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# MODELING REAL PROPERTY TRANSACTIONS WITH USE CASES

MODELIRANJE NEPREMIČNINSKIH TRANSAKCIJ S PRIMERI UPORABE

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## ABSTRACT

*This paper analyses land security management principles and practice in Slovenia (Si) by presenting a real property transaction example that is formally described and modeled as a use case. First the legislation settings and the description of the dual real property registration system in Slovenia are shortly outlined. Then use case descriptions and UML diagramming examples of a simplified real property transaction process are developed. The use case described is the sale of a whole urban built-up property with a detached house. Using the general-purpose object oriented modeling language (UML) and following the adapted system engineering methodology this transaction case is represented on several diagrams: package, class, use case, activity and sequence (interaction). The article concludes with the analysis of the process, discussion of security provision for this real property transaction case, time span of similar transactions and the reasons for possible delays. Some considerations for improvements and reduction of the time needed can also be derived.*

## KEY WORDS

**UML modeling, real property transactions, use case**

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## POVZETEK

*Članek analizira načela varnosti pri upravljanju nepremičnin v Sloveniji. Predstavljen je primer nepremičninske transakcije, ki je ponazorjen kot model primera uporabe. Najprej je pregledno podan sistem registracije nepremičnin in pomembne pravne podlage. Nato sledi opis primera uporabe in ustrezni UML-diagrami za poenostavljen primer nepremičninske transakcije. Obravnavani primer uporabe je prodaja pozidane parcele s samostojno stavbo. Z uporabo splošnega objektno usmerjenega jezika za modeliranje (UML) in sledeč prirejeni metodologiji sistemskega inženirstva so za podani primer nepremičninske transakcije razviti ustrezni diagrami: paketni, razredni, primerov uporabe, aktivnosti in zaporedja (interakcije). Članek na koncu podaja analizo poteka postopkov, varnosti in časovnega razporeda ter možne razloge za zamude pri tovrstnih transakcijah. Podani so tudi nekateri predlogi za izboljšave in možne časovne prihranke tovrstnih postopkov.*

## KLJUČNE BESEDE

**modeliranje UML, nepremičninske transakcije, primer uporabe**

## 1 INTRODUCTION

The Slovenian real property market has undergone substantial development in the recent decade. The actors in the branch have changed and professionalized, and the important regulations have

been renewed. Real property transfer procedures are prescribed through the legislation that is meant to provide transparency, simplicity and legal security. The state is responsible for the legal and regulatory framework within which the land market operates. Citizens, companies and other economic or juridical entities may own real properties or share them (joint ownership) without distinctive limitations. As Slovenia is a member of the European Union, its legislation is influenced by EU directives and decrees, but the real property legislation is not directly a subject of EU legislation. Such approach should contribute to the liberalization and harmonization of real property markets inside the EU.

The Law of Property Code distinguishes four possible real property acquisitions: by law itself (adverse possession), with the legal act (contract), by inheritance, and by decision of a state body. Besides the legal framework and market forces, a carefully harmonized real property policy should tend to level out some contrary interests. Figure 1 is an UML collaboration diagram that shows the basic principle of collaboration between the buyer and the seller, the main market actors, where, as it is well known, beside the property transaction process itself, the main complexity lies.



Figure 1: The basis of the property transfer principle on the UML collaboration diagram.

## 2 REAL PROPERTY LEGAL SYSTEM IN SLOVENIA

Cadastral systems around the world are clearly different in terms of their role, data structure, processes and actors involved. They are also organized in different ways, especially with respect to the real property registration principle. The International Federation of Surveyors (FIG) defines the cadastral system as a parcel-based and up-to-date land information system containing records of interests in land and buildings. It usually includes a geometric description of land property linked to records describing the nature of the interests, ownership or control of those interests, and often the value of the real property.

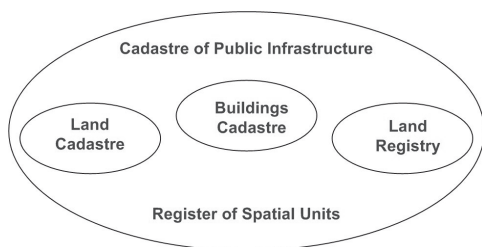


Figure 2: The structure of Slovenian real property registers.

