1999. Its versions have to correspond with the versions of the application software. There have been significant improvements in the efficiency of the migration system. Time needed for the automated data conversion for an average cadastral district has been cut from 10 days to two days. The system of migration was installed in February and March 2000 at all workplaces in order to start the trial migration. The purpose of the trial migration is to reveal all possible inconsistencies and errors in current cadastral data from the point of view of their migration towards Enhanced Cadastre. Errors will be corrected by means of the old system and the whole process will be repeated again and again till the time of the production (“sharp”) migration. It is necessary to make the process of the production migration as smooth and short as possible, because cadastral offices have to be closed during the time of the migration and will be able to provide clients with very limited services only. When data are migrated, the thorough inspection (verification) of the data in the Enhanced Cadastre structure has to be carried out. Only after the successful verification the director of the cadastral office in question can approve the utilisation of the Enhanced Cadastre. Of course, before the commencement of the roll-out, the Enhanced Cadastre has to be approved as a whole by the COSMC.

6 QUESTION-MARKS ENSUING FROM ENHANCED CADASTRE PROJECT

Question-marks mentioned in the title of this chapter do not refer to the success of the Enhanced Cadastre project. In spite of some difficulties and delays that have accompanied the Enhanced Cadastre project (and which are not exceptional in the comparable, huge ITC projects), the COCMC does believe in the success of this project. The recent progress of the Enhanced Cadastre project has justified this opinion. When implemented, the Enhanced Cadastre should bear a full comparison with similar systems in countries with fully developed market economy. At the same time the Enhanced Cadastre is an attempt to introduce a new type of services, distinctively oriented towards the needs and interests of clients, into environment of the Czech cadastre. The Enhanced Cadastre is both a challenge and possibility to improve significantly the position of the COSMC and the Czech cadastre in the Czech society. But there might be some doubts if the current arrangement of the COSMC will allow getting the possible maximum from this project.

The COSMC is the top state administration body depending fully on yearly determined state budgets and being liable to all limitations valid for the state administration (regulated number of employees, regulated salaries, etc.). Although the Czech Government has supported the Enhance Cadastre project (Cabinet Decree of November 1997), it has been extremely difficult and often impossible to obtain the needed level of funding from the state budget for individual years of the project. The Enhanced Cadastre will enable to decrease number of employees of cadastral offices in some time, but there is the necessity to increase the number of ITC specialists in order to ensure the smooth operational run of the Enhanced Cadastre. Recruiting of these people for state

administration bodies is very difficult, the private ITC companies still can offer better salaries. Both the preparation and operational run of the Enhanced Cadastre are rather costly and in order to cover these costs, it would be necessary to get a maximum income from the Enhanced Cadastre services. But, to fulfil this goal successfully it would deserve some skills and behaviour, which do not usually reside in state administration bodies or , e.g. skill in marketing (of cadastral information), to be capable of special approach towards separate groups of clients, to have the possibility of the preparation of value added products, etc. From this point of view, the rather rigid framework of the public administration does not create the best environment for the maximum utilisation of the new possibilities, which Enhanced Cadastre enables. The COSMC is aware of that fact and has started the strategy considerations concerning the new role and arrangement of the cadastral branch in the Czech Republic utilising also results of the projects of the international assistance. There have been two projects relevant in this respect. Firstly, there was the project of the co-operation with a Canadian company Teranet Land Information Service, Inc., Toronto, Ontario (1994-99). Secondly, the Phare project "National Cadastral Policy and Enhanced Cadastre", carried out by experts from The Dutch Kadaster in the years 1998-99. As both agencies have a very strong experience with implementing cadastral information systems and marketing of cadastral information, their recommendations will be taken into account during formulating the COSMC own strategy for the new Millenium.

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