

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

Lets 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 it's 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

Apparent Discrepancies

- ✓ 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	COMPLEX
BENEFIT	<ul style="list-style-type: none">✓ Maintenance Efficiency✓ Response Time✓ Usability✓ Portability	<ul style="list-style-type: none">✓ More Powerful Analysis✓ Enforced Data integrity✓ Fully integrated data model
COST	<ul style="list-style-type: none">✓ Less enforcement of business rules✓ Less data✓ Possible limitations to high end analysis	<ul style="list-style-type: none">✓ More costly to maintain✓ Requires more training✓ Slower✓ Required high-end DBA

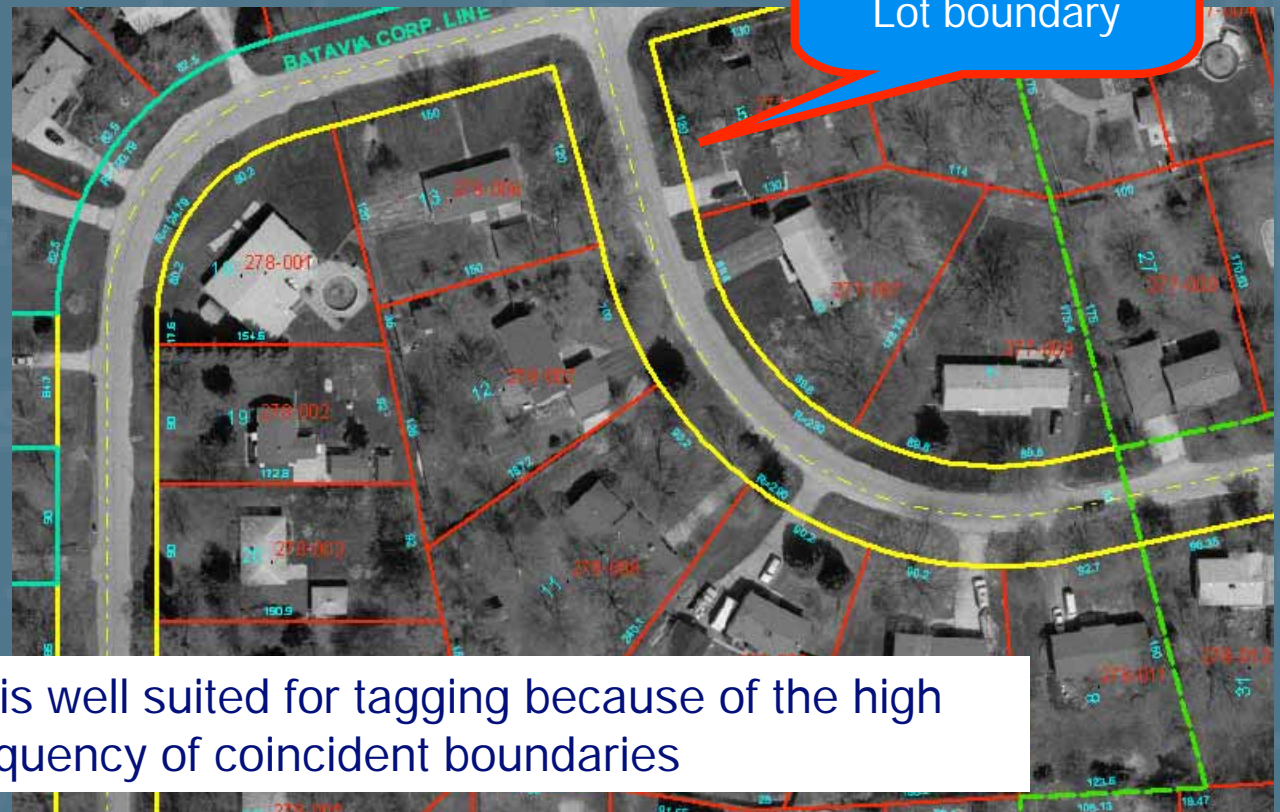
An Example of an Alternative Geodatabase Data Model

