

# Real Estate Transaction Procedures in the Cadastre System of r. Macedonia

Vanco GJORGJIEV, Gjorgji GJORGJIEV, Naumce LAZAREVSKI, R. Macedonia

**Key words:** cadastre transaction, XML

## SUMMARY

The services that cadastre system in Macedonia provide, as a support of the needs for the public sector, private sectors and private persons, have long year of tradition and orientation toward permanent upgrading, reforms and redefinition of the relations and platforms initiated for effectuating legal and economical interests which users have. The procedures as a collection of functions for accomplishment of transactions of any kind, in the cadastre systems, especially services known as a services related with the cadastre procedures, are encumbered with great number of legal and technical documentation as well as participation of many institutions in the transaction process.

In this paper the procedures for transaction of real estate properties in the cadastre system of R. Macedonia will be elaborated concentrating on the processes and procedures which are most often used. The description of the transactions will be presented as a comparison between the existing processes and a new suggested model. The existing processes will be presented in general and the stress will be put on the new suggested solution. The conceptual model is defined as a schema of the cadastre transaction *Macedonian Cadastral Transaction Markup Language (MCTML)*, based on the simple principle that any transaction between the users and the cadastre system is accomplished through a data format define in MCTML.

The observation of these transactions has been made from a side of an external user, and from the side of a participant in the processes and user of these services. With intention to identify the crucial factors which make the services inefficient and to identify the readiness of the users to accept the new and more dynamic way of communication, a survey was conducted. General and the most important conclusions which emerged from the analysis of the survey results will be promoted in this paper.

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## 1. INTRODUCTION

The cadastre system of R. Macedonia is defined as an integral system of real estate, and from the aspect of organization it is a subsystem of Geodetic-cadastre information system. This system is established and maintained by Real Estate Cadastre Agency (RECA). Basically it is a system for registration and distribution of real estate data and ownership rights upon real estate. It promote the relation between **subjects** as a right holders and real estate as an **objects**. This basic relation, is considered as an foundation for definition and development of data frame of the system.

Basic principles of the real estate cadastre in Macedonia, have provide continuity of the events, authority and public services. The law regulations according which this activities are govern define cadastre as an public register for registration of real estate.

RECA as an successor of the State Authority for Geodetic Works, the only institution which have mandate to administrate with real estate, in 1980 has developed a data model and application with sequential database, which actually started the digitalization of the attribute data for real estate. Based on this data model in 1990 was finished the digitalization on the whole territory of the state. This data structure and data model with some minor technical redefinitions today is still used which emphasize the fact that for some time the offer for new and contemporary services stand still. It has to be notice that in the last few years RECA has started with the establishment of the new contemporary relation database for management of the attribute data concerning real estate and along side with it is going to be implemented workflow management for measuring the performance.

Governed by its own long year of research and experience the authors of this paper has made a study with the topic "*Development of progressive model for registration and distribution of the cadastre data in R. Macedonia*". In this paper a segments from this research will be presented. Comparative analysis of the Macedonian traditional cadastre system and other traditional cadastre system have been conducted, keeping the legal continuity and administrating with the data from the legal and economic system of the state, identification of the users, function and analyzes of the transaction procedures of the system. It should be stressed that suggested conceptual model is based on the principle "*data should be circulating between the institutions, not the users*" ...

## 2. IDENTIFYING USERS OF THE SYSTEM

Participants in the cadastral transactions depend on the type of transaction. Overall, participants in the transactions of the cadastre system are:

- external actors (initiate the transaction), and
- internal actors (RECA employees).

External and internal users of the services are identified as actors in the real estate cadastre, whose relationship to the level of activities and procedures are set within the separately developed Use Cases. As an external actors are treated participants by whom process starts or comes from to RECA, while internal actors identified as civil servants, as part of public administration, who make changes in the registered data. Identification of the external users was conducted by analysis of the developed UML diagram of activities. Each activity that ends at REC as an final actor, is treated as an action initiated by an external user. Based on this assumption the following external members are differentiated:

- owners of real estate (legal / natural persons)
- notaries, and
- private surveying companies.

In the period December 2008 - January 2009 there were conducted interviews/consultations with external and internal users, as well as observation of system levels of interest in the implementation of the transaction procedures. In that period transactions with the highest frequency were identified:

- KT1: Issuing a property certificate
- KT2: Issuing a copy of cadastre map
- KT3: Conveying of title to the real estate as total, and
- KT4: Conveying of title on the part of real estate.

