Towards LADM Country Cadastral Profile – Case Poland[*]

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Key words: LADM, Country Profile, Cadastre, Poland

SUMMARY

The Geographic Information - Land Administration Domain Model was formally published by International Organization for Standardization on the 1st of December 2012. At the same time, although independently, the new model of Polish cadastral system has been being prepared. It is defined as the part of the new order concerning the ground and building cadastre, that has stage of final draft now. The author's idea is to prepare initial Polish cadastral profile, based on LADM.

The application schema of cadastral database was built applying UML notation, according to the ISO 19100 series standards methodology. The Polish cadastral model contains 71 classes, that are presented at 16 diagrams and grouped in 8 thematic packages.
The first step was to chose the main classes of Polish cadastral model, provide them with English names and assign related LADM classes. The results are presented in tabular form in the paper.

The next step was analysis of diagrams presenting the Polish cadastral model and identifying the key connections among its classes. Subsequently, the key connections between classes concerning "Objects", "Parties" and "Rights to Properties" of Polish cadastral model were identified and presented graphically using Unified Modelling Language. Classes from packages "Address" and "Lease" were partly or fully omitted as considered not important for building LADM country profile for Poland. Then the two diagrams – one concerning "Objects" and the other with "Parties" and "Rights to Properties" were merged into one diagram. As the result seemed too complicated, some similar associations were substituted by one connection with some constraints. Some connections which seemed necessary at this stage were also added. The obtained result, together with diagram describing relationships between classes PL_Change, PL_LegalDocument, PL_TechnicalDocumentation and PL_GeneralObject are suggested to present profile of Polish cadastral system. Since the order defining the Polish cadastral model is not published yet, some small corrections in the proposed form of Polish country profile may be introduced if necessary.

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1. INTRODUCTION

The Geographic Information - Land Administration Domain Model (ISO, 2012) was developed by the Technical Committee 211 of International Organization for Standardization. It was finally approved as an ISO standard on the 1st of November and was formally published by ISO on the 1st of December 2012.
At the same time although independently the new model of Polish cadastral system has been being prepared. The new Polish cadastral model is defined as the part of new order concerning the ground and building cadastre. The author's idea is to prepare initial Polish cadastral profile. Presently, it is going to be the preliminary profile, since the Polish cadastral model has not been finally approved yet. The country profile for Poland was built by the author basing on the draft version of new regulation changing the order – in case of Cadastre for Grounds and Buildings (Order, 2013) and with application of Land Administration Domain Model as a reference model for cadastral systems. Until the order is not a law, some corrections in the model of Polish cadastre are possible. When the order is finally published they may be taken into account in the profile proposed by the author.

2. THE LAND ADMINISTRATION DOMAIN MODEL

Works concerning ISO 19152 "Land Administration Domain Model" (LADM) have been conducted since FIG congress, that took place in Washington in 2002. The first version of LADM called the FIG Core Cadastral Domain Model was presented at the FIG congress in Munich in 2006 (Lemmen, Oosterom, 2006). In 2008 FIG proposed Land Administration Domain Model in the Technical Committee 211 of International Organization for Standardization (ISO). Land Administration Domain Model received status of Draft International Standard in December 2009 and was formally published by ISO on the 1st of December 2012 as ISO 19152 (ISO, 2012). The Land Administration Domain Model was also accepted in European Committee for Standardization (CEN) and became a European standard as well (CEN, 2013). On the 30th of May LADM was also published by Polish Committee for Standardization (PKN, 2013).

The Land Administration Domain Model is a descriptive standard. It provides the reference model, that is supposed to serve two targets (ISO, 2012). One is providing the extensive basis for development and refinement for efficient and effective land administration systems, based on Model Driven Architecture. The other is to enable involved parties, both within one country and between different countries to communicate.

The Land Administration domain Model purposes are to:
– define a reference model, covering basic information related to components of Land Administration (including those over water and land and above and below earth surface),

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- provide terminology for land administration, based on various national and international systems, that is simple, useful in practice and enables description of both different formal and informal practices and procedures in various jurisdictions,
- provide the basis for national and regional profiles,
- enable the combination of land administration information from different sources in a coherent manner.

