Bridging the Gap between LADM and Cadastres

Mohsen Kalantari, Abbas Rajabifard, Jill Urban-Karr, Kenneth Dinsmore
Introduction

• Implementation guidelines for LADM – A six pillar approach
• A case study driven methodology
  – Victoria
  – Belize
• Design and develop a LADM Geodatabase
• Disclaimer
Pillar 1- Objectives and motivation

• International compliance
  – Global Cadastre (McDougal et al 2013)

• Cross jurisdictional data exchange
  – PSMA Australia

• Upgrading or new versions for existing systems
  – Stewart
Pillar 2- Existing institutions

- It is not about data, it is about implementation implications

- Case study Victoria, lesson from ePlan implementation
  - Vicmap property update
  - Software vendors and solution providers for ePlan
  - Cadastral surveyors, data literacy
  - Local governments
  - State governments
  - National bodies such as PSMA Australia

- Case study ESRI Geodatabase
  - Use LADM as a reference and make sure to be compliant but let the business needs drive and put it to the test
Pillar 3 – Semantic Compliance

• Existing land administration processes
• Other relevant domains e.g. land development, land use planning
• Example:
  • **Restriction (Encumbrance):** A restriction is a formal or informal requirement to refrain from doing something (modified from ISO 19152: 2012 (LADM)). In Victoria, formal restriction examples include building envelopes, rules of an Owners Corporation, mortgages, easements and covenants. These are known as encumbrances when they are recorded on title.
  
  • **Responsibility (Obligation):** A responsibility is a formal or informal requirement to do something (modified from ISO 19152: 2012 (LADM)). In Victoria, responsibilities are known as obligations and examples include Section 173 agreements under *Planning and Environment Act 1987*, municipal rates and land taxes.
Pillar 4 – Structural Compliance

- Existing cadastral or land administration databases
- Interoperability with other relevant datasets
- Examples
  - ePlan, spatial approach, legal independence and interoperability

<table>
<thead>
<tr>
<th>Parcel</th>
<th>Parcel</th>
<th>Parcel</th>
<th>Easement 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Rights</td>
<td>Ownership</td>
<td>Ownership</td>
<td>Ownership</td>
</tr>
<tr>
<td>Restrictions</td>
<td>Easement 1</td>
<td>Easement 1</td>
<td>Easement 1</td>
</tr>
<tr>
<td>Party</td>
<td>Owner 1, LGA 1</td>
<td>Owner 2, LGA 1</td>
<td>Owner 3, LGA 1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Parcel</th>
<th>Parcel</th>
<th>Parcel</th>
<th>Easement 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Interest</td>
<td>Ownership</td>
<td>Ownership</td>
<td>Ownership</td>
</tr>
<tr>
<td>Beneficiary</td>
<td>Owner 1</td>
<td>Owner 2</td>
<td>Owner 3</td>
</tr>
<tr>
<td></td>
<td>LGA 1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Pillar 5- Feedback and improvements

• Examples
  – Towards 3D-Cadastre and business case for it
  – Consideration of BIM for 3D-Cadastres
  – Integrated legal and physical views of the world (Advanced principles of cadastral data modelling, Aien et. al. 2013)
  – Cadastral Template 2.0 to include LADM

• A FIG LADM working group to formalise

• Improvement to LADM to be introduced on a regular basis
Pillar 6- Capacity building

- Land administration curriculums in universities and educational institutions to include LADM
- Examples
  - University of Melbourne, Land Administration systems GEOM30013
  - Tutorials on LADM using EA and ArcGIS
Belize Case Study

- Stewart has integrated land registration/cadastre software package – landfolio®; currently version 2.5
- Belize project began in 2006 with the initial IADB funded work modernizing the offices of Land Registry and Surveys and Mapping of the Ministry of Natural Resources and Environment
- Landfolio is in the process of re-design (version 3.0) and will include LADM and Esri’s parcel fabric
- Selected Belize as test case for new landfolio LADM compliance
Belize Case Study – cont’d

• Belize has 64 categories of land ownership
  – Declared land: registered in a Torrens system
  – Undeclared land: titled in a deed book and volume system
  – Government or private ownership
  – Absolute or provisional rights
  – Leasehold
  – Timeshare, condominium

• Belize has 170+ user environment across multiple departments (Physical Planning, Valuation, National Estates, Inland Revenue + original registry and cadastre) in 6 district offices + 1 national office
Belize Case Study – cont’d

• The previous system explicitly models:
  – Proprietorship
  – Taxation
  – Mortgage and easement restrictions

• The previous system implicitly models:
  – Other types of RRRs (for example, Power of Attorney, charge, etc.)

• Since both data models share the Torrens capabilities, the new system retains the implicit RRRs from the entries, however, the data conversion process includes a manual review of each “land register” to find RRRs that are implied in the entries and explicitly create the appropriate objects in the LADM model.
A = Archive Enabled
E = Edit Tracking Enabled
(CreatedBy, CreatedOn, UpdatedBy, UpdatedOn fields)
R = Registered
V = Versioned
Att = Attachments Enabled

Blue = table registered with ArcSDE
Yellow = table is not registered with ArcSDE
Purple = an ArcSDE relation between two other tables
Party
Source
### BAUnit - Spatial

**Table: SDELandFolio.DBO.LF_BAUNIT**
- **Fields:**
  - ObjectID
  - AdminDivision
  - Name
  - LotBlockParcel
  - ApproxArea
  - OriginalRegistrantDate
  - Inactive
  - IsGovernmentLand
  - IsBoundaryDispute
  - IsFractionalLot
  - IsCondominiumUnit
  - IsTimeshareUnit
  - FractionalUnit
  - FractionalPlanID
  - MetaBounds
  - Appurtenances
  - LegalDesc
  - Location
  - UpdatedOn
  - UpdatedBy
- **Indexes:**
  - IN_H_SDE_BFWID.Index
  - CDB_153B_CondoTI

**Relationship: SDELandFolio.DBO.LF_BAUNIT_Has_SeparatedRight1s**
- **Fields:**
- **Indexes:**

**Relationship: SDELandFolio.DBO.LF_BAUNIT_Has_Parcel**
- **Fields:**
- **Indexes:**

**Relationship: SDELandFolio.DBO.LF_BAUNIT_Has_Restriction1s**
- **Fields:**
- **Indexes:**

**Feature Class: SDELandFolio.DBO.SeparatedRight1s**
- **Fields:**
  - OBJECTID
  - BAUnitID
  - SeparatedRightType
  - SystemStartDate
  - SystemEndDate
  - LegalStartDate
  - LegalEndDate
  - SHAPE
- **Indexes:**

**Feature Class: SDELandFolio.DBO.Parcel_Parcel**
- **Fields:**
  - OBJECTID
  - BAUnitID
  - SystemStartDate
  - SystemEndDate
  - LegalStartDate
  - LegalEndDate
  - SHAPE
- **Indexes:**

**Feature Class: SDELandFolio.DBO.Restriction1s**
- **Fields:**
  - OBJECTID
  - BAUnitID
  - RestrictionType
  - SystemStartDate
  - SystemEndDate
  - LegalStartDate
  - LegalEndDate
  - SHAPE
- **Indexes:**
BAUnit Is Parcel
Belize – Next Steps

- Convert entire existing data set (200,000 parcels and associated attributes, documents) using a conversion program to enforce the rules of the relationships;
- Complete development of landfolio 3.0;
- Submit for LADM conformance testing;
- Roll-out to clients