

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

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SUMMARY

The project of the Information System of the Cadastre of the Real Estates of the Czech Republic (IS CRE) was carried out in 1997-2002. The IS CRE project brought a completely new solution in comparison with the old systems, basic features of which (e.g. data structure) originated from the first land information system (1976). The IS CRE is a uniform, comprehensive and countrywide information system, supporting all aspects of the administration of the Czech Cadastre. The IS CRE utilizes the client/server architecture. There are 111 local workplaces, administrating local databases, interconnected by WAN with the central database. Replications of changes from local databases are replicated in the real time into the central database, which is therefore up-to-date. The central database serves as the only point of a connection with clients using the remote access services to the cadastral data via Internet. Remote access enables to get the same extent of information, as at the counters of cadastral offices - also the data of digitised cadastral maps are accessible via remote access. The IS CRE project strived to remove all deficiencies of old systems and to reach a solution, corresponding to all contemporary demands just in one step and it made the project extremely complex and demanding. A special attention had to be given to the sub-project of migration of the data of previous system. There were some delays and difficulties during the course of the project. The rollout had to be postponed by almost one a half years, but nowadays the IS CRE is fully tuned and capable to cope with still increasing demands on the work of cadastral offices. In spite of the recent start of the operational run of the IS CRE (2001) the continuous support and development are necessary, as the IS CRE has to reflect the changes in the legislation and in the sphere of the State information policy, e.g. the just starting implementation of the e-government concept in the Czech Republic.

THE BRANCH OF THE COSMC

The Czech Office for Surveying, Mapping and Cadastre ("COSMC") is the supreme and independent body of the state administration in this field. The President, appointed by the Government of the Czech Republic and responsible only to the Prime Minister, heads it. The COSMC ensures the uniform performance of the administration of the Cadastre of Real Estates of the Czech Republic ("CRE"), establishment and maintenance of survey control, creation, updating and editing of basic and thematic state map series, standardization of names of geographic objects, development and maintenance of the Automated Information System of Surveying and Cadastre, documentation of results of survey activities. The COSMC also acts as the coordinator of the research and of the international cooperation in surveying and mapping, exercises controls over the Land Survey Office, over Survey and Cadastral Inspectorates and over Cadastral Offices, grants and withdraws special licences of surveyors, nominates administrators of basic and thematic map series and has some other

duties. The COSMC (78 employees) has its own chapter in the State budget of the Czech Republic.

Administration of CRE is performed by 77 cadastral offices in districts and their 34 sub-district branch offices in larger towns (5200 employees). Carrying out the administration of the CRE is the most important task and accounts for approximately 80% of all activities in the sector of the COSMC.

Land Survey Office apart from the duties in the field of surveying and mapping over the whole territory of the Czech Republic also performs the administration of the Central Database of CRE.

Seven Survey and Cadastral Inspectorates (90 employees) supervise the performance of cadastral offices and those activities of private companies and licensed surveyors related to the state administration.

THE CADASTRE OF REAL ESTATES OF THE CZECH REPUBLIC

There are two main parts of the Cadastre of Real Estates of the Czech Republic (“CRE”):

- Descriptive Information Files (“DIF”) – “written part of CRE” - consist of records on territorial and cadastral units, parcels, owners, rights, encumbrances, mortgages, etc. DIF have been fully computerised since 1998.
- Survey Information Files (“SIF”) – mostly represented by cadastral maps. Cadastral maps are either in an analogue form (about 78% of the territory) or in a computerised form – Digital Cadastral Maps (“DCM”) – about 22% of the territory. Digitising of cadastral maps should be finished by 2008. Cadastral offices administrate cadastral maps, but private licensed surveyors provide cadastral offices with data for the maintenance of cadastral maps in the form of so called Geometrical Plans.

The CRE comprises both a classical cadastre (a technical tool) and land registry (a legal part) according to the new cadastral legislation since 1.1.1993. Cadastral offices in cases of the entries of proprietary and factual rights related to the real estates (e.g. a case of the contract based conveyance of a real property) act as courts in many European countries. Entry into the CRE is based on the decision of a cadastral office and new proprietary rights come into full force only after the entry into CRE has been made. There is also another type of the registration into the CRE - a record - when proprietary and other factual rights are changed by a decision of a court or other state administration bodies (inheritance cases, restitution cases, results of land consolidation projects, etc.). Cadastral offices in cases of records just check the technical correctness of documents. This joint administration of both legal and technical parts of land administration in one system brings extended demands on the complexity and accuracy of a supporting information system.

HISTORY OF THE COMPUTERISATION OF THE CRE.

The utilization of computers in the field of land administration has a long tradition in the branch of the COSMC. The first countrywide automated system started in 1976, based on the file and batch processing on mainframes in 7 regions. Further changes followed (1986 centralisation, 1991 a shift from file processing to IDMS database system), but the main features, the data structure and utilization of mainframe, stayed almost the same and the system was not productive and flexible enough to support a huge increase of demands on the services of Cadastral Offices after the year 1989, ensuing mostly from the privatisation and

restitution processes and a development of the real estate market. Moreover, not a cadastral or land registry system, but only a system of Real Estate Inventory was used between 1964-92. The Real Estate Inventory system was mostly oriented towards demands of the centrally planned socialistic economy and agriculture and only “usership” large parcels, created by the forced socialisation of the agriculture, were registered and maintained. When the CRE came into existence, the only possibility was to take over the data of Real Estate Inventory system as being the data of the CRE. There was a necessity to complete these data by capturing of missing detailed data on ownership. This completion of DIF was planned and also carried out during 1994-98. It was obvious that the old central system was not able to satisfy new demands. In 1992 the COSMC reached the decision to provide Cadastral Offices with basic computerisation (Local Area Networks of PCs and simple programming system for PCs, linked to Central system), as the only possibility how to enable Cadastral Offices to cope with new tasks. During the years 1992-1994 all cadastral offices were equipped with LANs of PCs and a programming system for LAN of PCs was introduced. Its data structure was derived from the Central System. It was the only realistic possibility at that time, but it meant a postponement of a final solution of known disadvantages of the old system until later, after the completion of the DIF data.

