Linking the Land Information Systems in the Philippines Using the LADM as a Global Schema

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Key words: Digital cadastre, e-Governance, LADM, modelling

SUMMARY

The Philippines has multiple land registration agencies which have their own separate and isolated land administration systems. This result in the duplication of software development and redundant and sometimes conflicting data. These undermine the security of tenure as well as inconvenience the citizens and other users of said data. Connecting these systems would therefore enable better coordination between the agencies and offer significant savings in manpower and resources.

In this paper, an approach for integration of the existing legacy systems using the LADM as a global schema is proposed. The LADM is extended to accommodate the existing Philippine land administration systems data models. The resulting data model is a minimal country profile that accommodates the existing databases and should serve as a contribution in the development of the full LADM country profile for the Republic of the Philippines.

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1. INTRODUCTION

The land administration system in the Philippines has been described as both multiple and complex (Bangsal, 2008). It is governed by multiple laws, regulations, processes and standards which are managed by multiple institutions with limited collaboration (Dealca, 2009). This has resulted in multiple land information systems (LIS) with redundant or conflicting records and data silos.

Efforts to harmonize the two largest LIS in the country, the Department of Environment and Natural Resources' (DENR) Land Administration and Management System (LAMS) and the Land Registration Authority's (LRA) Land Titling Computerization Project(LTCP), have not progressed well which can impede the progress of cleaning up redundant and conflicting land records (Llanto et al, 2010). The Land Sector Development Framework, the strategic roadmap for land administration, has also been promulgated. Among its objectives is the establishment of a unified land information system (DENR-LAMP2, 2010). However, it is currently just declaration of principles that still need to be translated into operational guidelines, procedures and activities. The LARA bill has been also filed to merge the different land agencies but they it has languished in Congress (Llanto et al, 2010)

Given the difficulty of introducing institutional reforms, an integrated land information system can be an alternative to a single land administration agency. (Adobo, 2012). This would allow users and stakeholders to have a unified view of the data stored in multiple LIS. An integrated national LIS would facilitate the sharing of information and optimization of land administration activities. However, the absence of a standard data model makes it difficult to develop an integrated land information system. To integrate the different LIS, a global schema/data model has to be developed. One that can dominate or cover all the existing schemas and allow the different LIS to communicate with each other. The Land Administration Domain Model (LADM), an ISO standard for land administration, was designed to solve the lack of a common concepts and ontology in the domain. It can be the global schema that will unify the Philippine land administration system. There have already been research on using it to link registers (Mader et al, 2013) and it has been implemented in a distributed situation (Rutamu, 2006). However, it is a generic model and will have to be customized to fit the Philippine situation.

2. LAND INFORMATION SYSTEMS IN THE PHILIPPINES

2.1 LIS in the Philippines

There are currently 23 agencies with interest in land. (Dealca, 2009). Of these, four are the main land administration agencies: Department of National Resources (DENR), Land Registration Authority (LRA), Department of Agricultural Reform (DAR), and the National Commission of Indigenous Peoples(NCIP). Each of these four agencies has their own land information systems which are developed in isolation.

3. ANALYSIS OF LAND INFORMATION SYSTEMS

The aims of this research are:
- recognize the relationship between features in the existing LIS
- identify attributes common the existing LIS and LADM

The fragmentation of the LIS is due to the fact that they were developed in isolation due to funding sources from different development projects. The LADM was chosen as the global schema for integration as it is an ISO standard and it aims to provide an ontology for the land administration domain of which the LIS belong to.

3.1 Analyzed LIS

Not all the LIS were analyzed. Only the four agencies with major interest in land were considered due to time and resource constraints. Of the four, only three were included. This is due to the willingness of the agency to share information about their system.

Table 1 Analyzed LIS

Land Administration System	Agency
Emancipation Patent Information System (EPIS)	Department of Agrarian Reform
Certificate of Land Ownership Award Information System (CLOAIS)	Department of Agrarian Reform
Land Administration and Management System (LAMS)	Department of Environment and Natural Resources – Land Management Bureau
Ancestral Domain Database and Information System (ADDIS)	National Commission on Indigenous Peoples

The EPIS database is composed of only one table. Due to its simplicity, it will the EPIS and CLOAIS will be treated as one database for the rest of the paper.

