

# The Cluster Enterprise of Real Property Business

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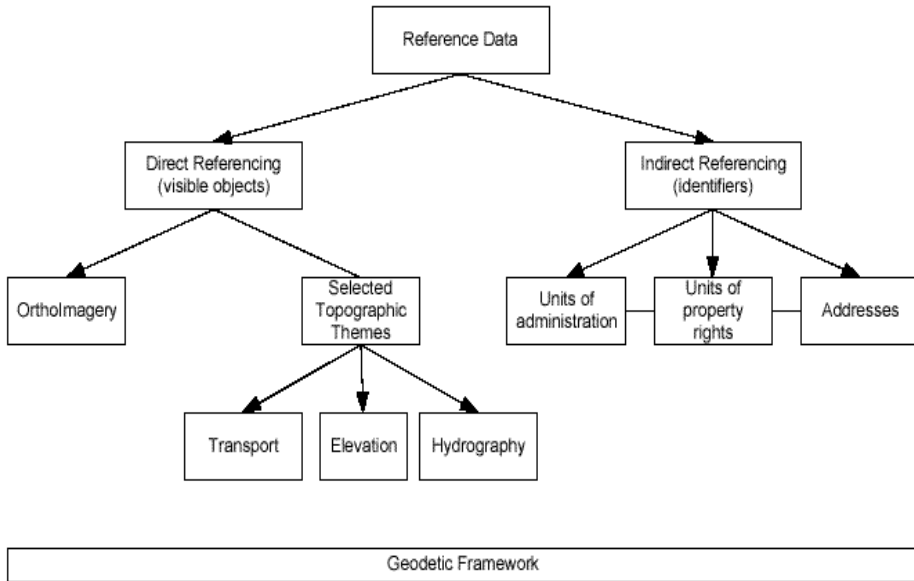
**Abstract.** In order to apply the potential of available web technology, business processes must be described in a coherent way across organizational boundaries. Business processes include geographical data in the context of constructions, as well as in environmental affairs, and in real property transactions, among others. The paper regards the domain of real property transactions. Drawing on research of European scope, it analyzes the framework of business processes in order to facilitate the adoption of service oriented architectures. The paper motivates the notion of a ‘cluster enterprise’ and identifies further steps towards a standardization of real estate business.

## 1. Introduction

Management in industry and government are facing challenges due to the expanding potential of the information and communication technology (ICT). The web technology allows for the combination of data sets and services that are provided by a number of servers, both in-house servers and servers managed by other organizations. The technical term is Service Oriented Architecture (SOA). In order to profit from this potential, managers have to combine their concern for the ICT use within their organization with the business processes which constitute the core of their interaction with their environment: customers, suppliers, service providers, etc. This state of affairs applies not only to industry, but also to government, as customers may be replaced with citizens and suppliers may be replaced with other governmental units. In a number of countries, you may now observe efforts to introduce or adopt a Service Oriented Architecture by setting up coordinating committees, discussion forums, etc.

Addressing the domain of geographical data, we find a cluster of business processes related to the provision and maintenance of constructions and technical infrastructure. Another cluster of business processes relate to environmental affairs: Parties include agriculture, extraction industry and others who impact the environment, as well as corresponding governmental units and NGOs. The European Union’s INSPIRE efforts, recently culminating in the issuing of a Directive on establishing an Infrastructure for Spatial Information in the European Community may be indicative of this cluster. Without claiming to be exhaustive, the final cluster to be mentioned regards the business processes related to real property transactions.

Units of real property indeed have a geographical component. This component consists of one or more parcels and mostly also the buildings and other fixtures on the parcel(s). However, buildings and parts of a building may also count as a unit of real property, depending on national legislation. Together with administrative districts and street addresses with the corresponding road segments, building entrances, and apartments, the property units constitute socio-economic, spatial units [1]. This group of spatial units differs from the group of visible objects, depicted on topographic maps, as illustrated by Figure 1.



**Fig. 1.** Reference data components. ETeMII Reference Data White Paper, July 2001, page 9.

The above specification and structure of geographical data provides a spatial context and structure for everyone involved with geographic information. This structure provides a basis for the mentioned INSPIRE activities.

