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## **PRELIMINARY WORKS ON LEADING POLISH CADASTRAL MODEL INTO CONFORMANCE WITH LADM**

### **1. INTRODUCTION**

The ISO 19152 “Land Administration Domain Model” has been developed by Technical Committee 211 (Geographic Information) of International Organization for Standardization. At the same time, although independently the new model of Polish cadastral system is being prepared. According to the INSPIRE directive (article 7) the international standards that are in favour for harmonisation of spatial data sets shall be taken into account in the development of implementing rules, so the purpose of this paper is to evaluate the compliance of Polish cadastral model with Land Administration Domain Model as a future standard. That includes preliminary conformance tests.

### **2. LAND ADMINISTRATION DOMAIN MODEL**

Works concerning ISO 19152 “Land Administration Domain Model” (LADM) are conducted since FIG congress, that took place in Washington in 2001. In the beginning, the LADM was called the Core Cadastral Domain Model. 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. The works on LADM has been conducted and it has the status of Final Draft International Standard registered for formal approval, now. The final version of LADM is expected later on this year and the publication of Land Administration domain Model as ISO 19152 standard will probably take place in 2013. The Land Administration domain Model is also proceeded in European Committee for Standardization (CEN).

The Land Administration Domain Model is a descriptive standard. It provides the reference model that is supposed to serve two purposes (LADM, 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 purpose is 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),

- 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 1900 series standards methodology. The Land Administration Domain Model is based on four basic classes (fig. 1).

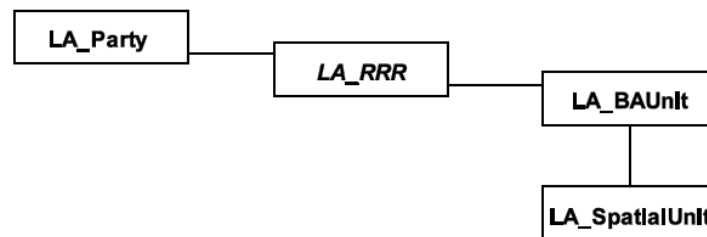


Fig. 1. Basic classes of the LADM (source: (LADM, 2012)).

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 classes. The classes of Land Administration Model begin with letters “LA”. These classes are organized in three packages and one subpackage (fig. 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.