3.2 LADM Compliance

Table 2 Party Package Attributes found in the analyzed LIS

Attribute	Number of matches
exPID (LA_Party)	4
name (LA_Party)	4

Table 3 Administrative Package Attributes found in the analyzed LIS

Attribute	Number of matches
name (LA_BAUnit)	4
type (LA_BAUnit)	4
uID (LA_BAUnit)	4
type (LA_AdministrativeSource)	4

Table 4 Spatial Unit Package Attributes found in the analyzed LIS

Attribute	Number of matches
geometry (LA_Point)	1
measurements (LLA_SpatialSource)	1
procedure (LA_SpatialSource)	1
type (LA_SpatialSource)	1

Table 5 Matches between existing LIS and LADM packages

Existing Database	Party Package LADM	Administrative Package LADM	Spatial Unit Package LADM
ADDIS (Ancestral Domain Database and Information System) NCIP	CADT_claimant CADT_register	ApprovedCALTs CADT CADTIssued	

CLOAIS/EPIS (Certificate of Land Ownership Award Information System/ Emancipation Patent Information System) DAR	CL_FarmerBeneficiary CL_FarmerBeneficiaryList CL_LandOwner EmancipationPatentList	CL_DistributedLand	
LAMS (Land Administration and Management System) DENR	DBSnamelist	RODTitle CIMParcel	CIMSurvey

Of the three databases, only the LAMS has matches in all the three main packages. The other two databases mainly act as registers and does not track the geometry of the parcel.

3.3 Level of redundancy

Table 6 Overlaps between existing LIS

Existing Database	ADDIS	CLOAIS/EPIS	LAMS
ADDIS			
CLOAIS/EPIS			**Overlapping**
LAMS		**Overlapping**	

The ADDIS tracks the ancestral domain whereas the CLOAIS/EPIS tracks agricultural lands covered by the agrarian reform act. The documents the ADDIS records are the Certificate of Ancestral Land Title and Certificate of Ancestral Domain Titles. CLOAIS/EPIS maintains a record of the Certificate of Land Ownership Award and Emancipation Patent documents. These are also tracked by the LAMS. The only part of the CLOAIS/EPIS not covered by the LAMS is the master list of farmer beneficiaries but these can be derived from the titles.

4. GLOBAL SCHEMA FOR LINKING THE LIS

By mapping the attributes of the existing LIS to the LADM whenever possible and extending the LADM classes when no matches are found, a global schema was produced which accommodates all the existing schema.