The Land Administration Domain Model is a conceptual schema, written with Unified Modelling Language (UML) notation. It is performed according to ISO 19100 series standards methodology. The Land Administration Domain Model is based on four basic classes (Figure 1).
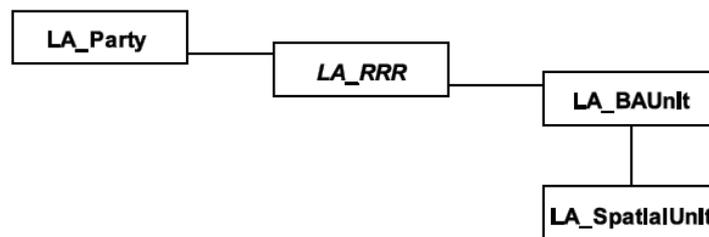

Figure 1. Basic classes of LADM (source: (ISO, 2012))

They are as follows:
- Class LA_Party, where instances of this class are parties.
- Class LA_RRR. Instances of LA_RRR subclasses are rights, restrictions and responsibilities.
- Class LA_BAUnit, where instances are basic administrative units.
- Class LA_SpatialUnit having spatial units as instances.

Totally, the Land Administration Domain Model consists of 48 main classes and special class VersionedObject. The classes of Land Administration Model begin with letters "LA". These classes are organized in three packages and one subpackage (Figure 2). They are:
- Party Package,
- Administrative Package,
- Spatial Unit Package,
- Surveying and Spatial Representation Subpackage.

The Party Package comprises classes applying to parties, its types and its role in land administration system functioning and its updating. The Administrative Package includes classes concerning real estates and corresponding rights, restrictions and responsibilities. The Spatial Unit Package consists of classes concerning spatial elements such as land parcel, building, utilities networks and attributes describing them (area, volume, geometry and so like). Surveying and Spatial Representation Subpackage is the Subpackage of Spatial Unit Package. It includes classes concerning elements like boundary points, boundary, transformation and information sources.
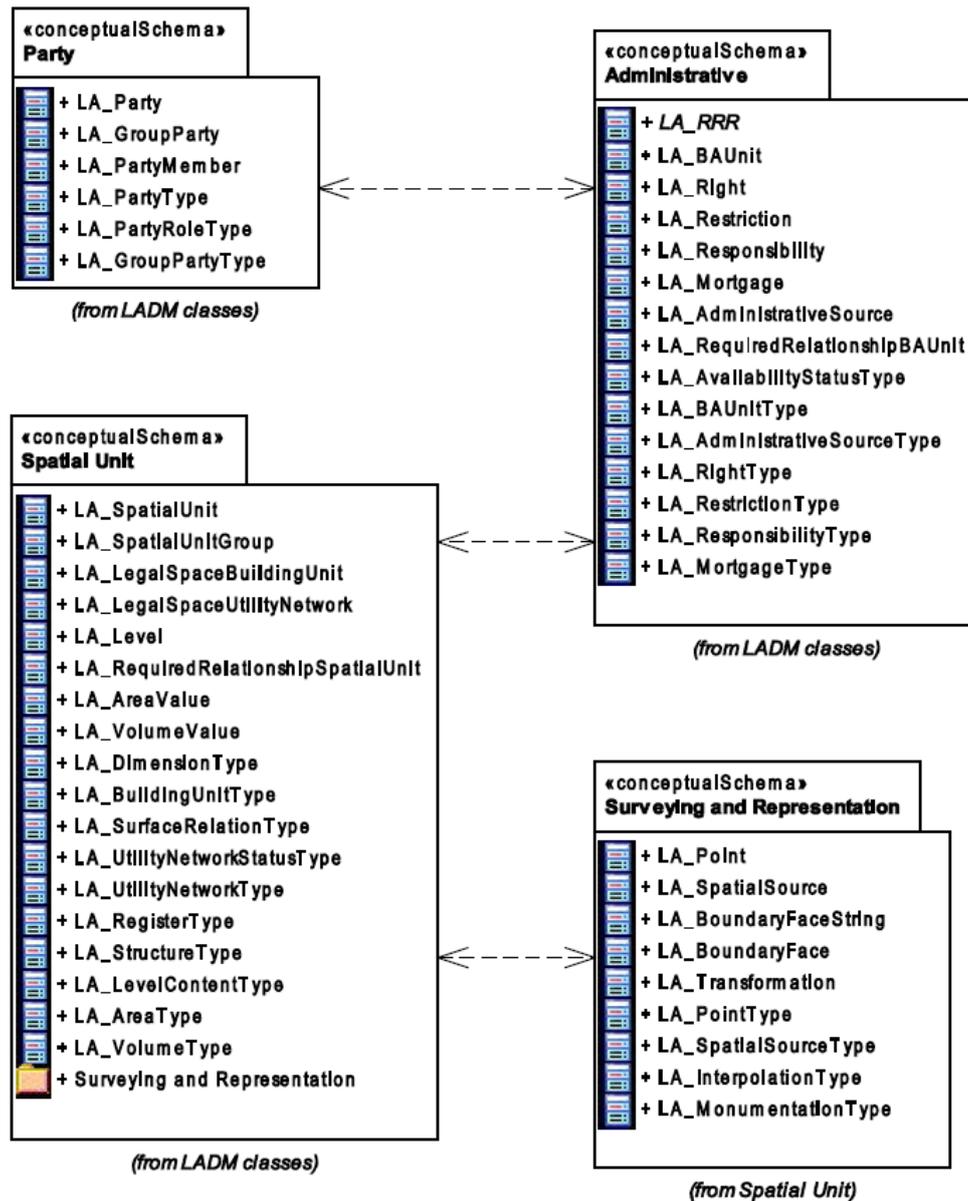
Figure 2. The LADM overview of (sub)packages, with their respective classes (source: (ISO, 2012)).