A tagged data model may be a partial or complete alternative

Use it for all
cadastral data

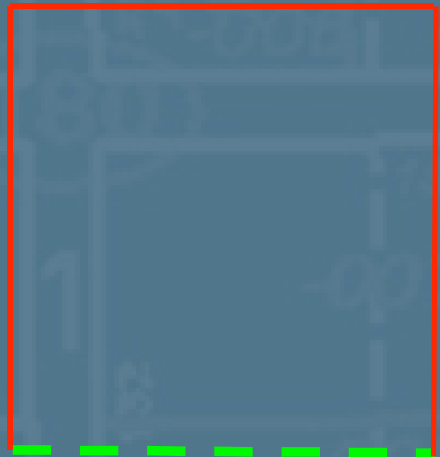
-or-

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

OID	Tag
214	Lot
214	Parcel
214	ROW
214	Subdivision

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

Anatomy of a Tagged Data Model

Microsoft Access

File Edit View Insert Format Records Tools Window Help

TagInfo : Table

ID	SubtypeCode	SubtypeName	SubtypePriority
12	366	Sub Line 100	3
18	420	Sub Line 400	4
3	351	County Line	5
5	354	Geog Twp Line	6
6	357	Section Line	7
7	360	Water Line	8
8	362	Road ROW	9
10	364	Railroad ROW	10
21	446	Parcel Line Leg Desc	11
1	309	Parcel Line	12
11	365	Lot Line	13

cadastral_line : Table

OBJECTID	ALPHATAG	SCENARI	SHAPE	TagSubtype	SHAPE
342975	Sub Line 100		.ong binary data	1	7.0094
342976	Sub Line 100		.ong binary data	1	127.47
342977	Sub Line 100		.ong binary data	1	108.45
342978	Sub Line 100		.ong binary data	1	82.208
342979	Sub Line 100		.ong binary data	1	32.624
342980	Sub Line 100		.ong binary data	1	157.00
342981	Sub Line 100		.ong binary data	1	141.00
342982	Sub Line 100		.ong binary data	1	52.259
342983	Road ROW		.ong binary data	1	178.50

Record: 2615 of 13242

GDB_RelClasses : Table

ForwardLabel	BackwardLabel	Cardinality	Notification	IsComposite
Tags	TaggedLines	2	2	1
condo_table	parcel_number	2	2	1