Each of these transactions is a business process for Real Estate Cadastre Agency and conducted studies made a detailed description of each step in the execution of those transactions. The description of the transaction, considering the intention to accurately determine the actors and events in each transaction, aimed at:

- To provide a clear / understandable concept as could participants in the transaction be able to understand and accomplish there goals without extended knowledge of modeling system functions,
- To provide the identification of objects within the transaction by creators who do not understand the transaction.

The study, beside already explained segments, was designed to analyze the existing platform support, establish and suggest a new platform structure with intention to provide higher efficiency in the formation and distribution of the services by the cadastre system. The identified functions through the analyses which priority was given require technical updates and development of standardized procedures for their realization, those functions are the following:

- access the data from real estate cadastre database
- issuing data from the Real Estate Cadastre with legal validity (property certificate and a copy of the map)
- issuing the data from the Real Estate Cadastre and related databases for professional users,
- registration of the *draft for future changes* in real estate cadastre and verification of surveying projects.

### 3. FORMAT AND CONTENT OF THE DATA

Each procedure in the cadastre system begins with the filing of an application form by the client, but the execution of the request is confirmed with official confirmation to the client. The transaction process is conducted on analog media and analog communications environments. The study has seen the situation as inefficient. To be identified data requirements by data formats and quantities UML activity diagrams of the carried out activities were used to determine input/output moments for transactions with status of priority. Data formats at input/output moments, is defined by the legislation. Within the legislation opportunities are provided for accepting and issuing data in electronic form. But the absence of laws that would regulate in details the data structure, reliability and its validity contributes this option, although legitimate, remains only an option, and full implementation of the procedures are carried on analog records. Should be noted that the format and content of the output document, *property certificate*, although the analogous, is formed based on model and module data of this software platform for storage and manipulation of cadastral data. It is a standardized document that has legal executive power and recognition in the legal economic system of the state.

### 4. DISTRIBUTIVE ENVIRONMENT OF CADASTRAL DATA

RECA under existing law is established to "... Perform work for the establishment and maintenance of real estate cadastre ...". It was established with headquarter in Skopje and the regional departments are responsible for maintaining the real estate cadastre for a particular area or a number of cadastral municipalities. Data maintenance is done at the local level. Cadastral data can be found in the database that is updated in the local cadastral departments, and a copy of the data base at some time interval is distributed in the central database. This leads to the data dissemination, but unfortunately in the opposite direction of the ideal one.

Within a local cadastral department, database is set on the central computer. Access to that database, cadastral officers have through computer terminals.

This established data environment for distribution of cadastral data, at the time of its creation satisfy the technological capabilities and needs. Requirements of the users were limited to the regional level, and the access to the data was satisfactory. Negative side of this kind of organization is expressed as:

- There are 30 local segmented cadastral databases,
- inconsistency in procedures,
- inability to provide services from one place for the whole territory of Macedonia,
- Complicated procedures to protect data,
- Complicated procedures for sophisticated analysis of data.

Ideal situation would be:

- Data storage at central database (data center),
- Issuing cadastre information from any cadastral office,
- Update data according local jurisdiction.

The advantages of such an organization structure are: single database, standardized way to access large data and simplified procedures for protection.

## 5. SYSTEM INTEROPERABILITY

Interoperability of the system is necessary to enable its communication to other systems in both directions. This means, opportunity cadastre system to use data and services from other systems, and the principle of reciprocity, other systems to apply information and services from the cadastral database.

Data and services which can be provided by other systems, and are useful for the cadastre system are:

- data concerning the right holders, the database of the Ministry for internal affairs and database of legal entities of the Central Register of Macedonia,
- data about defined urban area within each municipality,
- data about agricultural land by the Ministry of Agriculture,

Data and services of the cadastre system are used by large number of institutions including:

- Ministry for Transport and Communications,
- Ministry of Local Government,
- Ministry of Agriculture,
- Municipalities,
- private companies for planning and development.

With the interoperability of the system, study provides insights of the purpose of creating links with other systems, applying the principle "*functions of one system to call functions from another system without human interaction*". It is understood that this principle has some conditions like "*creation of working environment initiates precisely definition of the working environment of the functions itself as well as exchange of these descriptions between systems*".