INITIAL CONDITIONS OF THE IS CRE PROJECT

Therefore, the starting position for the preparation of the IS CRE in the year 1996 and also the reasons for its development can be therefore summarised as follows:

- Current systems at both central and local levels suffered from the following shortcomings:
 - Limited capacity, not sufficient after the completion of DIF databases,
 - Costly maintenance of different environments at central and local levels, central database was close to the end of its lifespan (operating and database management systems were not supported any more),
 - No possibilities to reach a simultaneous time of maintenance of central database and local databases. Central database was maintained by the means of the batch processing of change records sent from local data bases twice a month,
 - Insufficient security,
 - No remote access facilities for clients,
 - Insufficient compliance with standards, caused by the obsolete data structure (origins in the year 1976),
- Renewal of technical infrastructure would have been needed anyway around the year 1999 – the oldest PCs were from the 1992 year,
- Completion of the conversion of DIF will enable - for the first time in the history of the CRE - a quite new solution – the remote access to the CRE data.

GOALS AND EXPECTED BENEFITS OF THE IS CRE

At the time of the commencement of the IS CRE project the following main objectives of this project were outlined:

- To provide improved tools for the state administration of the CRE:

- To remove all deficiencies of the current system (capacity, security, standards),
- To provide an integrated environment for DIF and SIF and a support for the other documentation of the CRE,
- To provide a unified environment for local and central levels interconnected by WAN.
- For users / clients:
 - On-line access to cadastral information in a country wide scale, the uniform information at given time,
 - Possibility to get information about an ownership from the whole territory in justified cases.

At the same time the main expected benefits of the IS CRE project were defined in the spheres of:

- Remote access to CRE data, a possibility to get real time information, a restricted necessity to deal with cadastral offices,
- Facilitation of an exchange of data with clients by a strict adherence to national data standards,
- Facilitation of the co-operation with the other state administration bodies – an impact on taxes, land consolidation projects, courts and police dealing etc.,
- Real estate market, banks etc. – a faster delivery of reliable data (e.g. for mortgages),
- Open and flexible solution, capable to accept changes in the territorial division of the country, legislation, etc.

THE COURSE OF THE IS CRE PROJECT

The preparatory works for the IS CRE started in 1995 and 1996, when the “Strategy of the COSMC in the field of cadastral information systems” and “Introductory study of IS CRE” were worked out. As our in-house capacities were not sufficient for such an immense project, a Czech software house APP Czech (nowadays NESS Czech) was chosen by an open tender in 1997 as a supplier of the system integration of the IS CRE and the IS CRE project itself started in June 1997. In spite of the fact that the contract with NESS was called “system integration”, the COSMC however had for some serious reasons to reach the decision, to keep itself the responsibility for a procurement of the needed WAN, hardware and basic software (e.g. database and operating systems). NESS had the right to determine technical specifications of procured technical means.

According to the contract with the system integrator NESS Czech, its main responsibilities were:

- Design of the complete system, including of the sub-system for the migration of data from old systems,
- Delivery of the application software,
- Delivery of technical specifications on WAN, hardware and basic software. The COSMC was obliged to stick to these specifications at open tenders for hardware and basic software,
- The integration of all parts of the IS CRE into a complete and functioning system,
- The implementation of the IS CRE, based on the prepared installation of hardware and basic software,

- Training of users, etc.

The project of the IS CRE followed one of the usual methodologies of IS. Main stages of the project were:

- Global Analysis
- Detailed Analysis and Design
- Design of Technological Architecture and the determination of specifications on hardware and basic software,
- Programming and delivery of applications, including of the sub-system for migration,
- Testing
- Training of trainees
- Pilot runs
- Rollout (implementation) of the IS CRE
- Post-implementation check and tuning.

Simultaneously, after the delivery of the specifications, several open tenders, managed by the COSMC, were carried out for e.g. a database engine, tools for spatial data, a system management, and a central and local hardware.

The COSMC's original estimation of the length of the project was 3 years – 1997 to 1999. But the project itself started only in July 1997 – half a year later than originally expected, as there were some (unjustified and unsuccessful) complaints against the result of the tender for system integrator. To put the IS CRE into the operational run before 1.1.2000 was important, as the old systems suffered by Y2K problem. For this reason, both the COSMC and NESS agreed on a very ambitious and shortened only to 2.5 years time schedule of the IS CRE. The project had kept the pace with this time schedule for about one and half years. Some discrepancies between the interim results of the project and the time schedule appeared in winter 1998 / spring 1999, and these discrepancies were based on the following facts:

- There were unexpectedly serious mistakes in the 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 the basic software and hardware, caused by the extremely long progress of some tenders, as the additional time was needed to cope with complaints of the unsuccessful bidders. The worst case was the tender for the hardware for cadastral offices, which lasted in total unbelievable 14 months,
- The decision to solve all the known weaknesses of the old system by the IS CRE all at once had made this project really very complex one.

In the late spring of 1999 it became obvious that the IS CRE project was in the need of 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 rollout of the IS CRE 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. The postponement of the rollout of the IS CRE proved to be very beneficial for the project, but at the same time it brought the necessity to incorporate changes ensuing from the Y2K problem in the old systems.

The process of step-by-step corrections of mistakes and also incorporations of necessary changes, ensuing from the newly passed legislation, accompanied by testing, was repeated in

several waves in 1999 and 2000. A sub-system of the migration was corrected and tested simultaneously; as both systems had to correspond in order to enable testing.

Simultaneously with these tasks towards the improvement of the IS CRE, the sub-system of the migration was installed in February and March 2000 at all workplaces in order to start the trial migration. The system of the migration of the cadastral data from the old system to the IS CRE was relatively independent, but for the success of the IS CRE a very important sub-project. It was very complex and had to incorporate a vast check system, as the IS CRE uses a completely new data model and a structure. The system of the migration was tested and improved continuously since April 1999. The purpose of the trial migration was to reveal all possible inconsistencies and errors in the current cadastral data from the point of view of their migration towards the IS CRE. All discrepancies were assessed thoroughly in order to determine if it was less time consuming and possible to adjust the sub-system of the migration or to correct the data in the old system. The whole process was repeated again and again till the time of the production migration. It was necessary to prepare the process of the production migration as smooth and short as possible.