The challenges to manage or influence ITC use outside of own organizational boundaries raise the question on how to define the wider boundaries of shared interests which in SOA terminology is called an 'enterprise'. Should the economists' subdivision of society into sectors provide the frame? Or, should the various commercial branches, e.g. as defined by NACE, define the boundary lines? Alternatively, the governmental subdivision into ministries might provide for an approach. So far, no definite answer to this question seems at hand. Consequently, the management of affairs within such undetermined boundary is burdened with substantial uncertainties. These include the risk that efforts may be made in vain, due to overruling influences from outside. The governmental prerogative of issuing acts and other binding norms tends to be insufficient to address this situation, as international agreements and global market players may combine in constellations which are difficult to predict.

The systematization of geographical data illustrated by Figure 1 assist in reducing managerial risks. To further reduce these risks, a review of European and wider scope is provided in section 2 of various analyses of real property transactions. One of these analyses, namely the European research action ‘Modelling Real Property Transactions’, appears to be well aligned with the other activities; the paper thus draws mainly on the outcome of this research. Section 3 provides an introductory, technical description of the SOA framework, where the ‘enterprise’ concept is further detailed. This provides the setting for a quasi-formal description, a conceptual model, of the ‘real property enterprise’ in terms of a basic use case and the mutual interplay among the actors of the real property enterprise (section 4). In section 5, the outcome is discussed and further steps are outlined. A conclusion closes the paper.

## **2. Real property transactions investigated for higher efficiency**

The following briefly mentions five investigations into business processes regarding real property. They are all from this century, motivated in part by the further development of the European Union, partly by the insights of New Institutional Economics which gained momentum during the 1990s, among others through works of Nobel laureate Douglass C North [8].

The research action ‘Modelling Real Property Transactions’ was performed 2001-2005 by research staff of about a dozen university departments of Europe, including Greece, Hungary, and Slovenia. The theoretical base of the research was the mentioned New Institutional Economics which allows for the addressing of legal and organizational issues without being bound by the national legal and organizational settings. The concept of real property rights and the complex of legal, and professional structures underpinning it, could thus be analyzed drawing on methodology from research in information systems and knowledge engineering. This research developed in dialogue with corresponding standardization efforts, e.g. in terms of the ISO 191xx-family of standards, and specifically the proposal for a Cadastral Core Domain Model [2]. The formal evaluation of the research action mentions, among others, that “[t]he researchers have developed a methodology for fruitful comparative analysis across countries and jurisdictions and over time. They have made useful contributions to the application of institutional theory and transaction-cost theory. They have stimulated the formation of an ‘invisible faculty’ from many scattered disciplines and pockets of research.” [3]

The European University Institute in Florence hosts a project on ‘Real Property Law and Procedure in the European Union’. The study takes a legal approach and focuses on conveyancing, mortgaging and related questions of land registration as well as European law influences. Comparative reports have been drafted on the current legal situations in a number of EU Member States and candidate countries. The reports have been structured by a questionnaire containing precise questions and cases to be resolved by the reporters according to their national laws. The descriptions and specific solutions to representative real property law problems of the national reports are expected to provide legal practitioners with directly operational informa-

tion. Results are summarized in a 'General Report' [4] which among others comments on a EULIS project.

Starting in 2002, mapping and cadastral agencies from about ten European countries co-operated in the EULIS project to set up a prototype portal, providing access to land and property information of national agencies. The national information is supplemented with basic description of legal concepts, description of routines and effects of registration of real property conveyance and mortgaging, as well as contact information to authorities involved in the real property transactions. From 2004, a 'EULIS demonstrator' was in operation, providing access to national data. During 2006 - 2007, a validation project assesses national conditions in five Central European countries for a possible future connection to the EULIS service [5].

In Germany, the business processes related to the acquisition of home ownership were investigated through commissioned research which was published in 2006 [6]. This research use economic theory as the base for assessing the influence of transaction costs, as did the above mentioned research on modeling real property transactions. Interesting in the present context is the statement that "[t]he countries analyzed in this study do not vary in the logical structure of the acquisition and conveyance process. However, there are significant differences in the allocation of responsibilities and division of labor between them." [6, page 4].

Finally, mention is made of a study prepared by the Nordic mapping and cadastral agencies in cooperation with university staff [7]. Following an agreed, common structure, the study describes for each of the five Nordic countries property registration and the processes of formation of real property units and sale of real estate. The study adopted methods from the European modeling project and modified them to arrive at systematic textual and diagrammatic descriptions in the Scandinavian languages.