3. LADM APPLICATION IN COUNTRY PROFILES

Eight country profiles are mentioned in the informative Annex D to the ISO 19152 Land Administration Domain Model. They are Portugal, Queensland (Australia), Indonesia, Japan, Hungary, The Netherlands, Russian Federation and Republic of Korea. The country profile of Portugal consists of two figures and is widely described in the standard. The rest of profiles consists of one diagram. The individual country profiles include either only respective classes originating from LADM or both Land Administration Domain Model original classes and respective country classes. The first applies to the Dutch and Korean profiles with classes

names starting from country shortcuts (NL or KR respectively), whilst the second to the rest of country profiles mentioned in ISO 19152.

According to the author, the presentation of country profiles within ISO 19152 seems to have two purposes. The first is helping to understand the structure and relationships within the individual country land administration system, whilst the other is to show examples of structures, that can be helpful in building profiles for other countries.

4. THE MODEL OF POLISH CADASTRE

Presently, the Polish cadastral system is defined by the Order of Ministry of Regional Development and Buildings – in case of Cadastre for Grounds and Buildings (Order, 2001). The new order (Order, 2013) that is in the final draft version defines the new model of Polish cadastral system. The Unified Modelling Language is used for describing schemas and Geographic Markup Language as basic data exchange format, there.

The new model of Polish cadastral system is prepared to achieve several goals (Bydłosz et al, 2012). They are, inter alia:
 − cadastral data sets harmonization with Polish terrain information system data sets,
 − enabling cadastral data accessibility, according to the act on spatial information infrastructure (Act, 2010), that is a transposition of INSPIRE directive (Directive, 2007) into the Polish law,
 − accepting Geographic Markup Language (GML) as a essential format for cadastral data exchange and sharing.

The application schema of cadastral database was prepared applying UML notation, according to the ISO 19100 series standards methodology, as well.

The Polish cadastral model contains 71 classes. The classes of Polish cadastral model begin with letters "EGB". Relations between classes are presented at 16 diagrams. For organizational purposes these classes are grouped in 8 thematic packages. The names of packages are as follows: General Object, Objects, Parties, Rights To Properties, Address, Boundary Point, Lease and Legal Basis.

All cadastral model objects have attributes concerning creation and archiving dates for particular objects versions and spatial information infrastructure attributes. These attributes are inherited from abstract class EGB_GeneralObject.

5. BUILDING POLISH CADASTRAL PROFILE, BASED ON LADM

The first attempts of presenting graphically the model of Polish cadastre were made when preparing order in case of cadastre for grounds and buildings (Order, 2001). The schema of main relationships between cadastral objects is included there. This schema is prepared applying OMT (Rumbaugh) notation, that was the predecessor of Unified Modelling Language. No other graphical presentation of cadastral model except the UML schema of the

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register of prices and values for real estates, which is the part of cadastral system were published till the works on new cadastral model started.

During both Land Administration Domain Model development and the construction of Polish cadastral model, the idea of preparing the country profile of Poland appeared. The first step was to chose the main classes of Polish cadastral model, provide them with English names and assign related LADM classes. The prefix "PL_" was added to the class name for application in the country profile instead of original prefix "EGB_". The earlier works concerning comparison of Polish cadastral system and Land Administration Domain Model we helpful here (Bydłosz, Góźdź, 2011) and (Bydłosz et al, 2012). The main classes of Polish cadastral model applied in the country profile for Poland are shown in the table 1.