All the technical infrastructure of the IS CRE was ready by June 2000. The improvements of the IS CRE allowed realizing a pilot run of the IS CRE in summer 2000, when the IS CRE and the old systems were run concurrently at seven cadastral offices and outputs were mutually checked. As we were not fully content with results, the pilot run was repeated in autumn 2000. Based on the acceptability of the second pilot run, the decision leading to the rollout of IS CRE was reached in December 2000. It did not mean that system was without minor insufficiencies, but these could be removed in the course of implementation or at further versions of IS CRE.

The rollout of the IS CRE itself commenced in February 2001, when first three cadastral offices carried out the implementation of the IS CRE. The process of the implementation consisted of the following main parts:

- End of the operational run of old system, a backup of data and putting data into an interface for the migration,
- Check of the technological infrastructure,
- Installation of the IS CRE,
- Run of the sub-system of the migration of data,
- Verification of the data of the IS CRE,
- Training of employees, carried out at 23 temporary training centres by trainees, who passed the training courses realized by the system integrator,
- Initial transfer of the IS CRE data into the central database,
- Start of the operational run of the IS CRE, based on the decision of the director of a cadastral office.

The planned time for the implementation of the IS CRE at one workplace was 4 weeks, during them cadastral office had to be closed for public and was able to provide clients with very limited services only.

After the assessment of results at first three cadastral offices the mass rollout started in April 2001 and was carried in 11 waves per approximately 10 cadastral offices till the end of August 2001. The countrywide operational run of the IS CRE started on 2 September 2001. The pilot run of the remote access to cadastral data started even earlier, on 27 July 2001, when the cadastral data from about two thirds of the territory of the Czech Republic were accessible. The overall process of the implementation was quite smooth. The total volume of migrated data was about 70 Gbytes. A half of cadastral offices carried out the rollout in the

expected time, one quarter was faster, one quarter slower. Only one cadastral office had to use the emergency scenario and to return back to the old system temporarily. This cadastral office carried out the repeated rollout smoothly one month later.

THE SCOPE OF THE IS CRE PROJECT

The territorial scope:

One central database and 111 local workplaces (district cadastral offices and sub-district branch offices). In total, about 5200 employees of branch of the COSMC use the system for their daily work.

The Performance of the IS CRE:

During the year 2002, the first complete year of the operational run of the IS CRE, following cases were processed:

480 801 cases of entries of rights into the CRE

443 341 cases of records of rights into the CRE

1 518 721 printouts of cadastral information at desks of cadastral offices

2353 clients of the external remote access via Internet – 177 687 reports

103 972 reports of the internal remote access (via cadastral offices)

The financial scope (1997-2002):

The total cost, including of joint tasks of the development of WAN, e-mail and Internet services, etc. (1 EUR = 31.555 CZK):

System integration of the IS CRE: 7.9 million EUR

Basic software (licenses and support): 12.6 million of EUR

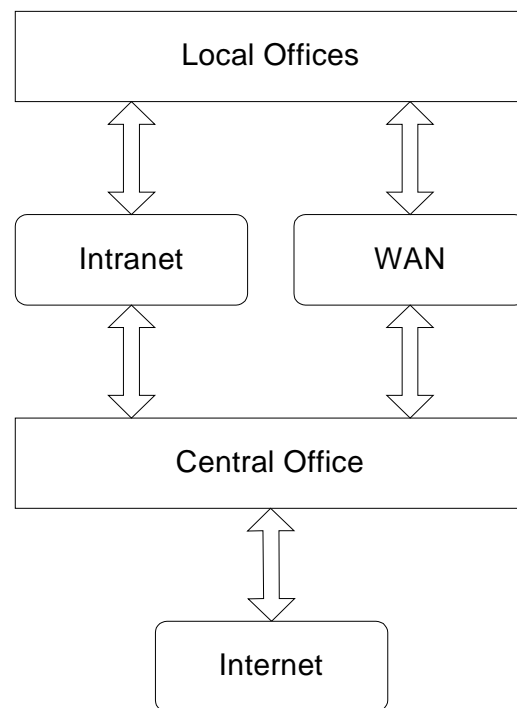
Hardware (central and local): 19.4 million EUR

THE ARCHITECTURE OF THE IS CRE

The technological structure goes arm in arm with the organizational structure. There is one central office and 111 local offices. All local offices are connected through the WAN with the central database. Every local site administers only its own part of data (data are divided to local sites on geographical base); the data are replicated to central database. The central database also provides local sites with the needful data from other regions than in their jurisdiction. This information serves to keep in the whole IS CRE the same content of codebooks, to utilize the same data about owners etc. A transfer is made via Intranet.

All changes are registered in the local site, the central database works (with a little simplification) only as a big storage.

In the central database there is also the unique point for the access to Internet for the whole