Slovenian cadastral and real property registration systems are of German land tenure origin. The cadastre was established in the 19<sup>th</sup> century (1818-1827) for fiscal purposes. It includes the geometric presentation of land parcels on cadastral maps and descriptive records about the properties of the land parcels. The land registration system, which is a title registration system, was introduced in the second half of the 19<sup>th</sup> century (1871-1884). Both registers started to maintain their data separately in 1884. Over the last decade the Slovenian Surveying and Mapping Authority of the Republic of Slovenia also established the digital Buildings Cadastre, where all the buildings and their parts are registered in descriptive and graphical forms.

## 2.1 Slovene real property registers at a glance

*The Land Cadastre* is the official database on land parcels and is nowadays available completely in the digital form. The cadastral database includes technical data on land properties. Data about parcels provide their identification and spatial location, thus enabling the required support for the legal protection of real property ownership, which is registered in the Land Registry. The descriptive part of the Cadastre collects data on:

- each individual parcel (code of parcel number and cadastral municipality),
- the area of the parcel,
- its boundary markers and formed boundaries of the parcel,
- the actual use of land of the parcel parts,
- owners of the parcel (acquired from the land register database), and
- the administrator, if a parcel is owned by the state.

The graphical part of the Land Cadastre consists of cadastral map series, mainly in the scales of 1 : 2880 for rural areas and 1 : 1000 for urban areas. The links between the descriptive and graphical parts of the cadastral database are established by the identification number of each parcel. In 2008 Slovenia will introduce the new ETRS89 reference system in the Land Cadastre. This is not an easy task, especially taking into consideration that Slovenia's cadastre was introduced about 180 years ago with the surveying tools, methodology and accuracy available in that time. The cadastral database is constantly updated almost in real-time and overall data quality is further improved with modern measurement and processing methods.

*The Buildings Cadastre* is a database that contains relevant data on buildings and their parts. This information system is linked to the Land Cadastre and partly to the Land Registry database. The Buildings Cadastre database is still under construction and by the middle of 2008 it is expected to be completely fulfilled. In the Buildings Cadastre the descriptive data records about a real property include:

- the identification number of the building and all the parts of the building,
- the owner and administrator if state-owned,
- the location, surface area and shape,
- the floor plan of the building and
- the actual use.

The graphical part of the Buildings Cadastre shows the contour of each building roof adjusted to its floor plan situation with different floor layers included. The links between the descriptive and graphical parts of the database are established by the identification numbers of real property units.

*The Land Registry* is a public register, which includes all data about real rights on real properties. The content of the Land Registry is based on private transfer contracts certified by notaries or by court decisions. Registrations are done by application only. Rights on land that can be registered are: ownership, lien - mortgage, land debt, easements, right of encumbrance and right of superficies. The Land Registry database consists of the main register and collected documents (archives). The main register contains real property entries that include rights on real property, the persons entitled to these rights, legal facts and burdens. The Land Registry Act assures its juridical grounding and The Supreme Court of the Republic of Slovenia maintains the register. The actual land registries are part of the local courts. They are responsible for registration of properties in their district. The Land registry is characterized by two important legal principles:

- Changes of rights to a real property do not take effect before they are registered in the Land Registry.
- The correctness of all titles recorded in the register is assumed as actual, until otherwise proven.

In Slovenia the Land Registry and Cadastral databases are not integrated and although all data are in the digital form, the databases are also not directly interlinked. The traditional redundancy of data is also still present and the quality of data is not systematically considered yet. The recent project aimed at their integration strategy development (Harmonization of real property registers, 2006) failed and was abolished mainly due to the inappropriate project management approach.

### 3 THE MODELING APPROACH

The Unified Modeling Language (UML) is a general-purpose visual modeling language, which is used to specify, visualize and document the components of discrete systems (Rumbaugh et al., 2004). UML is the Object Management Group (OMG) industrial standard (current version 2.1). It is important to realize that UML and the methods that use UML are separate, but tightly related issues. UML is a standard modeling language and not a modeling method. It consists of a graphical notation, blocks and rules that the methods applied can use to express analytical results or designs concepts. Figure 3 is an UML package diagram example that outlines the main actors and systems involved in a real property transaction in Slovenia. This diagram depicts the template pattern for the transaction example described later in more detail.

Modeling is the process of model developing and is generally based on the chosen methodology, experiences and some practical constraints. Any model captures the important aspects of the problem domain from a certain point of view, and simplifies or omits the rest. Which ones are important is the matter of judgment that depends on the purpose of such models (Šumrada, 2006). Modeling is also a well validated and widely accepted engineering technique. It can also be used to handle the intricacy of real property transactions, which may be too complex to deal

with directly. Figure 4 is an example of a simplified UML activity diagram for the general real property transaction process with swim-lanes showing the main roles of actors and flow of their activities.