Table 1. The main classes of Polish cadastral model, classes of Poland's country profile and related ISO 19152 classes

Objects			
	Polish model original class name	Name in the Poland's profile	Corresponding LADM class
1	EGB_OgolnyObiekt	PL_GeneralObject	VersionedObject
2	EGB_JednostkaEwidencyjna	PL_CadastralComplex	LA_SpatialUnitGroup
3	EGB_ObrebEwidencyjny	PL_CadastralSection	LA_SpatialUnitGroup
4	EGB_DzialkaEwidencyjna	PL_CadastralParcel	LA_SpatialUnit
5	EGB_Klasouzytek	PL_ContourOfSoilQuality-ValuationInParcel	LA_SpatialUnit (SubParcel)
6	EGB_KonturKlasyfikacyjny	PL_ContourOfSoilQuality-Valuation	LA_SpatialUnit
7	EGB_KonturUzytku-Gruntowego	PL_ContourOfLandUse	LA_SpatialUnit
8	EGB_Budynek	PL_Building	LA_LegalSpaceBuildingUnit
9	EGB_BlokBudynku	PL_BlockOfBuilding	LA_LegalSpaceBuildingUnit
10	EGB_LokalSamodzielny	PL_Premises	LA_LegalSpaceBuildingUnit
Parties			
1	EGB_OsobaFizyczna	PL_NaturalPerson	LA_Party
2	EGB_Malzenstwo	PL_Marriage	LA_GroupParty
3	EGB_Instytucja	PL_Institution	LA_Party
4	EGB_PodmiotGrupowy	PL_ GroupParty	LA_GroupParty
5	EGB_Podmiot	PL_Party	LA_Party
Rights To Properties			
1	EGB_JednostkaRejestrowa	PL_RegisterUnit	LA_BAUnit

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2	EGB_JednostkaRejestrowa-Gruntow	PL_RegisterUnitOfLand	LA_BAUnit
3	EGB_JednostkaRejestrowa-Budynkow	PL_ RegisterUnitOfBuildings	LA_BAUnit
4	EGB_JednostkaRejestrowa-Lokali	PL_ RegisterUnitOfPremises	LA_BAUnit
5	EGB_UdzialWlasnosci	PL_ShareOfOwnership	LA_Right
6	EGB_UdzialWeWladaniu-GruntamiSPiJST	PL_ ShareOfHoldind	LA_Right
7	EGB_UdzialGospodarowania-NieruchomosciaSPlubJST	PL_ ShareOfAdministration	LA_Right
8	EGB_RodzajPrawa	PL_TypeOfRight	LA_RightType
9	EGB_RodzajWladania	PL_TypeOfHolding	LA_RightType
10	EGB_RodzajUprawnien	PL_RightType	LA_RightType
11	-	PL_ Share	LA_Right
Address, Boundary Point, Lease and Legal Basis			
1	EGB_PunktGraniczny	PL_BoundaryPoint	LA_Point
2	EGB_ZrodloDanychZRD	PL_SourceOfDataZRD	LA_SpatialSourceType
3	EGB_Dzierzawa	PL_Lease	LA_Responsibility
4	EGB_Dokument	PL_LegalDocument	LA_AdministrativeSource
5	EGB_OperatTechniczny	PL_TechnicalDocumentation	LA_SpatialSource
6	EGB_RodzajDokumentu	PL_TypeOfDocument	LA_AdministrativeSource-Type
7	EGB_Zmiana	PL_Change	-

The fundamental class of Polish cadastral system is PL_GeneralObject. Its attributes concern identification in spatial information infrastructure, dates and times of object or its versions creation in the data base and dates and times of moving object or its versions to the archive in the data base. All classes of Polish cadastral data base inherit these attributes by the generalization relationship from PL_GeneralObject. Title "PL_GeneralObject" in the right top corner of the specific class indicates generalization relationship with PL_GeneralObject. It is worth noting that abstract classes have not got this relationship.