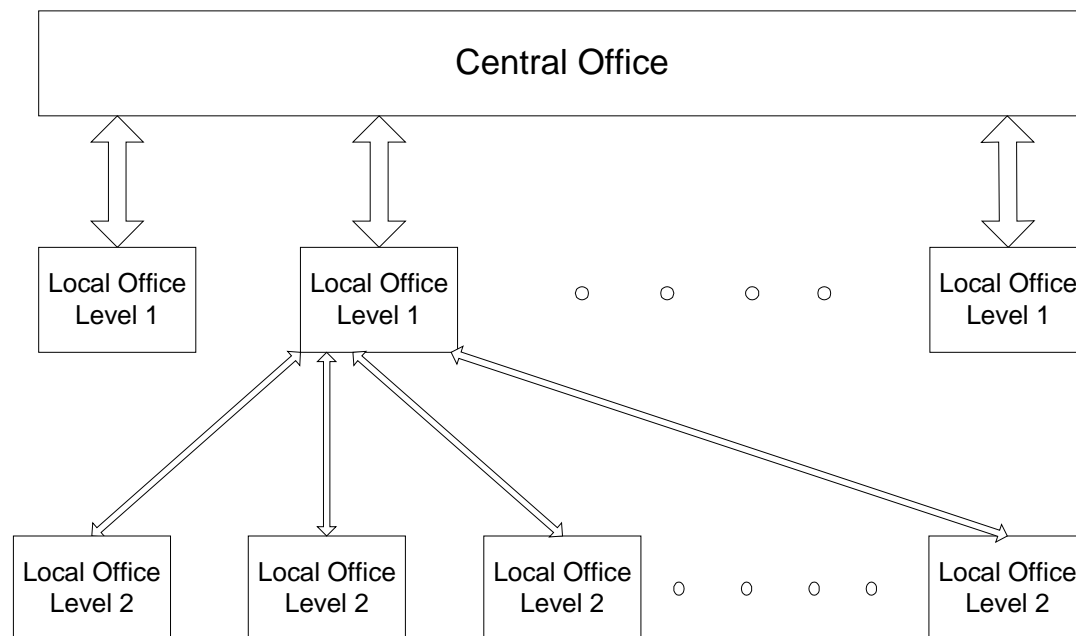


branch of the COSMC and the unique point of connection of external users of the remote access to cadastral data. The client/server architecture was chosen. There are a relational database servers at all cadastral and branch offices and also at the central system of the IS CRE interconnected by the WAN.

THE TECHNOLOGICAL INFRASTRUCTURE OF THE IS CRE

WAN

The WAN of the IS CRE 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 or 64 kbps for local (level 1) lines and from 256 to 1024 kbps for lines from regional offices (level 2) to Prague. There is a connection to the network of governmental bodies in Prague.



The whole environment of the IS CRE is administered with the utilisation of software for the system management. There are also the Help Desk services, both internal and external.

THE HARDWARE AND BASIC SOFTWARE

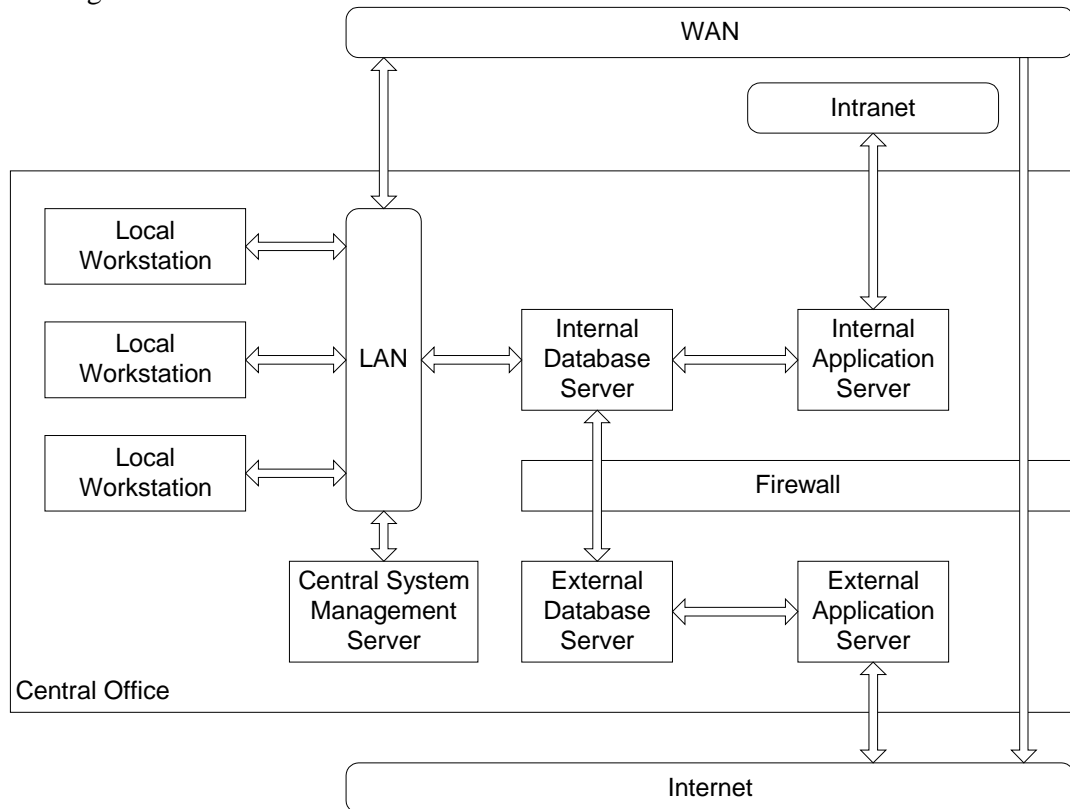
The IS CRE is based, with the only exception of different hardware of the central database and local workplaces, on the unified technology tools for both levels:

- Oracle Enterprise Edition with Oracle Spatial Data Cartridge as a database engine,
- BEA WebServer for the presentation on the Web,
- Bentley MicroStation SE, GeoOutlook as tools for different level of work with graphical data,
- CA Unicenter for System Management,

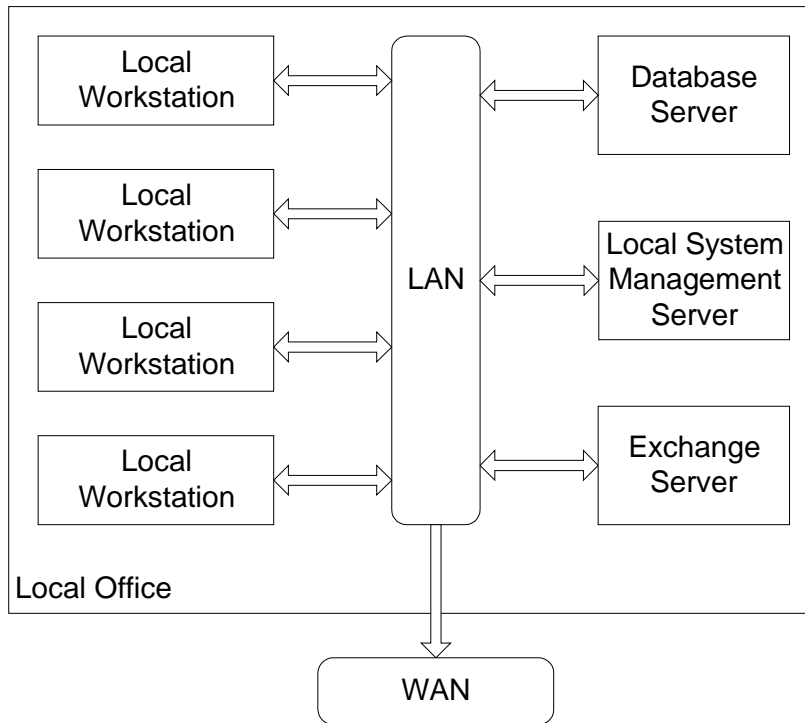
- Two clusters composed of two Compaq Alpha Servers GS60 with Digital Unix system, CheckPoint Firewall for central system of the IS CRE,
- Wintel platform (Intel based database, system management and Exchange servers and workstations with Windows NT/2000 operating systems, at least three servers at each site) at the local level of cadastral offices.