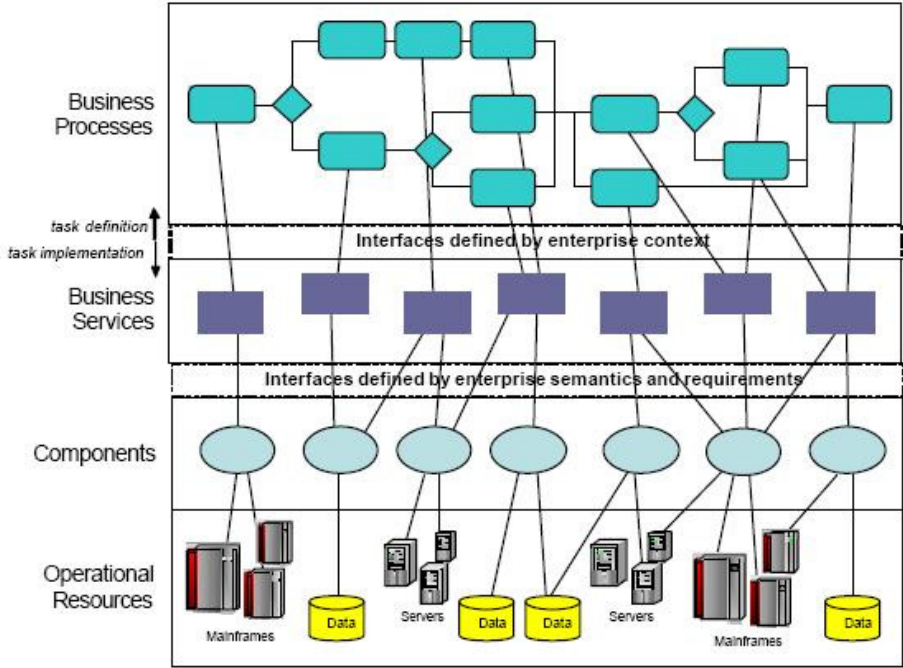
Summarizing, during the last five years or so, the business processes concerning units of property rights have been described. The descriptions have been comparative across European countries and mostly based on economic theory. This allows for a guarded optimism regarding the development of a general and valid conceptual framework of this domain.

### **3. A Service Oriented Architecture and the notion of 'enterprise'**

The Internet provides a technical infrastructure which allows an organizational unit to provide certain services, e.g. a set of real property data, to all users with Internet access. The mentioned unit can also act as a user of other services and combine the foreign data sets and related functionality with own components. The combined service may be offered in a way that the end user does not realize the origin of the different components of the service.

Figure 2 below illustrates the technology. Property data are maintained by a number of organizations by means of their mainframes, databases and servers. These operational resources used to provide pre-programmed information to business processes in-house or to business processes of external end-users who through contracts or licenses were bound to the individual organization.

The web technology has made it possible to specify and implement ‘components’ which in various ways are packaged into ‘business services’. The smooth packaging presupposes, however, that ‘components’ are specified in a standardized way within the domain concerned.



**Fig. 2:** A Service Oriented Architecture. Source: Mike Rosen (2006) BPM and SOA. Where Does One End and the Other Begin. BPTrends.

While the basic technology seems well developed, the task of managing the various options and their business implications is only partially structured. As mentioned in the introductory sections, the boundary of a domain is an open issue which is illustrated by an example: In section 2, the text related to Figure 1 suggests a distinction made between the data group of street addresses and the neighboring data group regarding units of real property. Although the two groups may be treated independently, an analysis of business processes is likely to result in the request of a combined use of the two groups.

The challenge is thus to specify components and business services which allow for reuse and to avoid duplication of efforts. The XML family of standards, including schemas and corresponding namespaces, is well suited for the specification task, but this does not solve the management task. The notion of ‘enterprise architecture’ may assist in this endeavor.

Figure 2 refers to ‘enterprise semantics and requirements’ and the ‘enterprise context’. In the following, the ‘enterprise’ concept is further detailed. As a point of departure, an enterprise may be taken as an organization. The ‘enterprise architecture’ reflects the efforts by an organization to align its resources, and mainly the ICT

resources, to the overall business strategy of the organization. It specifies business, information, applications, and technology in a coherent and development oriented way [9]. The paper further details 'business' into business strategies, business processes (which compares to the business processes of Figure 2), and business requirements for the systems and data management. The 'applications' of the paper compares to the 'components' and 'services' of Figure 2, and similarly 'technology' compares to 'operational resources'; see [9] for further details. Apparently, the terminology in this field seems underspecified, so no claim on providing definite statements is made.