The class PL_Change is the realization of new object's creation or changing at least one of its attributes or relationships. The PL_Change indicates PL_LegalDocument or PL_TechnicalDocumentation. Practically, it means, that PL_Change is basis for introducing changes resulting from legal or technical documents into the cadastral database. All these classes belong to Legal Basis package. The diagram of connections between classes PL_GeneralObject, PL_Change, PL_LegalDocument and PL_TechnicalDocumentation (packages "General Object" and "Legal Basis") is presented in the figure 3.
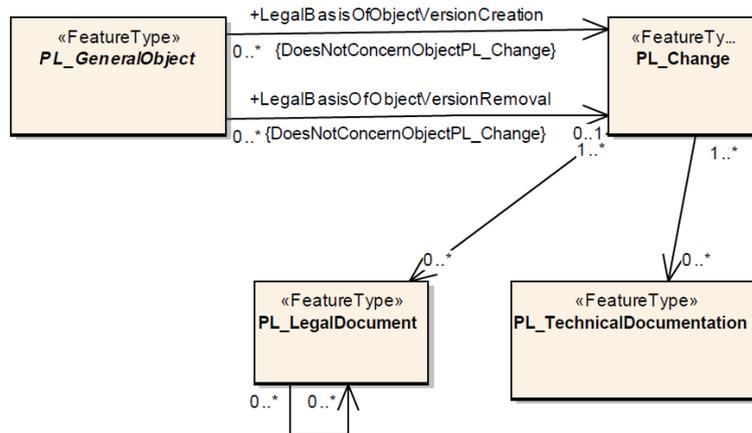
Figure 3. Schema of connections between classes PL_GeneralObject, PL_Change, PL_LegalDocument and PL_TechnicalDocumentation.

The second step was analysis of diagrams presenting the Polish cadastral model and identifying the key connections among its classes. First, the connections between main classes of Objects section of Polish cadastral model were identified. The relationships between classes like PL_CadastralParcel, PL_Building, PL_Premises, PL_RegisterUnifOfLand, PL_RegisterUnifOfBuildings, PL_RegisterUnifOfPremises, PL_CadastralComplex and PL_CadastralSection were presented there. Classes concerned with soil valuation, resulting with type of agricultural or forestry land use like PL_ContourOfLandUse, PL_ContourOfSoilQualityValuation and PL_ContourOfSoilQualityValuationInParcel were also added. The resulting UML schema is shown in the figure 4.