The central level - database and application servers (internal and external) are built as clusters. In case of the crash of one server, the other server takes over his role and supplies all functionality. There are some application clients working with internal database.

There is also Central System Management Server (Windows 2000). Local Workstations are running on Windows NT.



The local level - application clients are running on workstations with Windows NT. The database server runs also on Windows NT, management and Exchange servers run currently on Window 2000. Servers have different HW configuration depending on the size of the office.



BASIC FEATURES, ACHIEVEMENTS AND THE FUNCTIONALITY OF THE IS CRE

Based on the successful implementation and on positive practical results of the operational run at all workplaces, it can be said that all objectives of the project were met.

The IS CRE supports the whole administrative process at the cadastral office, inclusive of the accounting system and output of statistical data. The IS CRE enables to represent the state of CRE in 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 IS CRE has many new features that have brought achievements and new functionality for the everyday cadastre work. Main items follow:

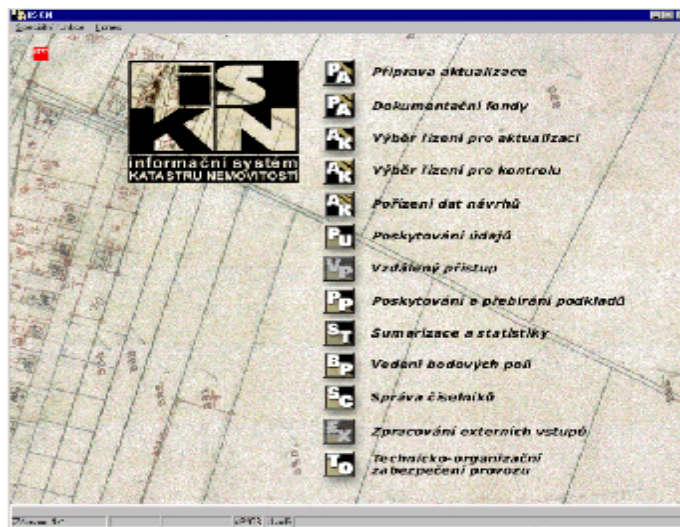
- Sufficient capacity for the increase of volume of cadastral data, ensuing mainly from on-going digitising of cadastral maps,
- Full integration of DIF and SIF in one database and integration of other parts of cadastral documentation; even graphical data are stored in database environment,
- Full compliance of the data structure of the IS CRE with National Standards of State Information System,
- Full uniformity of the IS CRE across the whole territory that is ensured by the remote installation of the application software for all workplaces at the same time and by the replications of the codebooks from the central database to all workplaces,
- Smooth mutual data exchange with other relevant registers of the State Information System,
- Co-operation with registers of inhabitants and companies,
- Uniform application software environment for both local and central data bases,

- Central database is maintained through the replications of changes from local databases in real time; graphical data are stored in the central data base, too,
- Central database is the only point of connection for remote clients and via the central database country wide search and the provision of cadastral information from the whole territory of the Czech Republic is possible,
- Environment for the remote access of clients to the cadastral data is Internet,
- Enhanced security of the IS CRE
- Possibilities to view historical and „future“ data, clients can be provided with the historical data (from the start of the operational run), too,
- Comprehensive and countrywide unified tool for the support of all aspects of the state administration of the CRE, including the dissemination of the cadastral data.

In order to reach the last achievement was necessary to built technological background in the broader extent than the IS CRE itself needed. It is possible to say that indirect achievements of the creation of the IS CRE, serving also for the other purposes, are:

- WAN,
- E-mail services,
- Access to Internet,
- Renewal of hardware.

A BRIEF DESCRIPTION OF THE APPLICATIONS OF THE IS CRE



The IS CRE has, as mentioned above, the uniform application software environment for both local and central databases. The differences are very small. The reason for small differences is some unique tasks that are executed in the central database (e.g. statistic tasks, searching for the ownership of some person across the whole territory of the republic, the administration of code-books, etc).

The entry screen of the IS CRE enables an access to all applications of the IS CRE. The access is further restricted by roles of employees, which are defined by the head of a cadastral office according to their tasks.

A brief description of all applications:

- PA - Preparation of maintenance
 - § Registration of proceedings, registration of “security seal” in cases of the ongoing change of legal relations, confirmation of Geometric Plans, administration of documentary files.
- AK - Maintenance
 - § Preparation of the design of a change, check of design, possibility to work with the „future“ state, confirmation of changes, redeployment of the change design from future to present- valid state together with redeployment of the current state to the historical one, maintenance of data.
- PU - Provision of cadastral data
 - § Provision of the data regarding the valid and historical state, data for Geometrical Plans (reservation of parcel numbers etc.), recording of provisions of data, fees.
- VP - Remote access (internal)
 - § Client’s account, setting up, administration.
- PP - Preparation and taking over of source data (e.g. results of a new mapping) via OEF and NEF }see below).
 - § Preparation of sources, reading from external sources, renewal of cadastral files, redeployment of a part of cadastral unit, change of boundaries of cadastral unit.
- ST - Summarisation and statistics
 - § Summarisation and statistics, sheets and records, source data for Economic Information System.
- SC - Administration of code-books
 - § External codebooks, internal codebooks central and local, import of codebooks and administration.
- EX - Links to external systems
 - § Reading of source data of territorial identification codebooks of quality of soil, checking of identification of natural (Register of Inhabitants) and legal persons (Company Register).
- BP – Control points
 - § Preparation of the design of a change, check of design, confirmation of changes and provision of these data.
- TO - Technical and organisational application
 - § Internal support of security and run, replications, prints.