Now, the Service Oriented Architecture is not limited to a single organization, rather the potential is to serve a group of organizations, possibly both from industry and government. The notion of 'enterprise' consequently has to be extended from referring to a single organization to a group of organizations which co-operate, or - more precisely - from a single organization to a cluster of organizations which are dependent on one another to achieve their individual objectives. This type of enterprise is here called a 'cluster enterprise'. The research referred to in section 2 above addresses such a cluster enterprise, namely the organizations involved in real property business.

The real property cluster enterprise is loosely structured. In some countries, you may find a coordinating body, but generally there is no appropriate, single authority with mandate and resources, as you would find it in an individual organization. A cluster enterprise may be established through the logic of the market, e.g. to defend the interest of a industrial sector relative to competing sectors, but governmental involvement seems needed where substantial parts of the cluster is also part of public administration. Nordic governments are in fact heavily involved, see e.g. [10]. In addition, theory-based research seems needed to approach durable solutions.

The following section introduces the real property cluster of organizations and lists their objectives and requirements to the underlying information system.

## **4. Needs, basic use case, and complementing roles within the real property cluster**

The cluster enterprise of real property organizations needs to be analyzed to benefit from the potential of available technology. The statement of user needs is followed by a basic use case. Rather than developing further details, the mutual interaction within the cluster is investigated.

### **4.1 User needs and functional objectives**

What are the needs of the end-users of the market in real estate? New Institutional Economics informs us that in order to acquire a unit of real property, we have not only to pay the market prize, but also to cover the costs caused by

- surveying of the market for appropriate purchase objects,
- assessing the attributes of the object,
- establish sufficient trust in the other party and negotiate the purchase conditions,

- providing the financial means and the safe exchange of assets, as well as
- establishing means of enforcement in case of default.

The item: assessing the attributes of the object, does not only regard the physical properties of the unit in case: the size of parcel and building, and the quality of roof, etc. The quality of the seller's title to the house in case is much more critical: Is the person who appears as the owner in fact entitled to sell the house? The same holds for rights and encumbrances in the property: Is the information on mortgages in the house provided by the apparent owner complete? Or is there a risk that another party will appear after the sale with well documented claims?

It appears that conveyance of title to real property is troubled with what economists call 'information asymmetry': The seller is in a much better position to know of quality and especially legal details than the buyer. The general answer to this situation is documentation and public recording of real property attributes. Leaving details and historical outline apart, we may state the following list of overall objectives for the real property cluster enterprise, which compares to the overall business strategy of an individual enterprise:

To reduce information asymmetries and transaction costs, user needs may be stated in terms of the following functional objectives which must be met within a jurisdiction, cf. [11]:

- Property units are identified and located, and shape and size attributes are recorded.
- Rights in property units are categorized within the jurisdiction, adjudicated, and recorded.
- Skilful transaction officers are available to reorganise the rights in a real property unit and its surroundings at the wish of the parties, without compromising the claims of other holders of rights, and in compliance with spatial, environmental and agricultural legislation, etc.
- Skilful registrars verify of the powers of the disposer, safeguard the interests of other holders of right, and monitor further rule compliances.
- Involved agencies and professions offer compensation in case of occasional errors, and improve where possible the correctness and consistency of the recordings and the efficiency and transparency of business processes within the cluster enterprise.