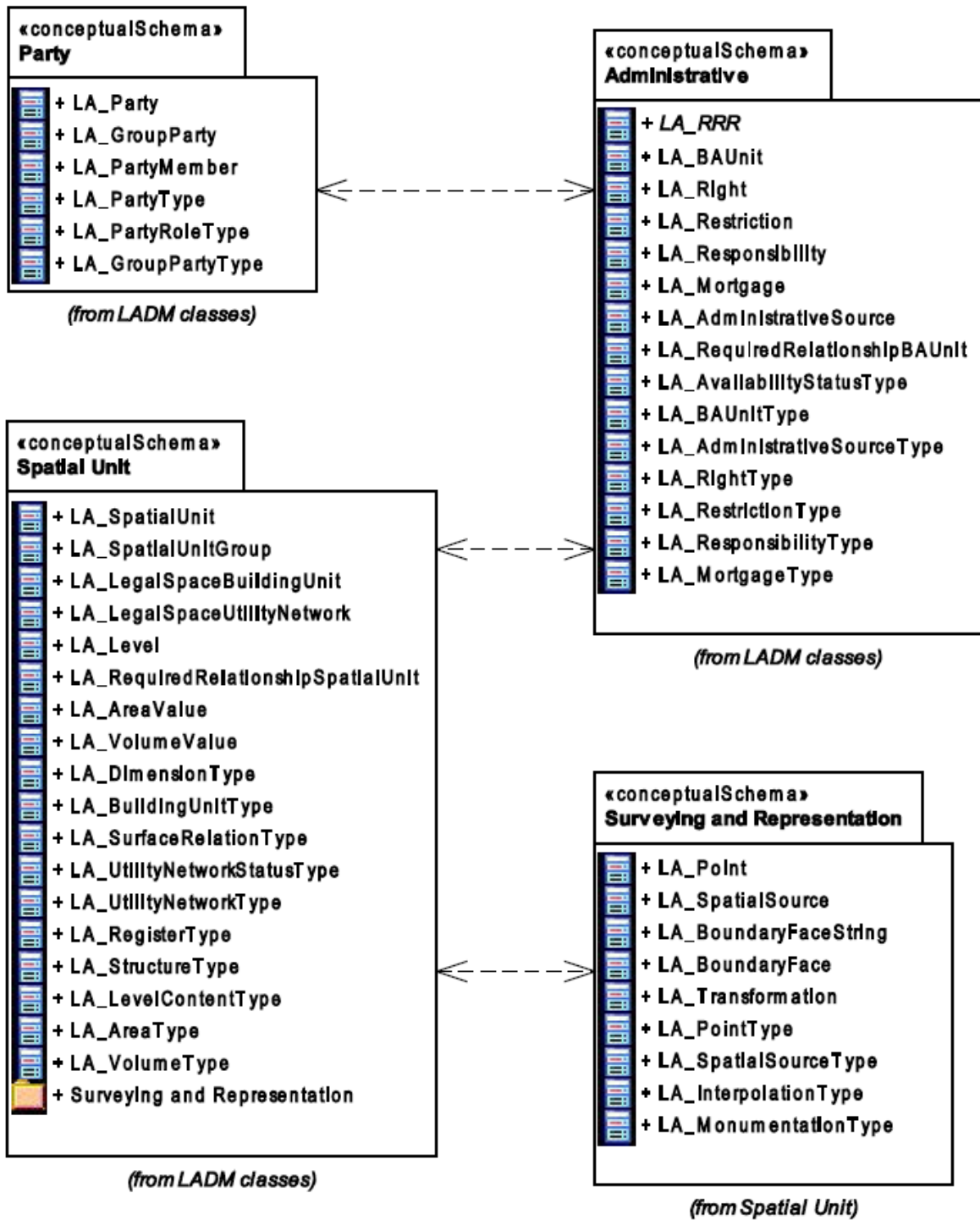


Fig. 2. The LADM overview of (sub)packages, with their respective classes (source: (LADM, 2012)).

### 3. THE MODEL OF POLISH CADASTRAL SYSTEM

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, 2012) that is in the final draft version defines the model of Polish cadastral system. The Unified Modelling Language is used for describing schemas and Geographic Modelling Language as basic data exchange format.

The Polish cadastral model contains 59 classes. The classes of Polish cadastral model begin with letters “EGB”. Relations between classes are presented on twenty one diagrams. For organizational purposes these classes are grouped in 7 thematic packages. The names of packages are as follows: Objects, Parties, Rights To Properties, Address, Boundary Point, Lease and Legal Basis. The application schema of Polish cadastral database is presented on figure 3.