## 6. SURVEY OF THE USERS NEEDS

Satisfy the needs of users is a key factor for success of all organizations, and to RECA as part of public administration it is a factor of its existence. To meet someone needs, it is necessary those needs to be understand. Although it is generally accepted that "the customer is always right", observing the registration system customers large amount of dissatisfaction can be noticed. Dissatisfaction as a sociological phenomenon is not the subject of this paper, but the acceptance of the proposed method for communication with the registration system and increase the level of customer satisfaction is a measurable factor for success in conceptual design.

Identified needs of the actors of the system for registration of ownership in terms of everyday communication are satisfied with the previously established functions.

To examine the sufficiency of the offered functions and needs of new functions within this research a survey has been conducted. This research was conducted through direct contact and informal conversation, interviews and survey of identified users.

### **6.1 Definition of the survey**

Due to the specific needs of each type of user a special questionnaire sheet has been made. The conducted survey was expected to provide the current IT level of users knowledge and their willingness to use electronic services. The survey of individuals has begun to survey the users of the Centre for Real Estate Cadastre Skopje as users who need services of RECA. After receiving a number of negative answers to the questions "Do you use a computer?" and "Do you have an e-mail address?" has come to the conclusion that can not be provided with sufficient number of users that can be used for design of electronic services. Therefore, these two questions are dropped from the survey and the survey was placed on the website. The invitation to participate in the survey was sent via electronic mail, and the answer on the questions that were dropped from the survey was positive for each participant.

### **6.2 Results of survey of individuals**

Since the survey had received a total of 77 valid responses, and conclusions were obtained as follows:

- 65% of people surveyed in the past three years requested cadastre services and usually require insight into data, property certificate or a copy of the cadastre map.
- 85% use maps.google.com and GoogleEarth as online cartographical products, and 29% use other cartographical product presented on the web. This shows geospatial awareness of the users included in the survey.
- 92% of people included in the survey responded positively to use of electronic services through Internet and payment via internet.

The obtained results gave encouragement to develop electronic services to communicate with citizens. Answers which shows that 51% of the people included in the survey, have used internet to pay for some particular products shows that it is a popular method for obtaining goods and services. These findings encouraged the authors of the paper to develop an application for administrating cadastre services via internet.

### **6.3 Results of the survey point to private surveying companies**

Since the survey had received a total of 31 valid responses, and conclusions presented are based on empirical results as well as interviews with participants:

- private surveying firms are small with typically 2 to 3 employees,
- all employees have access to computers and are trained to use office software,
- using internet is very satisfactory. 77% of companies have Internet in the offices, all employees have at least one e-mail address (official or private) and 90% of the companies, if it is needed, communicate with clients via e-mail.
- using specialized software packages for surveying activities is limited to cadastral drawing. Formats as \*.dwg (AutoCAD) and \*.dgn (Microstation) are most often used.

CAD packages are used only as tools for drawing and only 20% of their functionality is used.

- the requirements that private surveying companies have from REC usually in average consist of 28 property certificates and 24 copies of the map. This figure, multiplied by the number of private surveying firms and single value of the service, shows a small financial effectiveness of these functions. However, the increased speed of data dissemination in case of electronic data exchange, contributes to other financial and organizational benefits.
- all companies expressed willingness to work with electronic data. Desirable way to communicate is as follows: with CD (55%), e-mail (77%) and only (3%) through the Web site. This shows ignorance of interactivity and opportunity for automation of the process in generating data. Knowledge of modern technologies for data exchange over the Internet exists, but there are not any application in practice.

Analyzing the obtained results, but mostly from direct contact with the cadastral companies impression has been made of the low level of IT awareness. There is technical equipment and opportunities for application of sophisticated technologies and methodologies, but the private sector is not yet aware of the possibilities and advantages from usage of electronic services. The application of CAD software to work with spatial data restricts data formats, but also facilitates its standardization.

There are accepted standards for drawing the spatial cadastral data made by REC, "Instructions for preparation of digital cadastral maps". This confirms the defined data model and provides a basis for design a format for data exchange over the Internet.

The application of tables in Microsoft Word for storage of alphanumeric data on property rights holders and real estate data shows very low level of preparedness for working with relational databases. This shows the need of creating a simple and understandable model and tool to fill this type of data. Also it is highlighted the inadequacy of legislation for the preparation of surveying projects. The format of data should be flexible as more as possible for possible changes in the future.