## 4.2 The basic use case

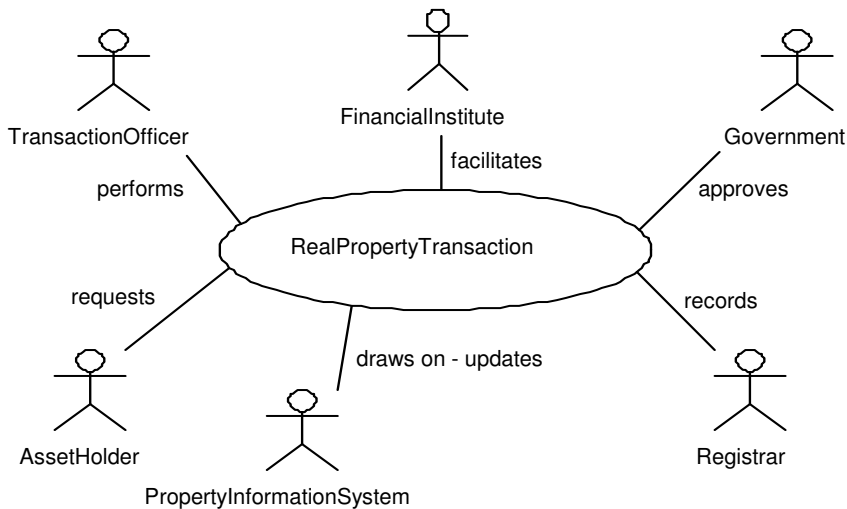
The basic use case of real property transactions may be depicted as follows, cf. Figure 3:

The transaction is triggered by the Asset Holder which refers both to the seller, whose asset is the title in the property unit, and to the purchaser, whose asset is the money for which the property is bought. Other holders of right in land also belong to the class of Asset Holders.

Transaction Officer is a general term for the various professions, who assist the Asset Holders and in most countries in fact perform the transaction at the request of their clients. Main sub-classes are Legal Advisors, including Notaries, Real Estate Agents, Geodetic Surveyors, and Construction Engineers. In some countries, the task of advancing the transaction is left to buyer or seller, who in such cases acts as a

Transaction Officer. As they are mostly not educated for such task, the above stated functional objectives can hardly be met.

Financial Institutes, that is banks, etc., facilitate the transfer of money from buyer to seller and also offer or mediate the mortgages and other loans needed to provide the purchase sum. The bank may take up the role of Transaction Officer, e.g. in case a mortgage is mediated from a Financial Institute which specializes in mortgage loans. The actor 'Financial Institute' also stands as a representative for a general Service Provider, who offers a service without being involved in the transaction process. An example may be the Construction Engineer who provides for a building survey, whereby the physical attributes of the property are assessed in a qualified way.



**Fig. 3:** The basic use case of real property transactions

It may be surprising to see Government involved in a general transaction process, as European markets in real estate is supposed to be operating without governmental interference. Especially for agricultural holdings, this is generally not the case, and when transactions involve a change in the shape or use of the property unit, governmental interference is mostly manifest.

The Registrar is the actor in charge of maintaining the consistency of property recordings. In many countries, property registration is divided between Land Registries within the Judiciary and the Cadastre within the Ministry of Environment or similar. The Registrar is the super-class for to both registration functions. In some countries, boundary surveying is performed by staff of the cadastral agency. The staff may act as a sub-class of Service Provider or as a Transaction Officer, depending on the involvement in the advancement of the process concerned.

The Property Information System is the idealized combination of property registers which support the transaction process. In the initial phases of a transaction, the parties draw upon the recorded information, while in the latter phase, the information generated by the transaction process is used to update the recorded information.

### 4.3 An example: The business process of establishing an easement

The above basic use case needs to be refined by developing use cases for the various types of transactions: sale with and without mortgaging, and with and without change of property boundaries, etc. These use cases should then be further detailed in terms of activity diagrams, and related to the components and business services mentioned in section 3.

The following develops on this by focusing on the establishment of an easement. This specialization is motivated by the fact that Danish land registration is being centralized to only one office and digitalized. Hitherto each district court has had its own registry. The new system is scheduled to become operational as of March 2008. The new system implies that documents to be registered have to be submitted in digital form. Some documents, especial easements, refer to map sheets with cadastral information. These annexed map documents have to be digitized as well, and this thus calls for an analysis of the business processes, cf. the uppermost layer of Figure 2. Accordingly, the following is developed to identify business services which support the provision of digital easement documents.

An easement is a legal construct. Due to the Danish dependence of the European and global context, the suggested solution should as far as possible be based on general concepts and standards. The research outlined in section 2, especially [4], provides the basis for assessing the Danish tradition in a European context, an issue not addressed in the following.

The following Figure 4 is a modification of the basic use case of property transactions which fits the establishment of an easement.