THE ACCESS TO THE CADASTRAL DATA

The Czech By-law No. 162/2001 Coll., on Cadastral Data Provision, determines an access to the cadastral data. The By-law regulates types and forms of data outputs from the Cadastre of Real Estates inclusive of ways of payment for data provision.

There are main forms of data provision:

- Data files,
- Title deeds (public documents, recognisable by courts etc.)
- Exchange formats,
- Forms – printing outputs,
- Remote access.

The IS CRE supports all mentioned possibilities of a dissemination of the cadastral data.

EXCHANGE FORMATS – OLD AND NEW

The IS CRE offers two kinds of exchange formats. We use, for a better understanding between external users and cadastral offices, terms “old” and “new” format.

“Old” exchange format (OEF) was used during the run of the old systems and exports descriptive data in dbf files and graphical data into vkm file. OEF will be supported till 2004. “New” exchange format (NEF) exports descriptive and graphical data as one file. Compared to OEF we can find some advantages:

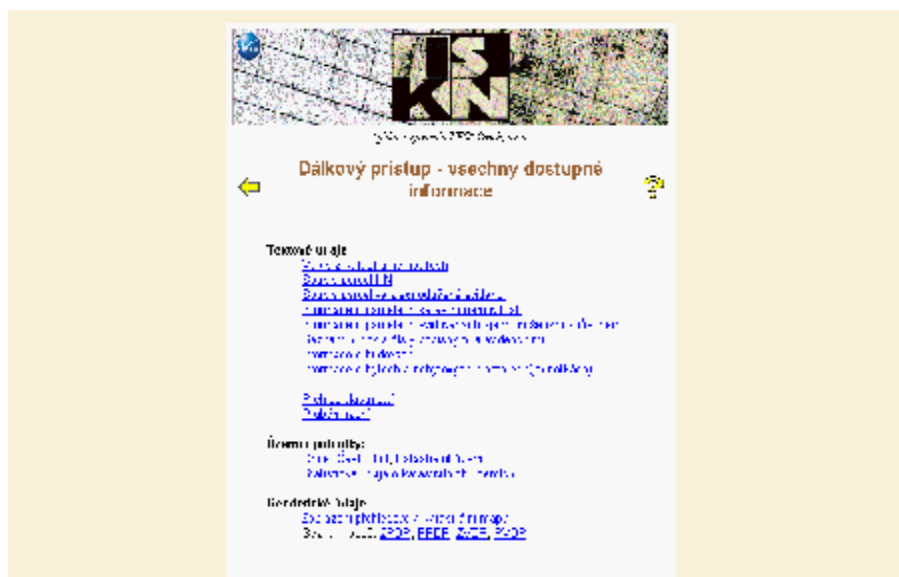
- NEF contains all digital cadastral data (DIF and SIF, data related procedures at cadastral offices),
- NEF has possibility to prepare the first export from any moment from the start of the operational run of the IS CRE (the 2nd of September 2001),
- By means of NEF only the changes of data from the given time can be exported,
- The processing of NEF is much faster then OEF as NEF corresponds to the data model.

THE REMOTE ACCESS TO THE CADASTRAL DATA

Remote access to the real estate data is a new category of the dissemination of the cadastral data. This possibility utilises Internet as a tool of the 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 is 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 enable to retrieve essentially the same extent of information, inclusive of digital map data, as at the counters 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 is charged.

Remote access to cadastral data (both descriptive and graphic) started in July 2001. The access is to the Central Database, which thanks to the data replicated from local databases is up-to-date. The security of the central database is protected by a firewall. Main clients are lawyers and notaries, estate agencies, banks and insurance companies, distraimers, private surveyors, valuers, and public administration offices. Data are provided by standardised services.

The remote access has two varieties – internal and external. Both of them use the same data and the same application. The difference is in connection to the central database. Internal users (cadastral employees) use internal WAN, external users Internet.



Examples of screens of the remote access (<http://katastr.cuzk.cz>)

The biggest advantages of the remote access are:

- Very good response time – in average an external user obtains result in a half of minute after the confirmation of his demand on his PC keyboard,
- Very “fresh” information – not older than 2.5 hours (in maximum), because 2 hours is limit for replication of changes in cadastral data from cadastral offices to the central database,
- Client can obtain basically the same data as at a counter of a cadastral office,
- Up-to-date and country-wide data are accessible, including of the data of digital cadastral maps (in the available extent),
- Printouts are not public documents – they have the information value only, but there are up-to-date,
- Printouts are equipped with time marks - time of last connection with local database so a client is aware of the time when the contents of the printout corresponds to the state-of art of the CRE at cadastral office,
- Clients at counters of COs can obtain cadastral data not only within jurisdiction of the cadastral office in question, but from the whole territory of the Czech Republic (information value only),
- Service is available for 7 days/ 24 hours,
- Free access to training system, a vast user documentation available on the web,
- Client does not need any special software, only common browser, available formats are pdf or html,
- Paid service, but very cheap - 50 CZK (about 1.5 EUR) per screen. The price of the output is reflected on the screen as soon as the demand is processed. Therefore a client can assess the price before opening an output – a protection against mistyping and wrong parameters of the demand.

The list of main categories of the cadastral data accessible via Internet:

- Basic information on the CRE:
 - Excerpt from the CRE (Title deed),
 - Drawing of cadastral and chart map,
 - Information on parcels.
- Information on procedures at cadastral offices (enables to find out the state-of-art of the processing of the separate case).
- Information for a client:
 - Access to the previous “printouts” for 24 hours after the processing without charging,
 - Information related to the client’s account,
 - Price list,
 - Change of the password.
- All accessible information (apart from possibilities of basic information):
 - Information on territorial units,
 - Information on buildings,
 - Information on apartments,
 - List of parcels,
 - List of building,
 - Overview of ownership,
 - Special data (e.g. for private surveyors).