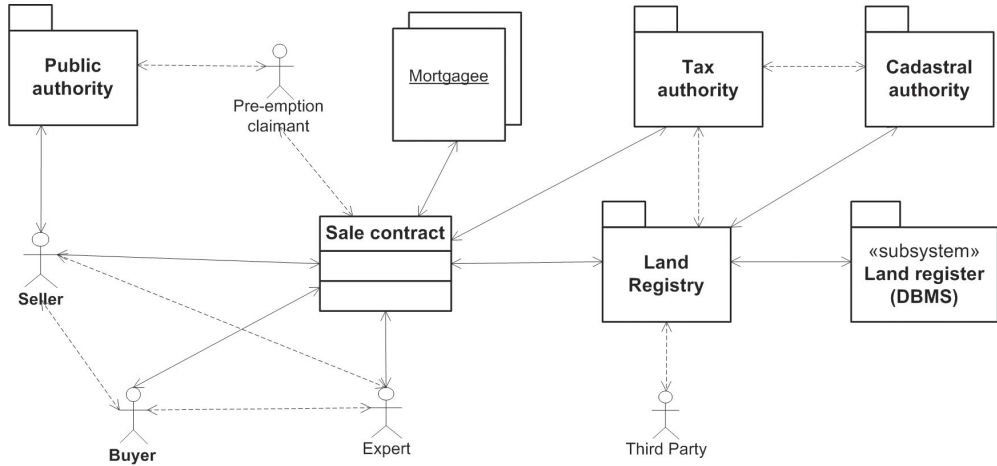


Figure 3: The actors and systems involved in a real property transaction (UML package diagram).

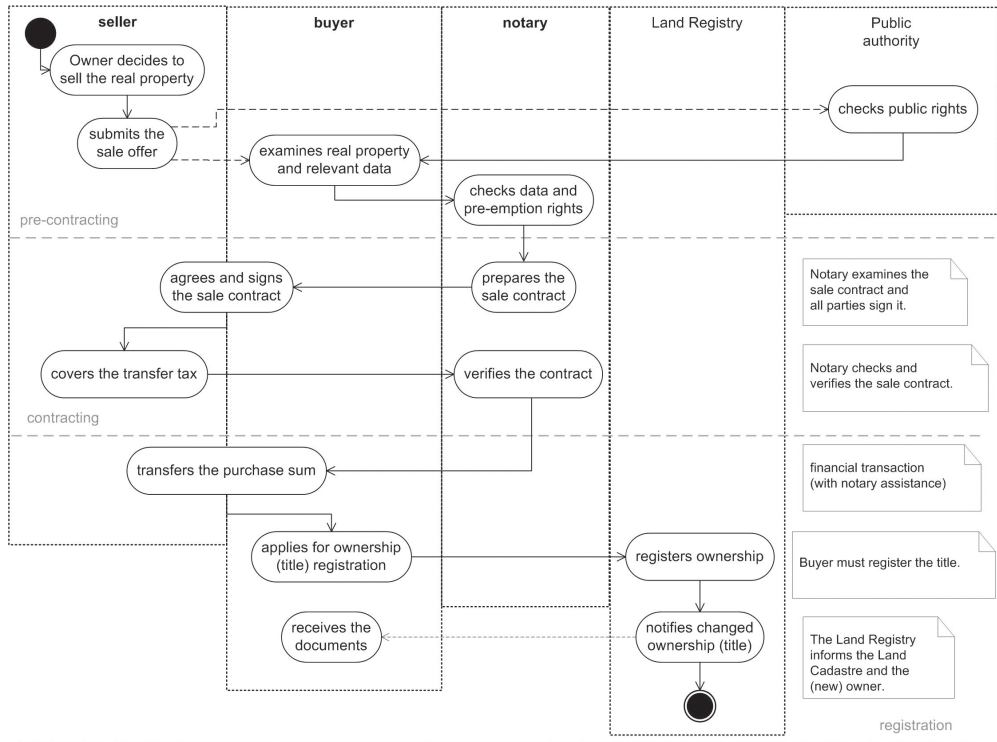


Figure 4: UML activity diagram with the roles of actors and flow of their activities.