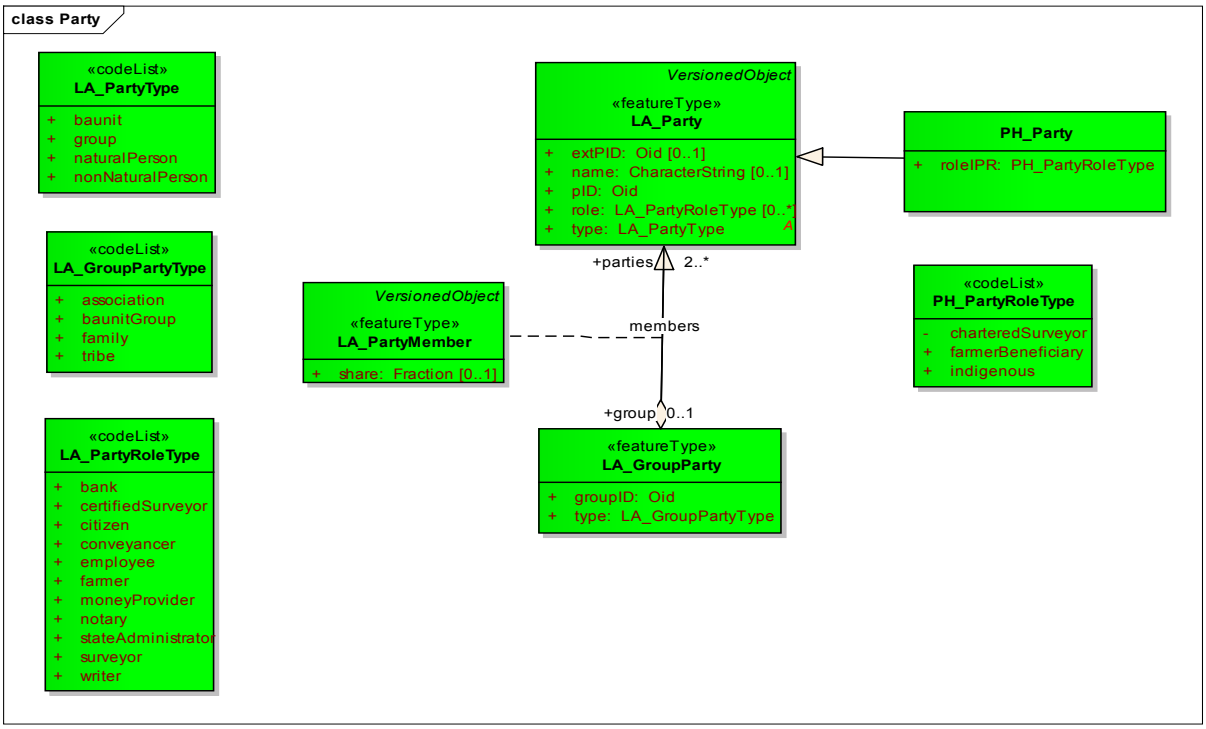

Figure 1 Proposed Party Package

The party types from the existing databases were used to create a new codelist called PH_PartyRoleType which adds the farmer beneficiary, charteredSurveyor and indigenous people type to accommodate the existing LIS.

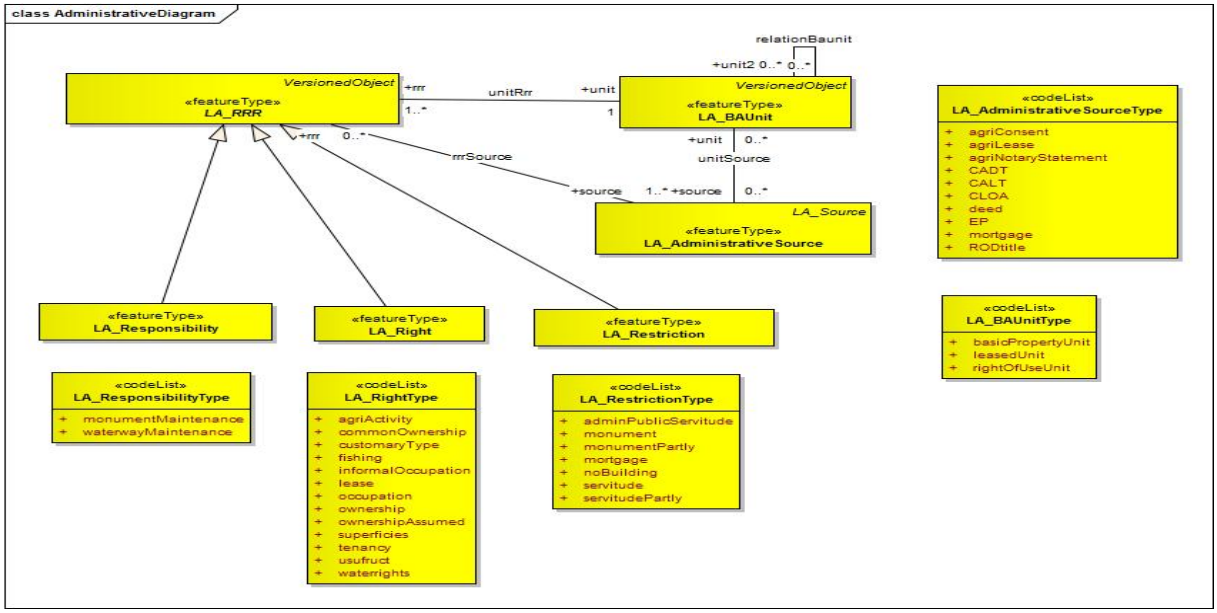

Figure 2 Proposed Administrative Package

For the Administrative Package, the CADT, CALT, CLOA and EP were added to the LA_AdministrativeSourceType to reflect the current situation.