The next step concerns relationships between classes of packages Parties and Right to Properties analysis. The key connections between three abstract classes PL_RegisterUnit, PL_Party and PL_Share were drown. The two abstract classes mentioned first are defined within the Polish cadastral model, whereas the PL_Share class is suggested by the author. The PL_RegisterUnit abstract class comprises classes PL_RegisterUnitOfLand, PL_RegisterUnitOfBuildings and PL_RegisterUnitOfPremises. The PL_Party abstract class includes PL_NaturalPerson, PL_Institution, PL_GroupParty and PL_Marriage classes. The PL_Share is an abstract class proposed by the author for easier presentation and visualization of the country profile. The connections concerning this class are presented basing on diagrams included within the model of Polish cadastre. The PL_Share class groups three real classes of Polish cadastral model (PL_ShareOfQwnership, PL_ShareOfHolding and PL_ShareOf-Administration). The schema presenting the relationships among three abstract classes and classes they include is shown in the figure 5.
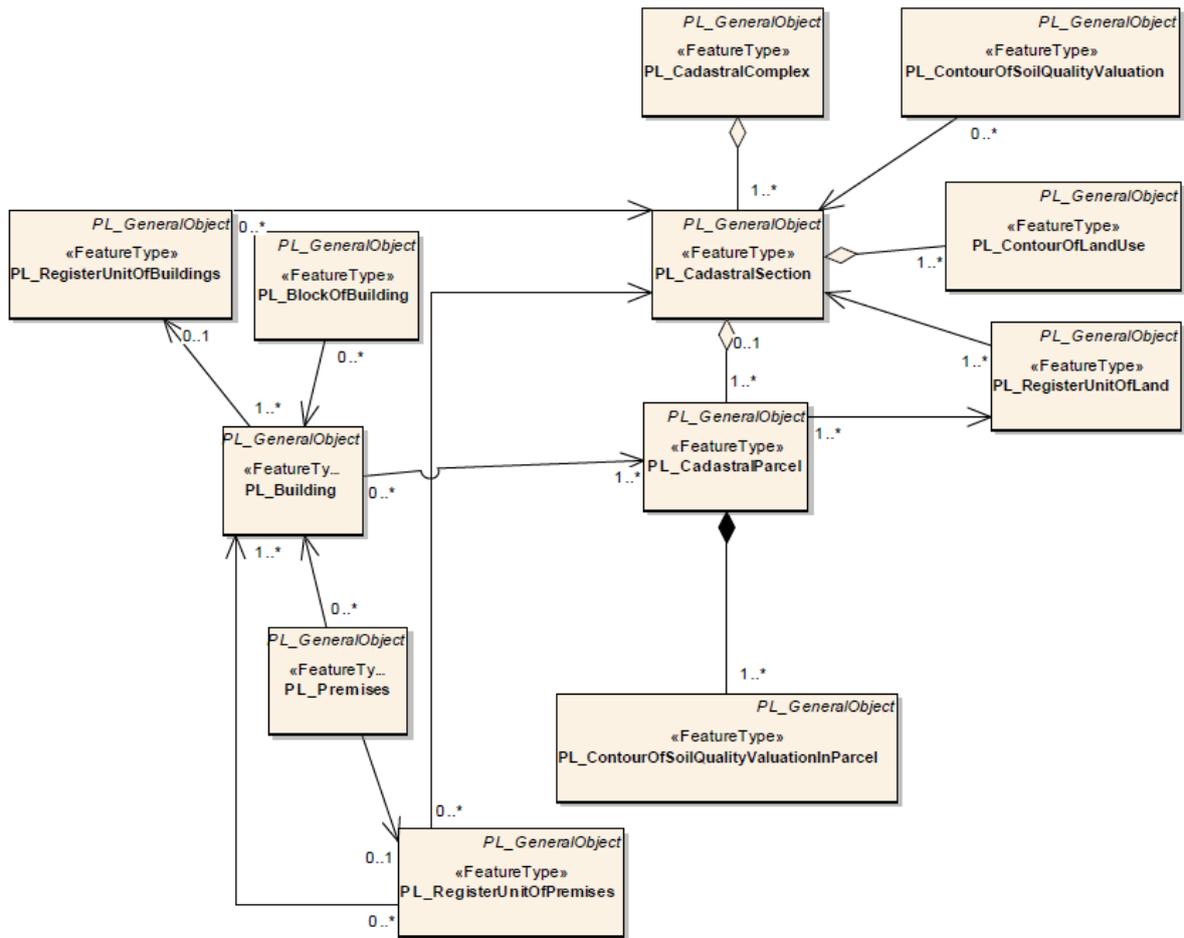
Figure 4. Schema of main relationships between Objects section classes of Polish cadastral model.
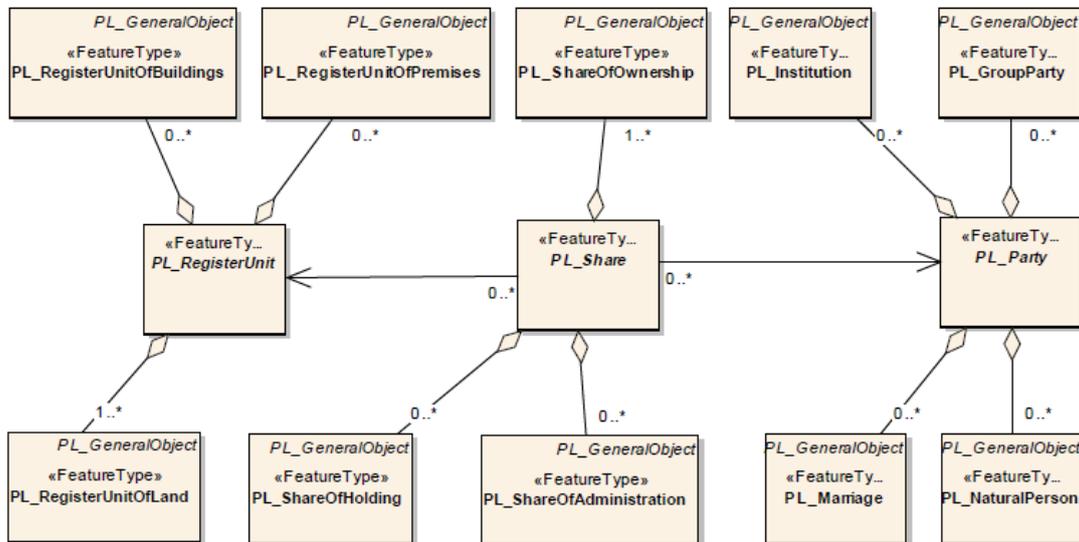

Figure. 5. Schema of relationships between classes concerning Parties and Rights to Properties of Polish cadastral model.