Modeling the problem domain of real property transactions from several separate, but related, viewpoints permits us to conceive it and formally describe it for different purposes. The main issue is to develop or adopt a suitable method that is tailored for the conceptual modeling in the spatial data problem domain. Firstly, we outline the main steps of the applied object-oriented approach that we used for real property transaction modeling and analyses. The model development is based on use case analysis, classification of objects and their interactions. The methodology applied for real property transactions modeling consists of the following steps (Šumrada, 2005):

- Proficiency acquisition and problem domain analysis (internal view),
- Use case analysis and use case modeling (external view),
- Distribution of responsibilities (roles) and interaction modeling (data exchange and timing),
- Testing and analyzing of developed models.

#### 4 MODELING A REAL PROPERTY TRANSACTION PROCESS

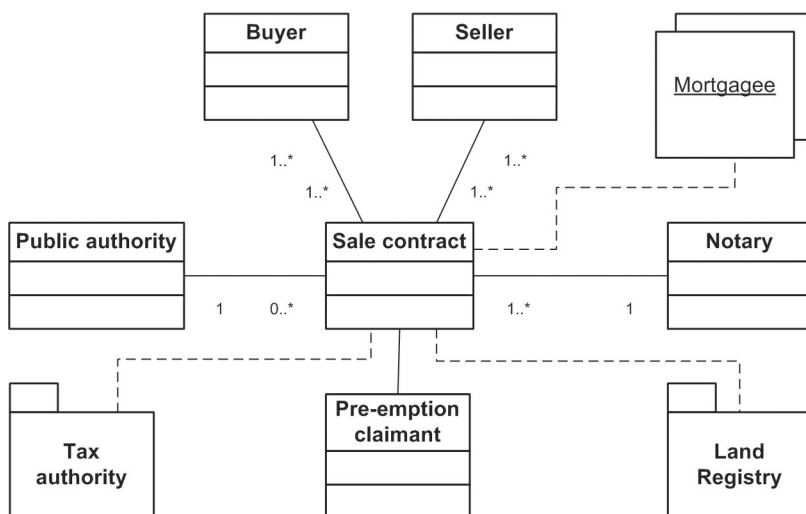


Figure 5: The main actors as classes on the UML class diagram.

Use case description and example diagrams for the typical real property transaction process are presented and elaborated to the appropriate detail. The transaction process is the sale of an urban built-up parcel with a detached house. Figure 5 is an example of UML class diagram outlining only the main actors as classes and the relevant outer systems. The simplification of the process should also be considered, to a certain extent, by leaving out the possible impact and consequences of easements and mortgages. The sequence of steps in the use case description and analysis is general. Many details are left out in order to keep clear the flow of the main activities.

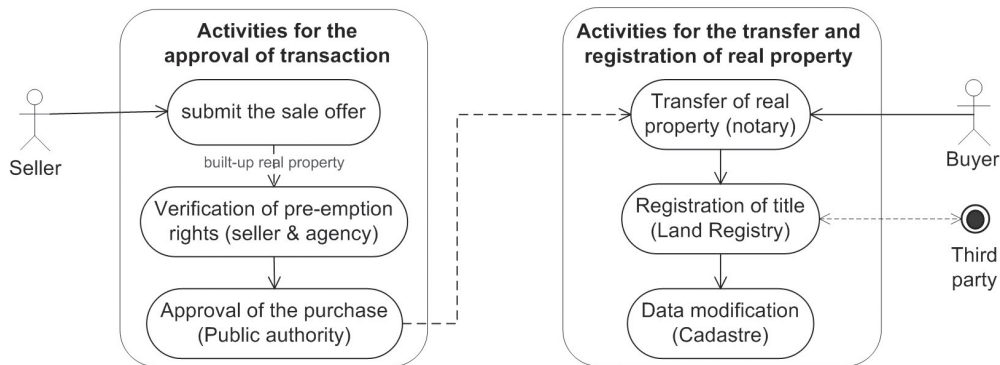


Figure 6: The two stage property transfer process on the UML activity group diagram.

The process of real property transaction examined can be divided into two distinct stages. The first part deals with the process of seeking the buyer, and in this step usually the support of a chosen real property agency is required. The list of pre-emption rights or other public interests, such as planning regulations, must be examined. The second part forms the property transfer activities and the new title registration in the Land Registry. The second part more or less follows a very similar pattern in most real property transaction cases, while the first part can differ because of the pre-emption regulations and also special planning restrictions for new built-up properties or planned sites. The differences in property value and the flexibility of real property market can introduce some significant local, though biased, impacts as well. Figure 6 depicts the two-stage property transfer process on the UML activity group diagram.