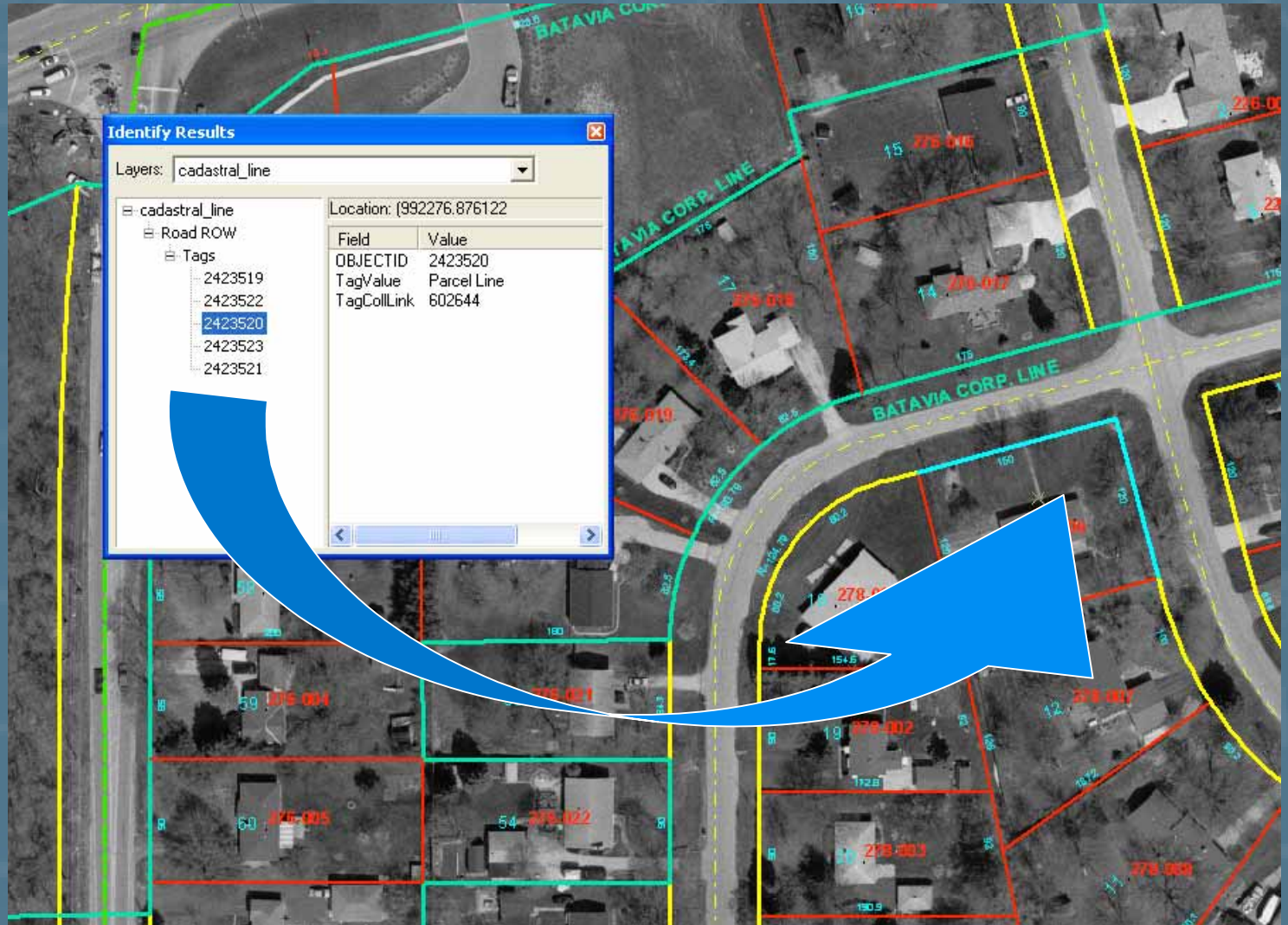
Tag : Table

OBJECTID	TagValue	TagCollLink
2399956	309	342978
2399957	365	342978
2399958	601	342978
2431342	366	342979
2431345	601	342979
2431343	309	342979
2431344	365	342979
2399962	601	342980
2399959	366	342980
2399960	309	342980
2399961	365	342980
2402038	365	342981
2402036	366	342981
2402037	309	342981
2402039	601	342981
2399963	366	342982
2399964	360	342982
2399965	309	342982
2399966	601	342982
2399967	604	342982
2402041	309	342983
2402042	365	342983
2402043	604	342983
2402044	601	342983
2402040	362	342983
2401798	365	342984
2401799	604	342984
2401797	309	342984
2401796	362	342984