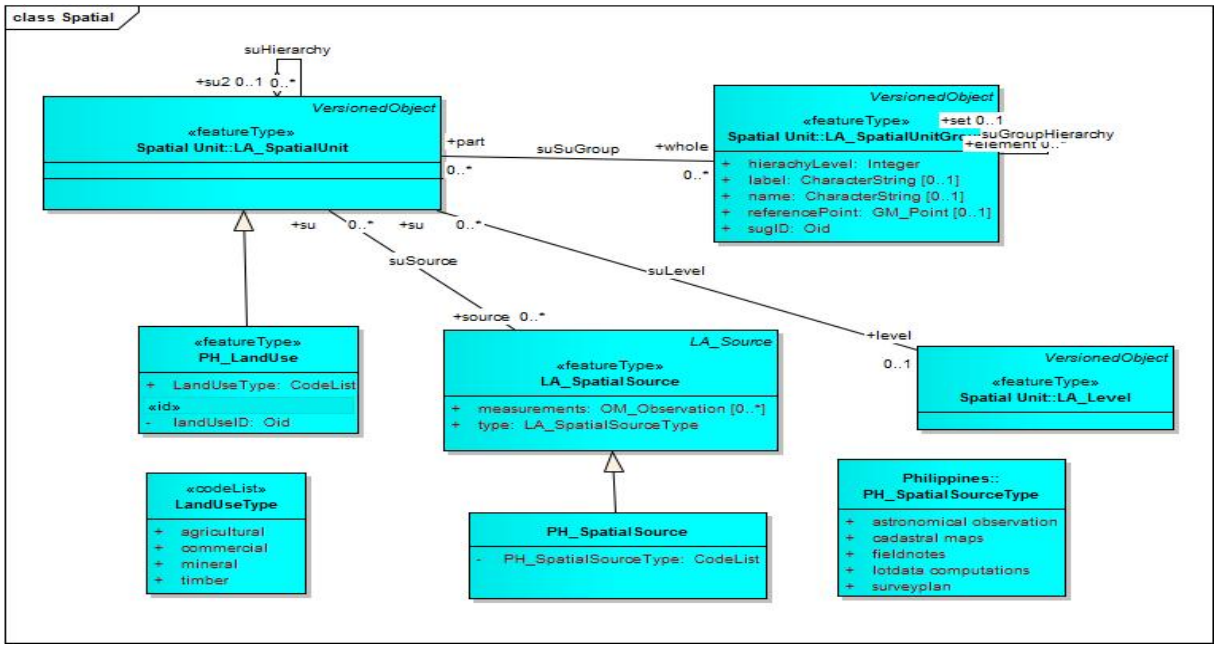

Figure 3 Proposed Spatial Unit Package

For the Spatial Unit package, the sources that are used in the existing are added to a new codelist called PH_SpatialSourceType to accommodate the existing databases.

5. CONCLUSIONS

The current LIS in the Philippines are fragmented due to them being developed in isolation. To enable communication between them, a global schema has to be created, one that dominates or covers all the existing schema. With this study, the LADM was extended to create a customized schema, one that is compliant with the LADM and that accommodates the existing schemas.

The original schemas were also found to be compliant with the LADM to a certain extent. It was also discovered that the LAMS and EPIS/CLOAIS completely overlap. To avoid unnecessary redundancy in maintenance in the future, it is recommended that the two databases be merged or be linked with each other.

The schema/data model produced by the research is a sort of minimal country profile that accommodates the analyzed LIS. Other LIS and existing laws can be added to make it a more complete country profile.

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BIOGRAPHICAL NOTES

Romer Aranas graduated in Geodetic Engineering from the University of the Philippines. He is currently finishing his thesis on using the LADM for the integration of multiple LIS. He specializes in spatial databases and web GIS.

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