#### 4.1 Sale and approval procedure for the built-up property transaction

In the case of the sale of an urban built-up parcel with a detached house there are only few possible pre-emption rights beneficiaries. Such pre-emption claims are mostly related to special cases such as municipal pre-emption rights or long term lease holders of the real property (pre-emption rights for apartments). Special case restrictions also occur if the property is declared as a cultural or technical monument (pre-emption rights for cultural heritage). In the transfer case of a detached house the role and impact of mortgage foundations (banks) is also very important, but here we do not elaborate mortgage relations in more detail. The transaction of such real properties is normally guided by a real property agent, lawyer or notary. Figure 7 presents the sale process connected with the process of pre-emption determination for a built-up real property on the UML use case diagram. The list of pre-emption beneficiaries does not seem to be long, but the detailed rules for the pre-emption compliance are complicated and consequently other specialties are left out. The detailed relations and settlement of mortgagees are also not presented.



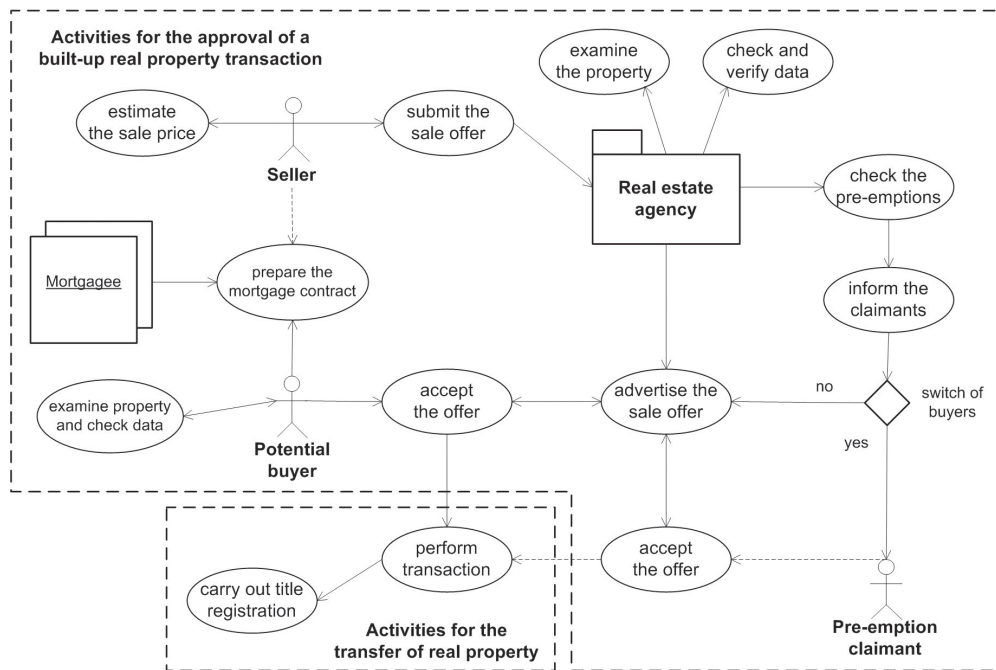


Figure 7: UML use case diagram for the process of pre-emption determination, public restriction compliance and sale activities for a built-up parcel.

The shortened use case description for the purchase of a built-up property is the following:

1. The seller (owner) starts the purchase process, estimates the sale price and usually chooses a real property agency.
2. The seller signs the contract with the selected real property agency, which is specialized in promotion of apartments and houses for sale and rent. The selected agency usually carries out the whole sale process. According to the Real Estate Agencies Act the highest commission for the sale transaction of a real property cannot be more than 4% of its contractual price with further limitations for extreme values.
3. The owner or usually the real property agency checks the pre-emption rights. If the pre-emption right exists, the offer is sent to the pre-emption rights beneficiaries. If the pre-emption rights claimant is a municipality, it has 15 days to reply and the physical persons have a 2-month period.
4. The potential buyer should examine the official data on the real property. He should also check the property that the agency promotes, for any possible deviations from its normal conditions. Often buyer seeks for support from legal or technical experts.
5. If needed, the buyer (and the seller) negotiates with the bank about the mortgage or land charge. The highest mortgage that can be approved by the bank is between 80% and 100% of the market value of the real property involved.