Record: 9105 of 47568

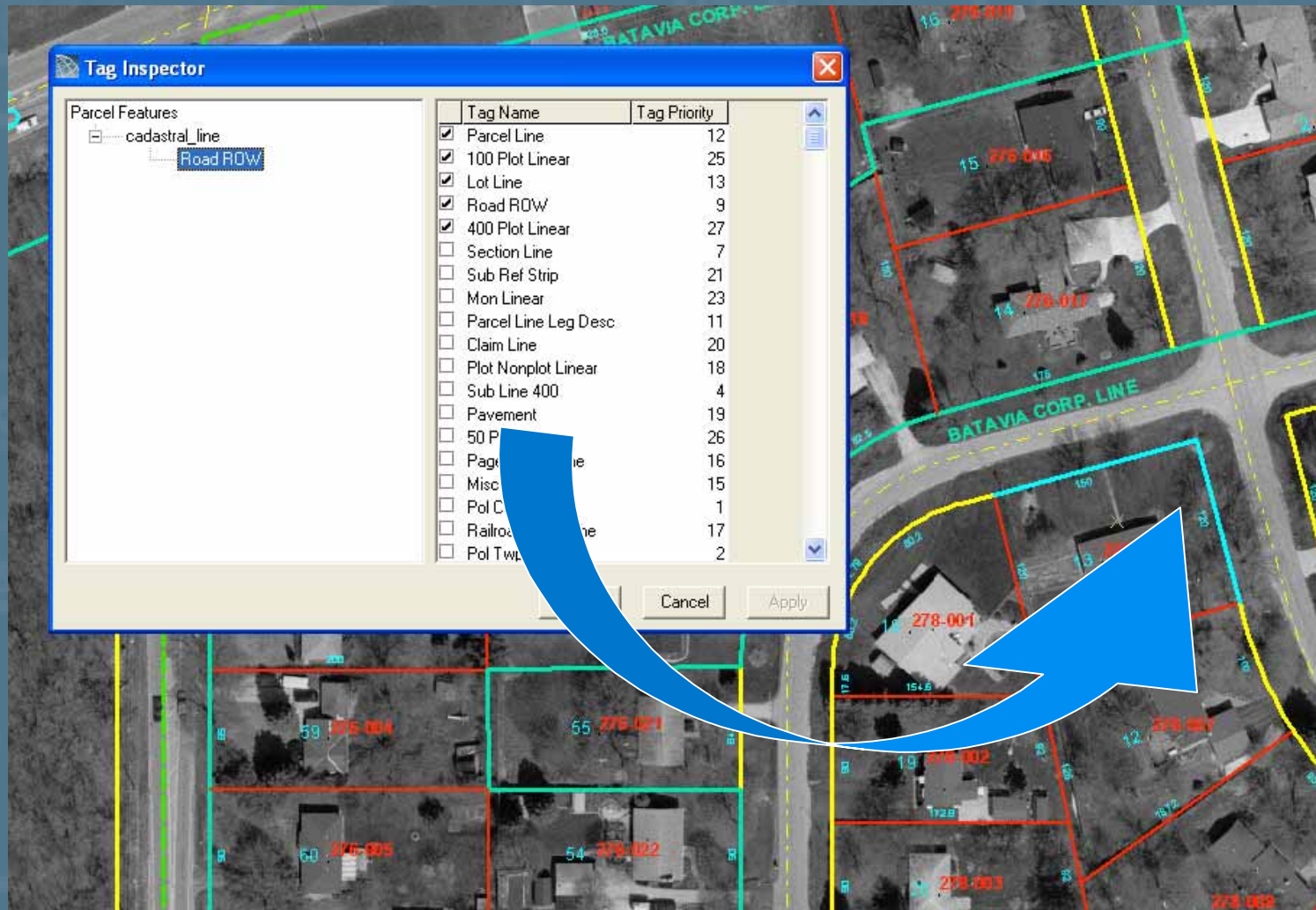
A Tagged Data Model in Base ArcMap

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

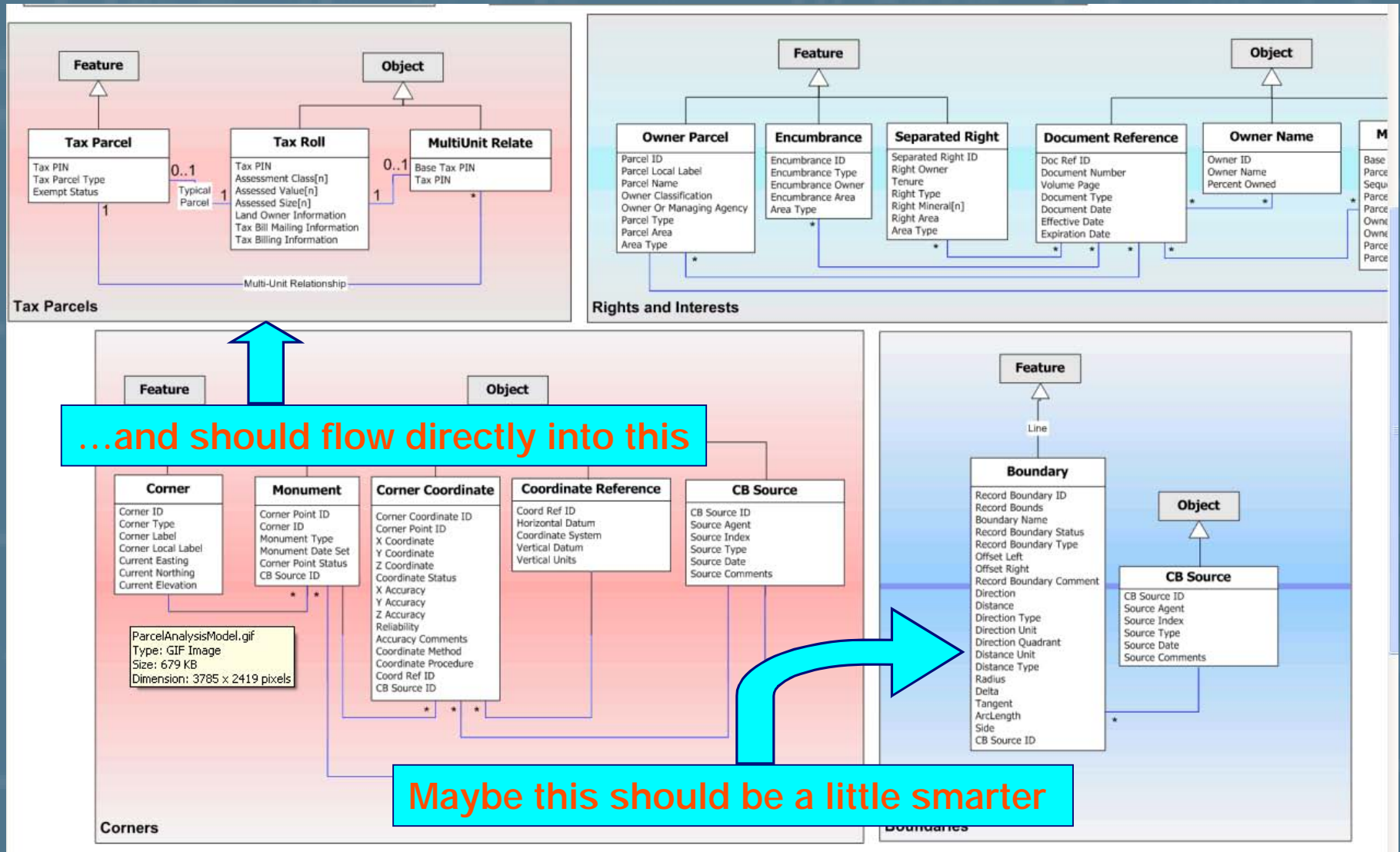
Can result in this