PRACTICAL EXPERIENCES WITH THE OPERATIONAL RUN OF THE IS CRE

As stated above, the countrywide operational run of the IS CRE started on 2 September 2001 after a quite smooth implementation. The most important fact ensuing from more than one and a half years of the operational run is that the system is a robust one and has never broken down during this time. This does not mean that the operational run has not been without difficulties. First difficulties, connected with the needed performance of the central system, appeared just after the end of the rollout, when the performance of the central system showed a significant slow-down in cases of some demanding outputs, e.g. output of OEF. The COSMC promised to support OEF for three years after the start of the IS CRE in order to provide its clients with a needed time to incorporate NEF into their systems. But the output of OEF, thanks to a completely different data model of the IS CRE, deserves some “re-migration” of data and consumes a lot of computing capacity. Moreover, the demands on the quantity and types of outputs changed – increased – significantly during the time of the development of the IS CRE. Second type of insufficiencies concerned the efficiency of work and an occurrence of some minor mistakes in the IS CRE at the level of cadastral offices. In spite of huge testing of the system before the implementation, some mistakes and inconvenient response times of some tasks occurred during the operational run. The IS CRE is really a complex system and it had not been able to test all possible combinations of data and proceedings before the rollout. For these reasons, the COSMC did not accept these final stages of the project of the IS CRE, the acceptance of which was envisaged immediately after the rollout. Some emergency precautions were introduced at the level of the central database, e.g. a restriction to the necessary scope of the activities and the hardware of the internal cluster of the central database was later upgraded and the system corrected and tuned. Emergency procedures leading towards the improvement of the efficiency of the IS CRE were agreed with the system integrator. The IS CRE was corrected and tuned in several versions of its applications software. As a rule for the last two years, there has been a new version of the application software of the IS CRE every three months and these versions have incorporated both the corrections of mistakes (including tuning) and solutions for new demands. This effort to ensure the needed efficiency of the IS CRE was successful and the whole project of the IS CRE was accepted in September 2002. The employees of cadastral offices have also acquired the increased knowledge how to operate the IS CRE since its rollout and this fact has also contributed to the current ability of the IS CRE to support the administration of CRE in the full scope and in the needed and still increasing volume of work.

LESSONS LEARNT FROM THE IS CRE PROJECT

The IS CRE was the first ICT project of the COSMC that was carried out based on a contract with a private system integrator and therefore our first opportunity to get the experience with this type of project. Unfortunately, the IS CRE is by far the largest and the most important from all our possible projects – it would have been useful to get experience from a smaller project at first. Now we consider the IS CRE project as a very successful one, but we could avoid some mistakes and delays having had experiences we have now at the beginning of the project.

The first issue is the complexity and the extent of the project. We decided to move from older systems to a new system meeting all contemporary demands just in one big jump, not to proceed by leapfrogs jumps. We succeeded at last, but the project was very demanding and

complex. The extent and complexity of system brought extreme burdens on both the system integrator and the COSMC. Not always it had been possible to give the needed attention to all details of the project in right time and it caused difficulties later. It might have been better to create a core of the system at first and, after getting experience and having this core system installed and tuned, to enlarge this system towards less important functions.

The second issue concerns the way, how the system integration was defined. It was not possible, mainly for reasons connected with the funding of the system, to tender for full system integration – delivery of the system on the key. We had to keep the responsibility for the procurement of the hardware and basic software and to tender for them separately based on technical specifications determined by the system integrator. Going along this way, we were probably able to save a substantial amount of money. On the other hand, this solution brought heavy burdens on the mutual co-ordination of all parties involved, when the COSMC had to co-ordinate the installation of hardware and basic software with the course of the project. Some tenders appeared to be unexpectedly lengthy thanks to the unjustified claims of unsuccessful contenders and the length of some tenders almost jeopardised the course of the IS CRE project. Moreover and more importantly, the forced separation of the procurement of the hardware and basic software from the system integration caused big difficulties, when some mistakes after the incorporation of basic software into the system, especially Oracle, appeared. Suppliers of the hardware and basic software had the contractual responsibility only towards the COSMC. The system integrator had no contracts with suppliers, but he had the overall responsibility for the integration of basic software and hardware into the functioning system. All discrepancies had to be solved in “a triangle” – COSMC – NESS – supplier – and we had to act as a moderator and it was not always easy.

The system integrator (former name APP Czech, nowadays NESS Czech) is a good Czech software house, which was the clear winner of the tender in 1997. They had experience with large information systems, but they did not have any experience in the field of a land administration or a cadastre. They became aware of the full complexity of the CRE only during the course of the project. The COSMC had agreed to the proposed division of the project into stages of the project, but we found later that this division seemed to overestimate stages of the detailed analyse and the design and to underestimate stages of programming and testing. We also agreed to the proposed methodology of the project – basically “waterfall” methodology, when solution in a stage in question ensues from the accepted results of the previous stages. As stated above, both the COSMC and the NESS tried to shorten the time of the project and to put the system into the operational run before 1.1.2000, but finally we learnt that it had been the mistake. It meant that there was not time enough between the acceptance of one stage and the start of the next one, there had to be some overlaps. The worst case was probably the acceptance of the stages of the detailed analyse and design, which formed the starting point for programming. Thanks to complexity of the system there was not enough time for the thorough examination and moreover, it was not able to foreseen the real face of the system in some cases. Also NESS proposed a good solution from the point of view of pure informatics in some cases and unfortunately we let NESS to convince us that it would be the right solution, but later practical demands of the cadastre enforced the change. The discrepancies between the supposed functionality and the delivered functionality were discovered only in the stage of testing and to heal them cost both parties time and money. But both parties had in mind demands and the success of the project and both parties managed to find out an acceptable solution in all cases of difficulties. Nowadays the situation is far better; NESS is a real expert in the cadastre field and has a good understanding of demands ensuing

from the administration of the CRE. Based on the experience with the IS CRE project, we do not consider the “waterfall” methodology as fully convenient for such a complex system and we will demand to use another methodology, based for example on the acceptance of prototypes of solutions, in the future development of the IS CRE.