## 5 THE REAL PROPERTY SALE PROCEDURE

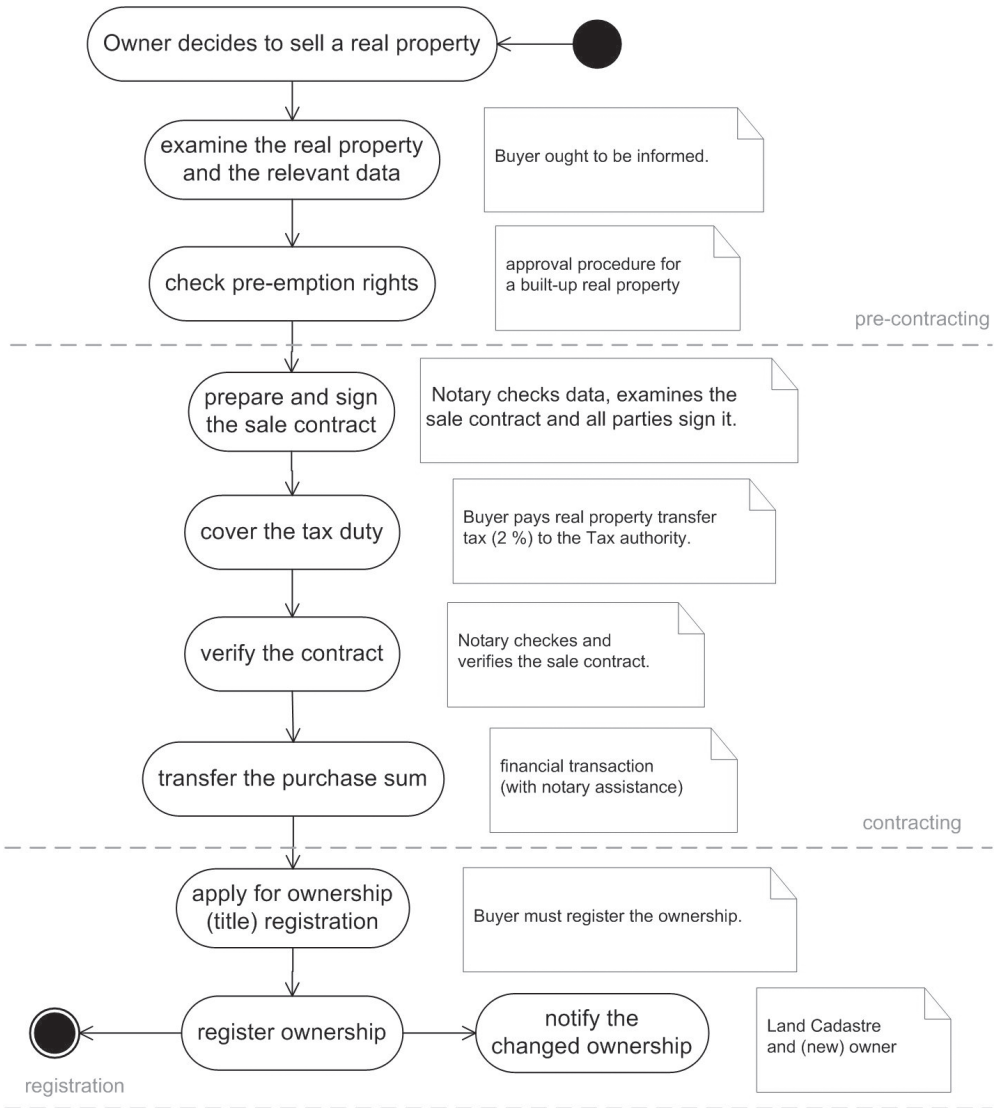


Figure 8: general UML activity diagram for the execution of a real property transaction.

The real property sale procedure is similar for most of the transaction cases with minor variations only. The previously described approval of the purchase phase (pre-contracting) is followed by the preparation of the sale contract, and the financial transaction itself (contracting), the registration of title in the Land Registry and data modification in the Land Cadastre (registration). The notary must assist the property transfer process and has to check the purchase contract, the Land Registry data, approval from the public authority concerned, and check that the transfer tax

is covered. Figure 8 is a shortened UML activity diagram showing the flow of activities for the whole transaction process of any real property.