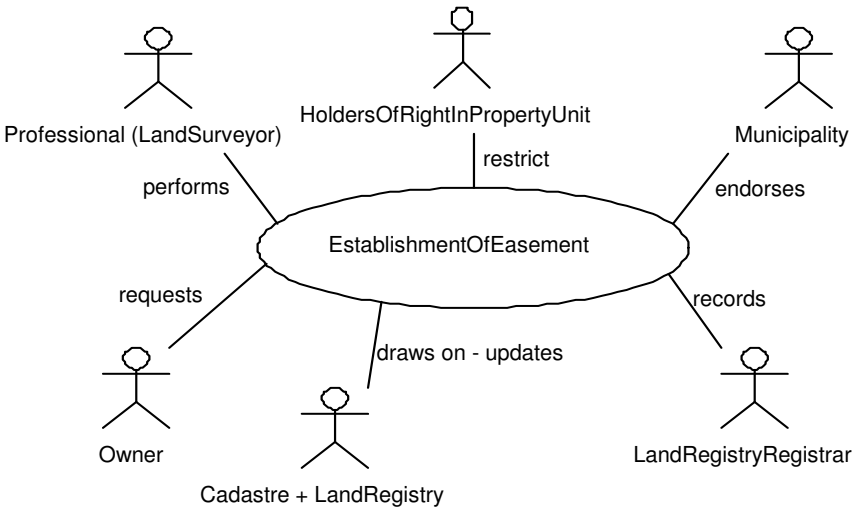
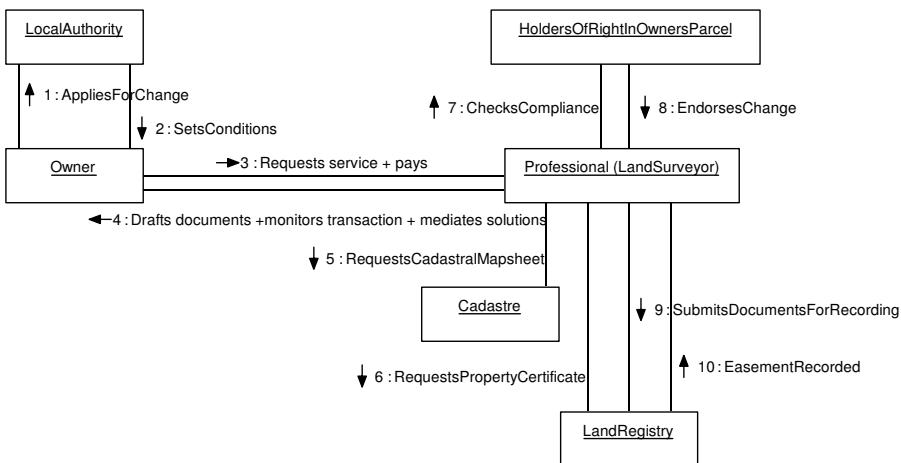


Fig. 4: The use case of establishment of an easement

The TransactionOfficer is replaced by a LandSurveyor, as the National Survey and Cadastre and the Association of Chartered Surveyors have a long tradition of effective cooperation, with the outcome that cadastral casework is now largely computerized.

This again motivates the role of the surveyor in the process of easement establishment. As no buyer or vendor is in action, AssetHolder is replaced with Owner. As we shall see detailed in the following, the establishment of a new encumbrance, the easement, has to be accommodated within other rights in the property unit. This fulfils the functional objective of “reorganising the rights ..without compromising the rights of other holders of right”, which was stated at the end of section 4.1. Easements are often established to fulfil a precondition for approval of a change by the municipality or another local authority.

The following Figure 5 develops on the interaction among the actors. The UML format is the Collaboration Diagram, but mention is made that the interaction is conceived from a social point of view, rather than from the point of view of exchange of information. The relation between Owner and LocalAuthority is bounded by statutory legislation which obliges the Owner to apply for changes, e.g. a subdivision of the property unit, and which grants the authority the power to specify conditions, e.g. that an easement be established.