#### **6.4 Results of survey of notaries**

The survey was conducted in direct contact with the notary offices and obtained a total of 10 responses, the obtained results are:

- notaries offices are usually small with 3 to 4 employees,
- all employees have access to computers and are trained to use office software, the exploitation of Internet is satisfactory, 70% of notary offices have access to internet, employees have at least one e-mail address, and 60% of the notary offices, if it is needed, communicate with clients via e-mail,
- Some notaries offices use specialized software to prepare documentation and archiving of it,
- Notary offices express a willingness to use electronic services for review of property certificates and encumbrances via Internet, but wish to receive information in traditional way (sealed property certificate on paper).

Notaries offices in the process of transfer of property rights appear to control the encumbrances of the property which is subject to the transaction. It also appear in registering a facts and situations affecting the rights of ownership, and that is after the signing and completion of contract for transfer of property rights. Although they have technical skills and are willing to use electronic services in the described process, it is also noted repulsion to accept additional engagement concerning existing transactions.

## **7. CADASTRAL TRANSACTION**

A transaction represents integral part of consecutive performed operations. It means that the transaction will be executed only if all operations are successfully carried out. It is strictly defined, monitored and verified set of operations with intention to make transaction cycle consistent. Transactions as a cycle in the cadastre system is encumbered with strict legal and technical models of cadastre data and dynamic intensive approaches from external and internal users of the cadastre system. Due to diversity of cadastral systems in each country in the region and the inability to find a proper definition of Cadastral transaction in the literature we will define cadastral transaction as *"interaction between the cadastre system and any institution that has authorization to have insight or can take legal actions related with regulation of property rights and data upon registered real estate"*. By interaction means any contact of an external actor with cadastre system, and by authorization would be possibility to have insight and influence concerning rights on property by the notary or private surveying firms.

### **7.1 Geometric elements in cadastral transactions**

Geometric elements that are an integral part of cadastral transactions represent a set of graphical data which spatially defines the real estate property upon which the transaction is executed. According to the OpenGIS Consortium GML Specification, the smallest record registered in graphic database is a spatial entity. Rules of consistency regarding geometry data are very strict comparing the rules regarding the consistency of alphanumeric data. This comes from the reason that in the process of manipulation with spatial data there are many complex spatial relationships between entities that leads to a correlations of the records in the database. Each entity in the database of spatial data must be considered in relation to neighboring spatial entities, which is another reason to provide data relation consistency. At the moment of execution of cadastral transaction, each spatial entity must be marked, and algorithmically locked, as a part of the transaction, to ensure its consistency. This is provided by adding a status which indicates that on this record execution of transaction is in the process. Due to segmentation of the cadastre data on geometrical and attribute data for cadastral transactions that require changes on those two databases is necessary to ensure the execution or cancellation of the transaction depending on the success of the operations performed in those two databases.

### **7.2 Application of Cadastral transaction**

To execute cadastral transaction is necessary to be initiated by the identified external users with authorization at different levels of execution. The contacts comes from: property right holders, persons who can claim title but are not registered in the cadastre database, public

institutions, courts, citizens and professional and scientific organizations. External users submit various requests from the cadastre system. Concerning current cadastral system and basic operations for data manipulation all application forms coming to the system can be classified into one of the following groups: applications for issuing of data, registration of property rights as well as circumstances affecting property rights. Presented groups for data manipulation are described with syntax, and are successfully used for further conceptual design of the system. According to the descriptions of the functions defined as the needs of users, design of the system has been made from logical aspect by defining the privileges of groups of functions to certain databases. The design is shown in the following table where the column "S" – (Select) presents privileges for search, in column "I" – (Insert) are the privileges to create a new record and column "U" – (Update) show privileges for updating records. The possibility of erasing was excluded in order to preserve all the data, and validity of the data is provided by creating a time stamp.

Function	Database of right holders			Database of real estate			Database of spatial data		
	S	I	U	S	I	U	S	I	U
Search and read cadastre data	•			•			•		
Creation of the records for new real estate					•			•	
Management real estate data					•	•		•	•
Registration of real estate data		•	•						

## 8. CADASTRE TRANSACTION BASED ON THE WEB SERVICES

Web-based services have a standard interface for receiving and issuing data. The design of this interface is established by the rules for data dissemination over the Internet and principles for interoperability and security of services and data. The simple application forms are followed by parameters for search in the URL address and complex requests are executed by XML document with precise structure. Depending on the application, cadastral transaction can be synchronously or asynchronously executed.