The notary verifies the signed sale contract. If not agreed otherwise, the payment of the transfer tax (2%) to the tax authority concerned is an obligation of the seller. The assessment of the transfer tax is based on the purchase price of the property (Real Estate Sales Tax Act). When the tax authority doubts the property price quoted on the sale deed, an independent appraisal could be commissioned. In the case of a noticeable discrepancy between the purchase price and the estimated market value, the transfer tax is based on the estimated market value (Real Property Mass-Appraisal Act).

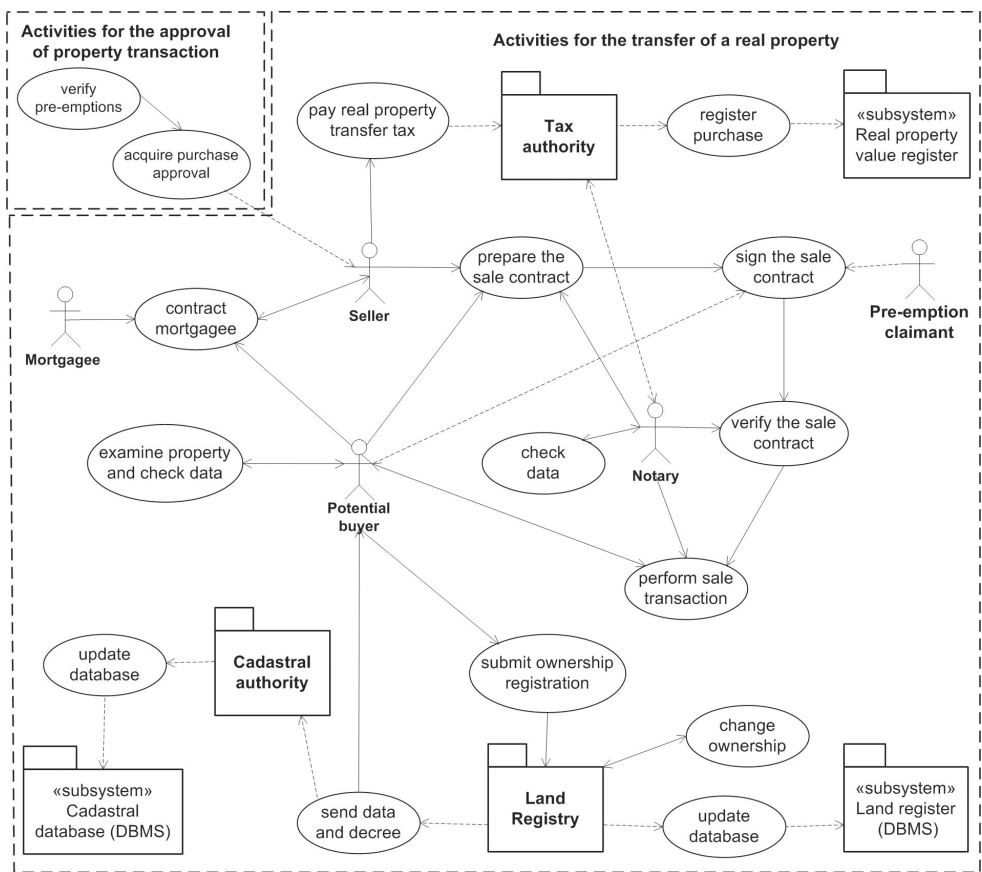


Figure 9: UML use case diagram for the transfer process of a real property.

The request for the registration of the title transfer together with the purchase deed has to be sent to the Land Registry. The Land Registry decision regarding registration is final after the expiration of eight days when no appeal is lodged. The Land Registry updates its database and forwards the statement about the new owner to the cadastral authority, which updates the cadastral database. The following description of the use case and the appropriate use case diagram in Figure 9 are

about the transaction process of real property in general.

1. The notary must check the real property data in the Land Registry and the pre-emption rights as well.
2. The seller and the buyer, with the help of a notary or a lawyer, prepare the purchase contract, which they both sign.
3. The purchase sum must be paid according to the terms written in the sales contract.
4. The seller is obliged to pay the real property transfer tax to the tax authority, which also checks the trustworthiness of the contract price.
5. The tax authority verifies the purchase price and registers the purchase price in its database.
6. The notary checks the contract and verifies the signatures of the seller and buyer – under the proviso that the administration office approved the purchase and that the transaction tax was covered.
7. The buyer (new owner) has to submit a formal request for the inscription (application form, deed etc.) of ownership to the Land Registry within a maximum of six months from the contract date. The actual owner covers the expenses of the title registration.
8. The Land Registry informs the buyer and the seller about the registration (possible appeal in eight days).
9. Mortgages (if any) are registered together with the ownership.
10. The Land Registry changes the ownership by updating the data in its database.
11. The Land Registry informs the cadastral authority about the new ownership.
12. The cadastral authority updates the cadastral database.