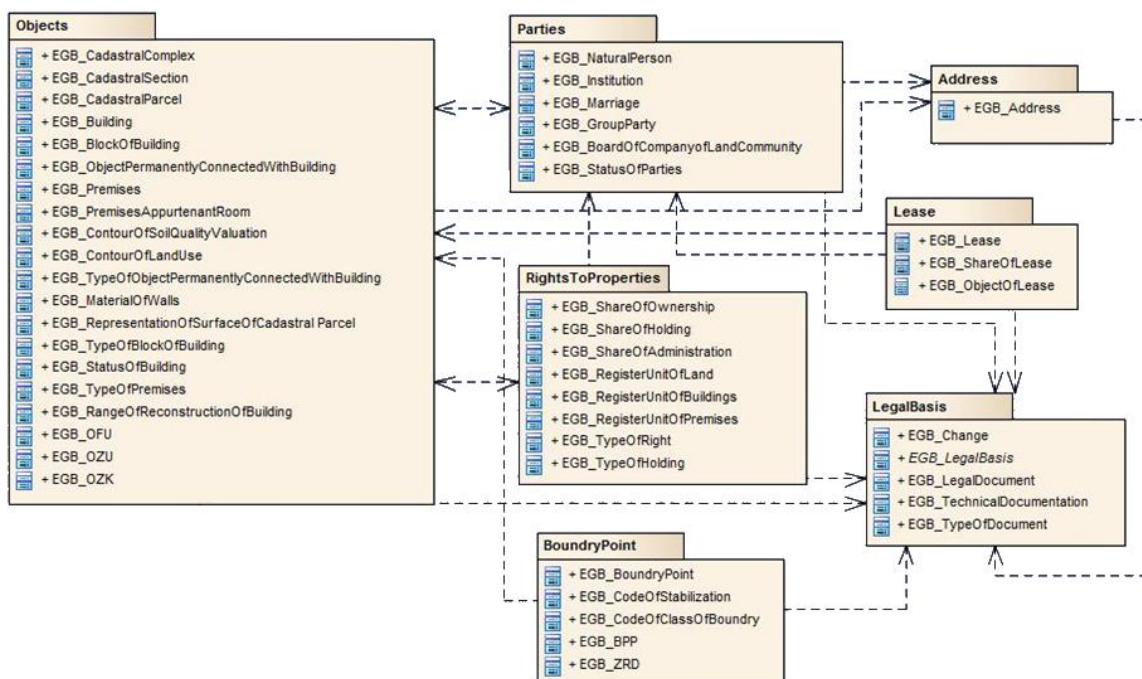


Fig. 3. The application schema of Polish cadastral database  
(source: (Bydłoz J., Gózdź K. (2011)- updated after publication)

### 4. INSPIRE DIRECTIVE

The European Union countries are obliged to implement the Directive establishing an Infrastructure for Spatial Information in the European Community (INSPIRE, 2007). Chapter III of the directive concerns interoperability of spatial data sets and services. According to the article 7 of the Directive, implementing rules laying down technical arrangements for the interoperability and, where practicable, harmonization of spatial data sets and services, designed to amend non-essential elements of this Directive by

supplementing it, shall be adopted. The international standards that are in favour for the harmonisation of spatial data sets shall be taken into account in the development of implementing rules. Moreover, where organizations established under international law have adopted relevant standards to ensure interoperability or harmonization of spatial data sets and services, these standards shall be integrated, and the existing technical means shall be referred to, if appropriate, in the implementing rules mentioned in this paragraph.

## **5. PRELIMINARY CONFORMANCE TEST**

Although both the ISO 19152 “Land Administration Domain Model” and Polish cadastral model are in their final draft versions, the author decided to perform some preliminary conformance test. Any land administration domain model claiming conformance to future ISO 19152 should satisfy the requirements given in Annex A, that is the Abstract Test Suite (LADM, 2012).

The conformance tests should give an answer if the Polish cadastral model is conformant with the LADM in terms of package and level. Such tests can answer the question if specific data sets of Polish cadastral model are conformant with corresponding LADM packages. Each test may take the following values: conformant, not conformant or not evaluated. Three conformance test are specified in LADM for every package. The packages may be level 1 (low level), level 2 (medium level) and level 3 (high level) compliant. The test method in (LADM, 2012) is performed to examine the application schema of the implementation under test (in this case Polish cadastral model), including class, attribute(s), and associations definitions. This can be done either by showing inheritance structure between the LADM and the tested model (elements) or showing mapping of elements between the LADM and the tested model. The author decided to choose the latter. The attempt was made to perform level 1 test of Polish cadastral model against Land Administration Domain Model. The results are presented below.

The Polish cadastral model have different packages then the Land Administration Domain Model. In the beginning, the general testing according to LADM were performed by the author. According to (LADM, 2012) the LADM package is level 1 compliant if:

- Party package. If LA\_BAUnit is implemented, the implementation package under test contains at least one class conformant with the definition of LA\_BAUnit and which has all mandatory attributes and association roles of LA\_BAUnit.
- Administrative package. First, the implementation package under test contains at least one class conformant with the definition of VersionedObject and which has all mandatory attributes and association roles of VersionedObject. Second, if LA\_Party is implemented, then the implementation package under test contains at least one class conformant with the definition of LA\_Party and has all mandatory attributes and association roles of LA\_Party.
- Spatial Unit package. If LA\_Right is implemented, then the implementation package under test contains at least one class conformant with the definition of one of the

specializations of class LA\_Right and has all mandatory attributes and association roles of LA\_Right.

- LA\_SpatialUnit - if LA\_SpatialUnit is implemented, then the implementation package under test contains at least one class conformant with the definition of LA\_SpatialUnit and has all mandatory attributes and association roles of LA\_SpatialUnit.

### Testing the LA\_BAUnit conformance

The class *EGB\_JednostkiRejestrowe* was chosen for conformance test with LA\_BAUnit class. The results of test were presented in the table 1.