With introduction of Web-based services and interpretation of records from XML file notaries will have updated data on real estate. Also, professional users that require spatial data from the cadastre system can use services like WMF and WMS and see the data in their GeoIS or CAD applications.

### 8.1 XML Scheme

Technical specifications of metadata containing the main elements of attributes, as well as basic and complexes of elements that could/should appear as a data structure are named as a "scheme". "XML scheme" describing XML document, typically expressed through the

constraints in the structure and content of the document and its syntax. The term *scheme* specifies application, format, rules for structuring and exchange of data within a strictly controlled environment. The full format of GML scheme can not be presented because it is going to take most of the space in this paper, but few examples will be given.

## 8.2 Application of GML Application scheme

GML application scheme was developed according to ISO 19118 standard for encoding spatial entities intended to provide: full compatibility of the proposed scheme with current trends, avoiding the needs for redefining the spatial specifications, enabling use of existing software solutions for data visualization and editing of spatial entities described in GML syntax. GML defines spatial objects by defining location, shape and position of the spatial entity. The location of the geometric objects in GML scheme is described by a set of coordinates:

```
<gml:coordinates> 45.67, 88.56 </ gml: coordinates>
```

The format for registration of the basic spatial object according GML scheme is presented below:

```
<gml:Point gml:id="p21">
  <gml:coordinates>492100.67,553892.56</gml:coordinates>
</gml:Point>
<gml:LineString gml:id="p21" >
  <gml:coordinates>
    492100.67,553892.56
    492150.87,553841.08
  </gml:coordinates>
</gml:LineString>
<gml:Polygon>
  <gml:outerBoundaryIs>
    <gml:LinearRing>
      <gml:coordinates>
        492100.67,553892.56
        492150.87,553841.08
        492030.17,552371.12
        492086.12,552384.84
      </gml:coordinates>
    </gml:LinearRing>
  </gml:outerBoundaryIs>
</gml:Polygon>
```

## 8.3 Application scheme of Cadastral transaction MCTML

Based on the developed conceptual model, the execution of any transaction between external users and cadastre system is supported by a unique record format. To define the record format application scheme of cadastral transactions will promote as:

### **MCTML = Macedonian Cadastral Transaction Markup Language**

All data sent or receive from the cadastre system is preserved under this scheme and files with such data have extension "\*. mctml". Each file in the header reference application scheme as:

```
<mctml xmlns = http://www.katastar.gov.mk
xmlns: xsi = "http://www.katastar.gov.mk/2009/XMLSchema-instance"
xsi: schemaLocation = "http://www. katastar.gov.mk mctml.xsd ">
```

where by <http://www.katastar.gov.mk> the space for the name of the objects is defined and as prefix is used mctml:. In addition, the definition of application scheme, following the lexical rules of the W3 Consortium, as the prefix for objects definition will be used xs:. MCTML scheme is a series of structured packages with a strictly defined form of application and data. Each packages is a separate data scheme to allow individual applications, simple manipulation, control and application in other similar shames. MCTML application scheme is an extension of the project made by the surveyor in terms of data exchange between external users and cadastre system. As individual entities or segments of application shame emerge: application form, current status of real estate, data from surveying real estate, transaction data and draft for a future changes concerning real estate.

#### 8.4 Basic data types in MCTML

Basic data types that appear in application scheme of cadastral transactions are same as the basic objects in the current cadastral system and there is always possibility for future upgrade if need is going to emerge.

##### *XS: Owner*

Owner or holder of title under the Law for Real Estate Cadastre can be any natural or legal person, local governments, and institutions at the central level. The full format of GML scheme can not be presented because it is going to take most of the space in this paper.

##### *XS: Property identifier*

As a unique identifier of real estate means a series of local identifiers that uniquely determines the real estate at the level of system/state. A combination of cadastral department, cadastral municipality and the number of the parcel within the cadastre municipality is the main identifier of a real estate. This identifier is necessary, and other identifiers of real estate are derived from it.