We think that the question of the cooperation with the system integrator is closely connected with previous issue. We managed to establish a good common cooperation at the level of project management. There were common the Executive committee at the highest level, the Steering committee for the coordination of work, the Commission for changes, the Quality committee, etc. But such a project as the IS CRE cannot be carried out without a deeper cooperation. We established a ring of consultants for separate applications, who assisted NESS and us at different stages of project – analysis, design, acceptance of stages, testing, proposal of changes etc. But as the COSMC itself is a rather small body – 78 employees in total, a department of informatics only 10 employees - we had to use experts from cadastral offices dispersed through the country. It was useful in the respect of the good knowledge of the cadastral work, but on the other hand, especially at the beginning of work on the IS CRE, these people had also another duties and were not able to give the needed attention to the IS CRE. Also, thanks to the dispersion of our resources, we were not able to put our employees into common working teams with the system integrator in his premises in Prague. Nowadays, we have managed to establish a development team, whose members will closely cooperate with the system integrator in the future as members of common, mixed teams. These people will not be responsible for the delivery of future solutions, but we expect of them to get a good detailed knowledge of the system and together with consultants, fully devoted to the work for the IS CRE, to correct any possible discrepancies of future solutions as soon as possible. Based on our experience, we consider a deep cooperation and an immediate correction of any irregularities as crucial factors of the successful delivery of systems without any delays and for a commensurate price.

PLANS FOR THE FUTURE DEVELOPMENT OF THE IS CRE

Now, after the completion of the IS CRE project in the end of 2002, the COSMC has with NESS only a contract concerning post-warranty support. Minor modifications of the IS CRE are also carried out under the umbrella of this contract. As the tender for the system integration took place in 1996 and the project was successfully finished, the COSMC, in the compliance with the Czech legislation has to launch a new tender for the future support and development of the IS CRE. This launch is planned in May 2003 and the expected length of a new contract is 3 years. In order to ensure the functionality of the system, the COSMC will determine an obligatory participation of NESS in the sphere of support of these parts of the IS CRE, which will remain unchanged during the course of the new project. The current post-warranty contract with NESS will be finished by the start of the new project.

Besides the support of the IS CRE, the incorporation into the IS CRE of following main changes is envisaged:

- Changes ensuing from the new legislation, both common, e.g. new Civic Code, tax legislation etc. and cadastral one. An amendment on the Law No. 359/1992 on surveying, mapping and cadastral bodies passed through the Czech Parliament in April 2003. According to this law, there will be substantial changes in the organization of our branch – there will be only 14 cadastral offices and some of current district and branch offices will become local branches of these 14 cadastral

offices. In spite of the fact that this change does not deserve an immediate reflection in the IS CRE, some accommodation of new responsibilities and tasks into the IS CRE will be inevitable in the near future. Also a new cadastral law, following the new Civic Code and a new definition of real property in it is foreseen.

- Changes ensuing from the common development in the State Information Policy. The Ministry of the Informatics of the Czech Republic was established on 1.1.2003. One of the main tasks of this Ministry is to introduce the concept of the e-government. One of the first tasks is the development of the Communication infrastructure of information systems of the public administration. The main tasks for the IS CRE will be an upgrade of our private WAN to this Communication infrastructure, an incorporation of the e-signature into the IS CRE and the incorporation of the exchange of data between public administration bodies based on XML format and a communication at the level “an application to an application”. Also the Portal of the public administration as the central point of a communication with citizens will be established and a common security policy of the Communication infrastructure introduced. A system of basic registers of public administration, in which the IS CRE will play a substantial role, is foreseen, too.
- Important tasks are connected with an upgrade of the technological infrastructure of the IS CRE. During the course of time some parts of basic software happened not to be supported fully by their suppliers, (e.g. Oracle version 8.06 that forms the database engine of the IS CRE) or their support will cease in the near future. The upgrade of the basic software is a very complex question due to mutual links and consequences towards the hardware. Therefore we will demand a deep analyse of this issue, which should determine the necessity of such an upgrade. The preliminary plans of the COSMC (have to be justified or corrected by the thorough analyse) are to carry out a minor upgrade towards supported versions in 2004 and to carry out the substantial change of the technological infrastructure in 2006-2007. This substantial change could also mean the move from client/server architecture towards a more modern one. Also a possibility, based on the highly improved functionality and capacity of communication means, to concentrate databases from all workplaces to only 14 future cadastral offices, has to be considered together with all consequences, especially towards the cost of such a solution. A renewal of the hardware of the IS CRE is also planned for 2006-2007; the envisaged funding from the state budget does not allow earlier exchange. We will observe closely the development in other countries, which are going to carry out the renewal of their land administration systems regarding the task of the modernisation of the technological infrastructure of the IS CRE.
- Changes ensuing from the internal tasks of the administration of the CRE. The main expected tasks are to incorporate the administration of digitised old maps dating from the 19. century (the scale 1:2880) into the IS CRE. This is not a big informatics issue; the IS CRE enables to administer precise digitised cadastral maps and will not deserve substantial changes, but primarily the methodology issue. The second main task is to evaluate possibilities to incorporate the Collection of documents in a scanned, digitised form, into the IS CRE – the cost

of the solution could be a main obstacle. There will be also minor improvements of the system, based on practical demands.

CONCLUSION

The COSMC considers the IS CRE project as a very successful one, in spite of all difficulties connected with the course of the project. The IS CRE itself is a well functioning system, supporting completely the administration of the CRE and includes also new tools for the dissemination of the cadastral data. We have acquired a lot of experience in all spheres connected with the development and the operational run of this project. We are willing and we will be pleased by the opportunity to share our experience with colleagues in other countries who can face the similar task. We will be also pleased to have the opportunity to get knowledge of the developments of similar information systems in other countries. We are especially interested in the technological background of such systems, which is developing rapidly and we may consider the necessity of the upgrade of our technological infrastructure in the visible future.

References

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Biographical notes

Vít Suchánek, MSc., graduated in surveying and mapping in 1968. Over thirty-two years of progressively advancing positions in programming and design of various cadastral and geographic related IT projects, management of IT and research and development projects and foreign assistance projects. Became director of the newly established the Department of informatics of the Czech Office for Surveying, Mapping and Cadastre in 1996. This department has been in charge of the IS CRE project.

Josef Jirman, MSc., graduated in surveying and mapping in 1976. About ten years of work as a land surveyor in mapping processes, next 7 years in managing of production and quality and in remaining time (10 years) dealing with the computerisation of the CRE and then with the IS CRE project in the Department of informatics of the COSMC as a project manager.

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