Cadastral Mapping Data Models in the Geodatabase

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Abstract

There are several very different data models to consider when designing a land records geodatabase--fully spatial, traditional linear, multi-tagged linear, ArcParcel Data Model, and various combinations of each. When is feature-linked annotation justified, and when isn't it worth the overhead? This session will discuss these options from the standpoint of productivity, practicality, and usability. We'll compare the cost and benefit of various approaches. A single data model will not be recommended because there is no single data model that is right for everyone. The various options, benefits, and drawbacks of each will be presented.
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I talk about it…they do the work
Our Philosophy on GIS Data Models

Simple is better than complex

There is no one data model that is right for everyone

The model can be expanded as needs change – don’t try to anticipate all future needs now

If you’re not going to use it, you probably shouldn’t include it

More complex data modes are more costly to maintain

Always focus on your “return on investment”
Cadastral Data Models...choices are everywhere

- Linear vs. All Spatial vs. Hybrid?
- Feature Linked or Standard Annotation?
- ArcParcel Data Model or Not?
- Shared Editing or Single Feature Editing?
- Import or Link to Attributes?

- What Should be in the Geodatabase, and What Shouldn’t?
- Should COGO Attributes be Carried?
The advice doesn’t all match

- ESRI Presentations
- User Case Studies
- ArcGIS Forums
- Consultant Recommendations
- Published Articles

Let's take a look
Apparent Discrepancies

- Relationship classes should be used sparingly because they slow down the responsiveness of the geodatabase.

- Use of feature Linked annotation is recommended because it ensures consistency between the text and the associated feature.

....but feature linked annotation is a relationship class.
Apparent Discrepancies

✓ COGO attributes should be maintained on parcel and subdivision boundaries

....but many ArcMap editing tools do not maintain COGO attributes, and they only apply to linear features
Apparent Discrepancies

- Dynamic tabular data should be housed and maintained in its native format and linked to the GIS so that business rules applicable to the applications used to maintain those data sets are respected and duplication of data is avoided.

...but most models recommend moving associated tabular data into the geodatabase, even though they are maintained in tax and CAMA software applications.
Parcels represent space. In a GIS, space is modeled with polygons. Therefore, parcels should be maintained as polygons.

Feature linked annotation is the recommended format for managing lot and parcel dimensions.

.....but feature linked dimension annotation requires a linear feature class to be associated with.
Apparent Discrepancies

✓ Coincident map features should be maintained as separate feature classes that share a topology rule, by use of the shared edit tools in ArcMap.

….but editing against a geodatabase with complex topology rules significantly slows down system response for the map editor.
These are not discrepancies…

These are options

- Everything you add to your database design will have a cost, and should have a benefit.

- The benefit must outweigh the cost for the data model component to be justified.

- There is no single cookie cutter data model that is right for every cadastral implementation of the geodatabase.
Model Complexity: Cost vs. Benefit

**SIMPLE**
- ✓ Maintenance Efficiency
- ✓ Response Time
- ✓ Usability
- ✓ Portability

**COMPLEX**
- ✓ More Powerful Analysis
- ✓ Enforced Data integrity
- ✓ Fully integrated data model

**COST**
- ✓ Less enforcement of business rules
- ✓ Less data
- ✓ Possible limitations to high end analysis

- ✓ More costly to maintain
- ✓ Requires more training
- ✓ Slower
- ✓ Required high-end DBA
An Example of an Alternative Geodatabase Data Model

A tagged data model may be a partial or complete alternative

Use it for all cadastral data
-or-
Use it for a subset of your cadastral data

Cadastral data is well suited for tagging because of the high frequency of coincident boundaries
Tagged Model vs. Traditional Layering

One geometry with multiple definitions

Ensures consistency between layers, because all layers are generated from the same geometry.

<table>
<thead>
<tr>
<th>OID</th>
<th>Tag</th>
</tr>
</thead>
<tbody>
<tr>
<td>214</td>
<td>Lot</td>
</tr>
<tr>
<td>214</td>
<td>Parcel</td>
</tr>
<tr>
<td>214</td>
<td>ROW</td>
</tr>
<tr>
<td>214</td>
<td>Subdivision</td>
</tr>
</tbody>
</table>
Anatomy of a Tagged Data Model
A Tagged Data Model in Base ArcMap

One graphic feature carries multiple definitions
A Tagged Data Model in an ArcMap Third Party Extension

One graphic feature carries multiple definitions
Tagged Model vs. Traditional Layering

Features on top of features on top of features

Can result in this

Topology rules will help...the exceptions are everywhere
A Tagged Data Model Can be Compatible with the ArcParcel Data Model

✔ Make the lines smarter….(i.e. tagged)

✔ Use the fast single feature topology rules to control the cadastral lines

✔ Create polygons by running queries from the cadastral line feature class

✔ Derived polygon feature classes will be coincident, because they were derived from the same lines
A Tagged Data Model within the ArcParcel Data Model

...and should flow directly into this

Maybe this should be a little smarter
A Queried Layer from a Tagged Data Model
Tagged Data Model Workflow

edit line(s) and assign feature tags

extract lines

update polygons

TAGS
subdivision line
lot line
parcel line

cadastral line feature class

parcel
lot
subdivision
A Tagged Data Model may or may not be what you’re looking for.

However……

✓ Consider all alternatives before you commit to a data model.

✓ Just because a data model is published, doesn’t mean it’s right for you.
How Much of the Data Model Should be in the Versioned Geodatabase?

✓ A versioned parcel inventory does not provide a single table that can be simply queried by external applications, because the entire version tree must be considered.

✓ However, we must protect multiple editors from colliding with one another.
Versioned enabled SQL Queries carry significant overhead

SQL Query

ArcObjects

ArcSDE

Versioned Geodatabase

Parcel FeatureClass

State 1 (QC)

State 2 (edit)

Default
A Solution: Independent Parcel Number Administration

Use one non versioned ODBC compliant table to enforce data consistency...everybody talks to it through standard protocols
This provides for simpler integration with appraisal and tax administration applications.
Loosely coupled Integration Between ArcGIS and Appraisal Software Works!

Create the parcel on the map... CAMA software sees it in real time!
In Conclusion

Cadastral data model design requires knowledge of the geodatabase, land records management workflow, and an understanding of the priorities and expectations of the end users.

Simple is usually better than complex.

There is no one data model that is right for everyone.

A data model must balance cost against benefit.

More complex data models are more costly to maintain.

If you’re not going to use it, you probably shouldn’t include it.

Always focus on your “return on investment”
Thanks!