Just for clarification an example is going to be presented. The number of parcel within cadastre municipality in the Macedonian cadastre system can be 1231, if that parcel is going to be subdivided in two parcels then the parcels that are going to emerge from the parcel 1231 will get numbers as 1231/1 and 1231/2. The identifier of real estate defines certain limitations. Identifier of the real estate, the sub number (“/1” or “/2”) of the parcel can be avoid, as well as the number of building and number of distinct part of the building within a parcel which are created in a similar way. Thus a universal identifier of real estate is defined as uniquely describes any type of real estate. As a proposal for a model of identifier of real estate is following syntax:

```
# OPS: KOPS: BROJ: DEL: ZGRADA: ZGRDEL #
```

This model of identifier is suitable and unique for any real estate. OPS is a code of a region of the state under jurisdiction of a cadastre department and the code KOPS is a code of cadastre

municipality within that region. Moreover, those segments of the identifier that do not apply can be left empty. For example, plot number 518 in town Kratovo would have identifier # 14:013:518 :::#, a plot number 259/2 in municipality Karpos would have identifier 25:167:259:2::#. In this case, building number 4 within the same parcel would have identifier 25:167:259:2:4:#, and a separate part of the building marked as a 7 would have a apartment identifier # 25:167:259:2:4:7#. With such identifier, there is no limit on the number of characters that is applied and data selection in the relation databases is more simple.

#### *XS: Parcel*

The parcel as a basic unit which is defined with boundaries, despite the location has additional properties that define it as a spatial entity. The data that describe parcels is taken from the currently active database. The spatial elements are complex and are represented by at least one polygon encoded by GML application scheme and reference point (centroid) which is used for setting up the number of the parcel in visualization or printing of it.

#### *XS: Building*

Geometry of the building from the application pattern is presented with the footprint of the building on the ground, whilst balconies and similar extensions are not taken into account. The identifier for identification of the building is the same as the parcel only expanded with the number of building within the parcel. On this type of object a full topological control is applied to ensure that building is within the parcel in which it belongs.

#### *XS: Separate part of the building*

A separate part of the building, describes the inner part of the building. It is a space of the building that can be considered as a single unit within the building with a separate entrance. Particular for this spatial object is its numeration within the building, and it is presented in local coordinate system.

#### *XS: Geodetic Point*

Type geodetic point extends the basic geometric data types from the GML scheme with specific properties of the geodetic net in Macedonia. This type of data provides a basis for defining the geodetic net of different types. Data for the geodetic net in Macedonia are needed in the procedure of issuing the spatial data on real estate, as well as verification of geodetic reports.

#### *XS: Geodetic measurements*

Type of geodetic measurements is a complex data type in application scheme which contains two or more geodetic points with geodetic measurements between points.

#### *XS: Legal Base*

Legal basis is a special data type that should provide the basis for additional documents complementing surveying project. This type of data is determined to avoid the vacuum in the time frame between the full exchange of information in electronic form and hybrid operation with the mix of paper and electronic documents. The paper documents in electronic form is represented as a scanned document with supporting metadata information.

*XS: Application form*

Request for obtaining data from Geodetic – Cadastre information system is taken from the current work with paper documents.

*XS: Property certificate*

Property certificate is a sequence of data structurally organized into four segments, segment B and C describes the real estate, the data related with the right holders is presented in the segment A, and encumbrances in the segment D.

*XS: A copy of the map*

The data model which is used to print a copy of the map is integral part of properties such as parcels and buildings. It must be stressed again that MCTML application scheme is only a carrier of data and it does not contain mechanism for visualization.

Various types of copies of the map that are found in the present cadastral system is only a visual modification of the basic type by printing of one or more parcels and the ability to display grid with coordinates.

*XS: Current legal status*

Type *current legal situation* represents status of the group of real estate properties and right holders on those properties that are subject of change. The objects of this type of data are required at the time when work on surveying project starts and represents an extract from existing database that are subject to change. This type of data regarding content is very flexible due to large number of possibilities for combining of the basic data types.

*XS: Detailed data from the process of data acquisition*

The objects of this type are initiated by surveying companies that perform survey on real estate. It only describes the measurements upon real estate, measured detailed points but not real estate itself. Data on real estate are represented in other object of the type XS: NewSituation. These data is needed to control the measurement of private surveying companies in the case of a judicial expert evidence as well as stake out of the surveyed position on the field. As a data from geodetic net can be points from the current geodetic net as well as newly established point necessary for the surveying of the real estate.