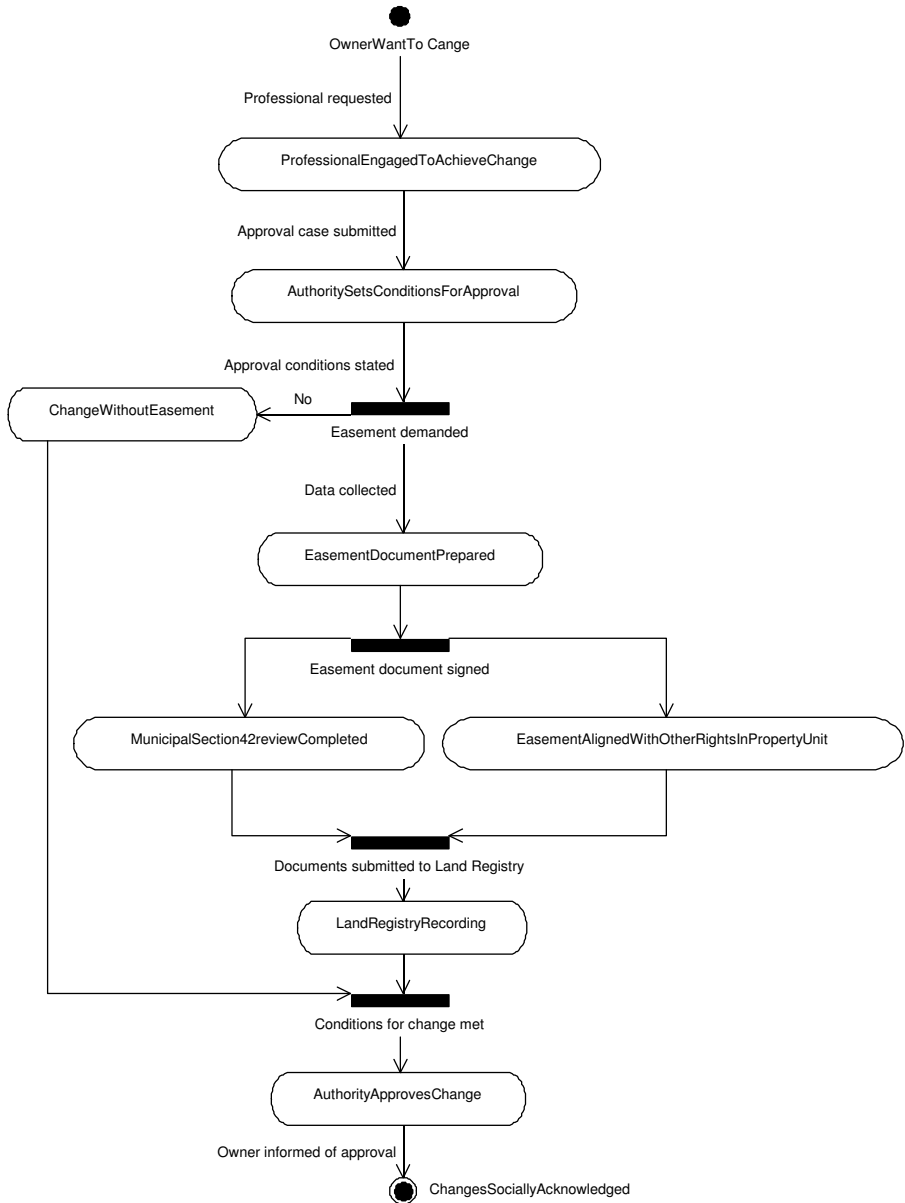


**Fig. 5:** Actor collaboration in context of establishment of easement

The relation between Owner and Professional is one of tit for tat: Money against requested service. However, it should be noted that in welfare societies like the Nordic, the professional’s code of conduct request that the request is professionally reflected so that not the literal request but the owner’s wish is accomplished as far as possible, cf. the above mentioned functional objective.

The relation between Professional and Cadastre and LandRegistry, respectively, is described in a more conventional way as information exchange. In fact, fees occur in both relations.

The following Figure 6 largely describes the business process in the detail requested for specifying web services. The flow first branches, where the LocalAuthority states, whether an easement is needed or not. The next branch accommodates for a Danish specialty: According to planning law, section 42, the Municipality has to add



**Fig. 6:** Activity diagram of the business processes needed to establish an easement

on the easement document a statement that no detailed plan is needed. (This prescript intends to prevent misuse of easements for planning purposes).

## 5 Conclusion

The introduction of service oriented architectures is hampered, among others because of difficulties in defining the boundaries for shared solutions. However, recent research in real property transactions assist in identifying a reasonable stable and well defined domain. Investigations in 'enterprise architectures' are generalized to cover a 'cluster enterprise', made up of actors within the domain of real property. Functional objectives are stated for the architectures of the cluster enterprise, and the mutual roles of actors and their involvement in business processes were specified in some detail. Finally, the introduction of digital easements was used as an example to illustrate the use of the analysis provided.

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