The last operation on relationships concerned Address, and Lease packages. From the point of view of country profile these packages are auxiliary and for clarity reasons it seems not necessary to include them in the profile.

The next step was to join diagrams presenting Objects (Figure 4) with Parties and Right to Properties (Figure 5) sections of Polish cadastral model. Then PL_BoundaryPoint class and its associations with PL_CadastralParcel, PL_CadastralSection and PL_CadastralComplex existing in original model of Polish cadastre were added to the diagram.
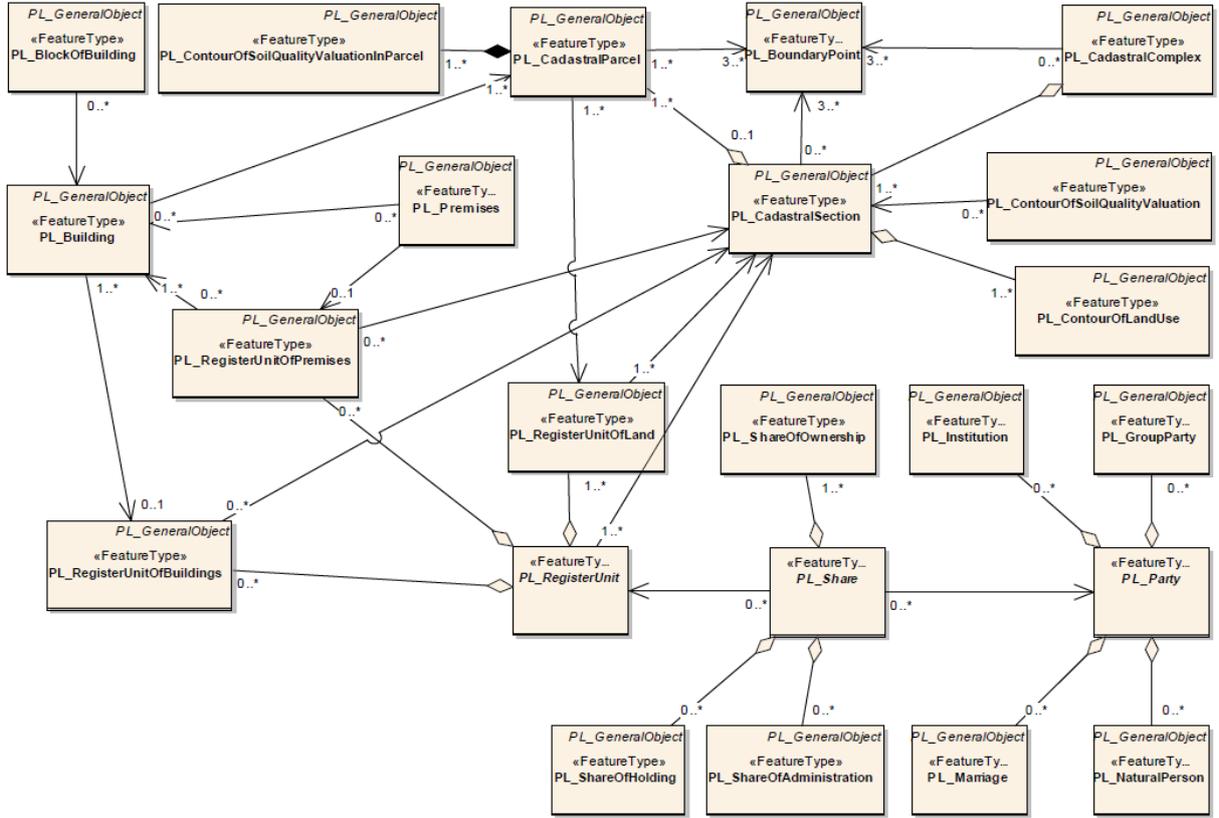

Figure 6. The result of joining "Objects" with "Parties and Right to Properties"