*XS: Transaction*

Transaction data type identifies objects in digital surveying project aimed to describe the procedure for coming up from current situation in the base (mctml: CurrentLegalStatus), using geodetic measurements of real estate (mctml: DataAquisition) to new proposed situation (mctml: DraftForFutureChange). Transaction is a series of steps that are performed for the modification of current situation regarding change of spatial and descriptive characteristics of real estate in order to get draft for future changes.

*XS: Steps of transaction*

As a step in the transaction means a single operation by which the procedure goes from some previous into a new situation. The possible situations are: creating an object, change the

properties of an object, create two objects and delete an object. Depending on the type of object which is going to be changed the following transaction steps are possible: **Owner** (create record and change of data), **real estate** (create record, change of descriptive characteristics, change of the spatial data, subdivisions and the creation of two records and preserving/archiving the old record, and amalgamation by creation of a record with components of two old records and also preserving/archiving the old records), **property rights** (create record, changing data regarding property rights but also preserving/archiving the old records as a former situation) and **encumbrances** (create record, changing data concerning encumbrances, preserving/archiving of the old records). With the combination of these steps may be carried out all operations in the cadastre system.

#### *XS: Draft for future changes*

Conceptual proposal for a change should represent the scheme of XML data from the surveying project. Because the data structures described in the rules for maintenance of the cadastre of real estate can be fully modeled in XML scheme, a small modification to incorporate the principles of the W3 Consortium has been made. The data contained in the *draft for future changes*, are subject of control by the law and surveying expert to determine their relevance, reliability and compatibility with the existing situation in the databases. Moreover, this control is needed because execution of a transaction is time consuming and possible changes in relation to the existing situation in this database are possible. The most common changes during that time are expected in the number of parcels (if subdivision has been done), geometry of large parcels, etc.

## **9. CONCLUSION**

Application scheme to elaborate digital surveying project and data flow is presented. Presented types of objects are of a technical nature, and must be tested in practice, with intention weaknesses of the proposed model to be identified. Also, it is necessary certain objects to be precisely defined as well as list of possible situations.

Since the data it is going to be used by the private surveying companies as well as the cadastre as institution, it is important to strength the partnership between those two stakeholders. Several steps of the transaction process is done by the private surveying companies which require full involvement of the private sector in the creation of the this type of applications.

Proposal is given for introducing unique identifier for the real estate which is adopted to the current data model of the cadastre system and recommendations made by INSPIRE directives.

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## BIOGRAPHICAL NOTES

**Vanco Gjorgjiev** has a degree of Geodesy from The faculty for Civil Engineering in Belgrade where he also attended master studies and become Master of Science in 1992. He also become PhD in 1996. At this moment he is a professor at the Faculty for Civil Engineering – Skopje for courses related with GIS and Cadastre systems.

**Gjorgji Gjorgjiev** is an Assistant at the Faculty for Civil Engineering – Skopje. He is Master of Science in Land Management in 2008 at the Royal Institute of Technology, Stockholm. He has several engagements in the past related with the land management and GIS projects. His master research was mainly related with the 3D cadastre issues concerning Macedonian cadastre system.

**Naumce Lazarevski** is an employee at the Real Estate Cadastre Agency. He is a Master of science, graduated at The Faculty for Civil Engineering – Skopje in 2009. In his professional carrier has many engagements related with GIS project and projects regarding cadastre system. Currently he is a PhD student at the Faculty for Civil Engineering – Skopje.

## CONTACTS

Prof. Phd Vanco Gjorgjiev  
The Faculty for Civil Engineering - Skopje  
Partizanski odredi BB  
Skopje  
R. Macedonia  
Tel. +389 (2) 3116-066 ext. 249  
Fax +389 (2) 3118-834  
Email: vanco@t-home.mk

Ass. MSc Gjorgji Gjorgjiev  
The Faculty for Civil Engineering - Skopje  
Partizanski odredi BB  
Skopje  
R. Macedonia  
Tel. +389 (2) 3116-066 ext. 238  
Fax +389 (2) 3118-834  
Email: gorgi.gorgjiev@gmail.com

MSc Naumce Lazarevski  
Real Estate Cadastre Agency  
Trifun Hadzijanev 4  
Skopje  
R. Macedonia  
Tel. +389 (70) 529-069  
Email: naumce.lazarevski@gmail.com