## 6 TIMING THE REAL PROPERTY TRANSACTION PROCESSES

The duration of real property transaction procedures depends mainly on the efficiency of public administration. The time span of real property transactions in Slovenia can take several months. The thirty days of the public announcement of sale offer for a rural real property, for example, is an obligation. Also the pre-emption decision period for built-up real properties can span over several months. On the other hand, seller's and buyer's activities concerning the title transfer can be shortened with the appropriate legal support. Beside the activities related to the pre-emption rights and sale approval by the relevant authority, the arrears at the Land Registry could cause an additional delay in the process of title registration. Besides special and more detailed UML timing diagrams the UML sequence diagrams are a very helpful general means for presenting the interactions among actors' real property transactions, for studying the sequential steps and the duration of a real property transfer procedure. A partial example of an UML sequential diagram for real property transfer procedure is shown in Figure 10. The duration of the presented shortened procedure spans downwards the sequential diagram and can be analyzed and estimated.

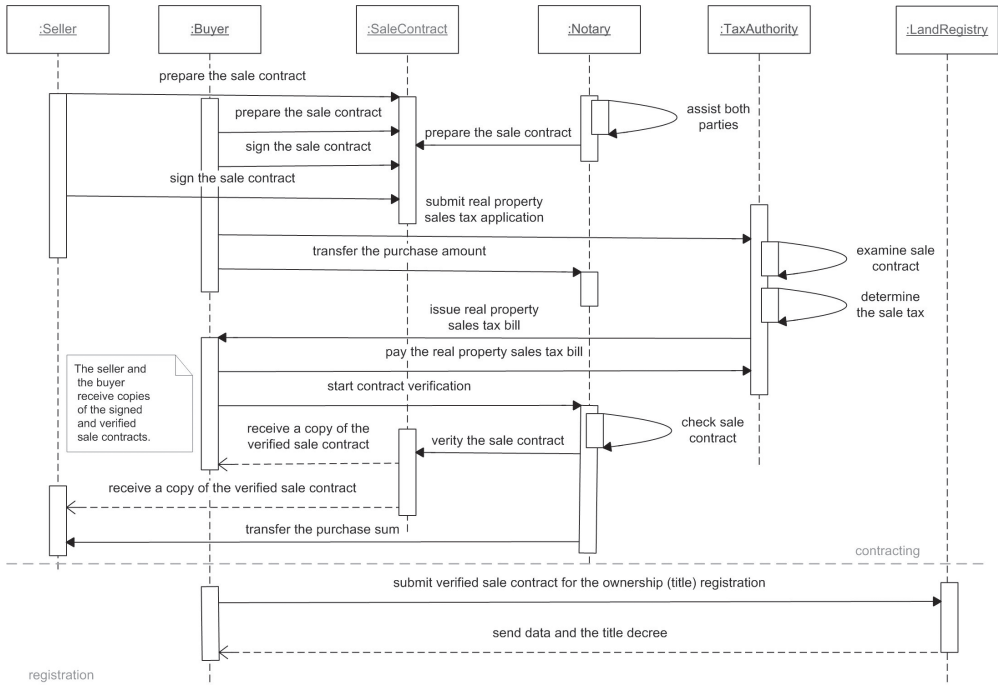


Figure 10: UML sequence diagram for the presentation of a real property transfer procedure.

## 7 CONCLUSIONS

The main concern in modeling examples of real property transactions has been the fulfillments of constraints, comprehension of transaction procedures and the roles of actors involved. The models of real property transactions, as reasonably simplified explanations of the underlying procedures, can serve as the base for the improvement and optimization of such transactions. In Slovenia, the transaction procedures for real property rights are well secured, but have to be simplified and shortened, when aiming to encourage the activities in the real property market (Lisec et al., 2007). The real property market should be more transparent and efficient regarding the pre-emption rights that hinder the market forces. Complicated steps cause uncertainty, they are time-consuming and consequently they increase the transaction costs to all the actors involved. Long lasting procedures can cause financial and economic loss to the individuals and as well to the society in general. In addition, the advantage of the established databases of real properties and other spatial databases should be better used in order to support real-time data flow among all the actors and institutions involved.

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