The result of joining these two diagrams with adding PL_BoundaryPoint class and its associations seems complicated, so some trials were performed to make it simpler. The associations between classes PL_RegisterUnitOfLand, PL_RegisterUnitOfBuildings, PL_RegisterUnitOfPremises and class PL_CadastralSection (Figure 6), which occur in the model of Polish cadastre were substituted by one relationship between classes PL_RegisterUnit and PL_CadastralSection with constraint that class PL_RegisterUnit consists of at least one instance of class PL_RegisterUnitOfLand. After adding the classes and relationships from the Figure 3 we obtained the proposed country profile for Poland. The result of these operations is presented in the Figure 7.
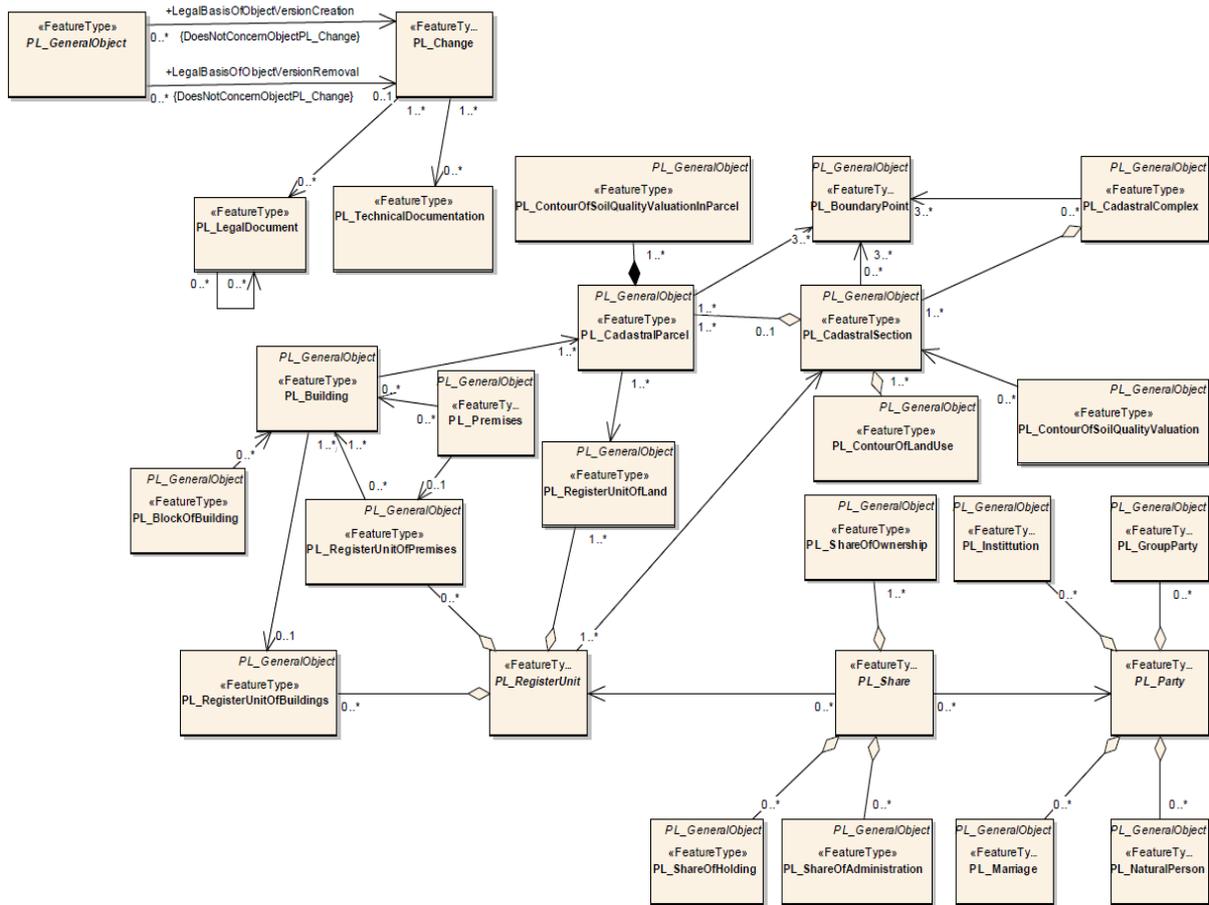
Figure 7. The profile of Polish cadastre based on LADM

6. FUTURE WORK

After the Order in case of Ground and Building Cadastre is finally published, it is necessary to check if some changes have been made to the cadastral model there. If they were, then they should be introduced to the suggested country profile as well. The author believes that the proposed profile should be consulted with experts dealing with cadastre, especially academic and government administration ones.

Since the preliminary works on conformance testing of Polish cadastral model against Land Administration domain Model have already been performed (Bydłosz, 2012), the following works may be conducted to check the compliance level of the Polish cadastral model with LADM.

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BIOGRAPHICAL NOTES

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