LA_BAUnit	<i>EGB_JednostkiRejestrowe</i>
<b>Attributes</b>	
Name (The name of the basic administrative unit)	<i>Nazwa</i>
Type (The type of the basic administrative unit)	<i>FeatureType</i>
uiD (The identifier of the basic administrative unit)	<i>idJednostkiRejestrowej</i>
<b>Associations</b>	
LA_Party	For example <i>EGB_JednostkaRejestrowaGruntow</i>
LA_SpatialUnit	Not directly to <i>EGB_Dzialka</i>
LA_RRR (at least one of them)	Not directly to <i>EGB_PrzedmiotDzierzawy</i>

Table 1. The results of conformance test of class LA\_BAUnit against *EGB\_JednostkiRejestrowe*.

As we can see the *EGB\_JednostkiRejestrowe* has all mandatory attributes of class LA\_BAUnit. It also has all mandatory associations, although not explicitly, which is allowed in the test. The *EGB\_JednostkaRejestrowaGruntow* class of Polish cadastral model is a corresponding class to LA\_Party (a party may be a basic administrative unit). There is also association of class LA\_RRR to *EGB\_Dzierzawa*, that is type of a right. This association is not explicit. It goes through classes *EGB\_JednostkaRejestrowaGruntow*, *EGB\_Dzialka*, *EGB\_PrzedmiotDzierzawy* and then to *EGB\_Dzierzawa*.

### Checking the implementation of VersionedObject in Polish cadastral model

The Polish cadastral model does not have the class like VersionedObject. The versioning is realized by attributes *startObiekt*, *koniecObiekt*, *startwersjaObiekt*, *koniecwersjaObiekt* there. So, there is not possible to perform that test.

### Testing the LA\_Party conformance

There are some other classes of Party package implemented in the Polish cadastral model, but the class LA\_Party is not directly implemented. So, there is not possible to perform that test.

### Testing the LA\_Right conformance

The Polish cadastral model does not have the class corresponding to class LA\_Right, for the limited number of rights is the part of Polish cadastre. Mostly, rights are subject of Land Register in Poland (Bydłosz, 2012). So, there is not possible to perform that test.

### Testing the LA\_SpatialUnit conformance

The class *EGB\_DzialkaEwidencyjna* was chosen for conformance test with LA\_SpatialUnit class. The results of test were presented in the table 2.

LA_SpatialUnit	<i>EGB_DzialkaEwidencyjna</i>
<b>Attributes</b>	
area ( The area of the 2D spatial unit)	<i>powierzchniaEwidencyjna</i>
dimension (The dimension of the spatial unit)	No such an attribute, but default is two, as polish cadastral system is 2D system.
extAddressID (The link to external address(es) of the spatial unit)	<i>identyfikatorRejonuStatystycznego</i>
label (Short textual description of the spatial unit)	<i>dodatkoweInformacje</i>
referencePoint: The coordinates of a point inside the spatial unit	<i>geometria</i> (optionally reference point ( <i>centroid</i> ))
suID (The spatial unit identifier)	<i>idDzialki</i>
surfaceRelation (Indicates whether a spatial unit is above or below the surface)	Not applicable as Polish cadastre is 2D system
volume (The volume of the 3D spatial unit)	Not applicable as Polish cadastre is 2D system
<b>Associations</b>	
LA_SpatialSource	No such an association, but there is an attribute <i>geometria</i> that feels some the requirements of LA_SpatialSource

Table 2. The results of conformance test of class LA\_SpatialUnit against *EGB\_DzialkaEwidencyjna*.

## 6. RECAPITULATION

Both the Polish model and Land Administration Domain Model are not binding regulations yet – so we cannot be sure if all classes will be a hundred percent the same like in draft versions of Polish cadastral model and Land Administration Domain Model.

The LADM covers the whole land administration system, while there are two systems in Poland (the Cadastre for Grounds and Buildings and the Land Register). The great part of LADM, especially rights, restrictions and responsibilities are included in the Land Register and are not or are slightly represented in Cadastre.

There is twenty diagrams describing the Polish cadastral model. It results in some technical difficulties during conformance tests.

All this factors cause that the result of this test is not one hundred percent sure. But the general idea to perform this was based on two purposes. First, it was to make general assessment of Polish cadastral model conformance with LADM. The second purpose is to go through the procedure of conformance test. It can be helpful if we decide to perform the conformance test of Polish cadastral model (that already will be in power) against the Land Administration Domain Model as a full ISO 19152 standard.

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