Topology rules will
help...the exceptions are
everywhere

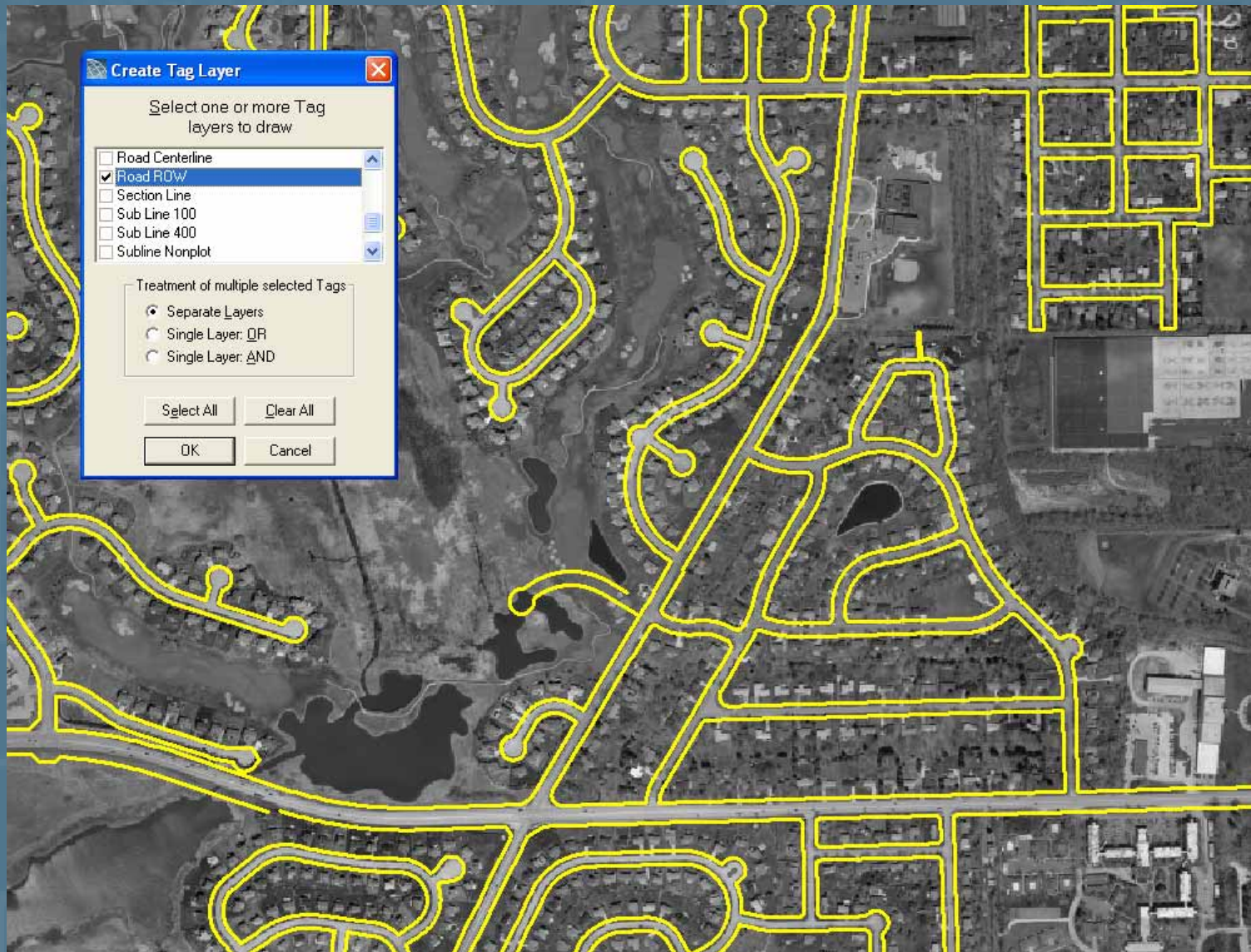
A Tagged Data Model Can be Compatible with the ArcParcel Data Model

- ✓ 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

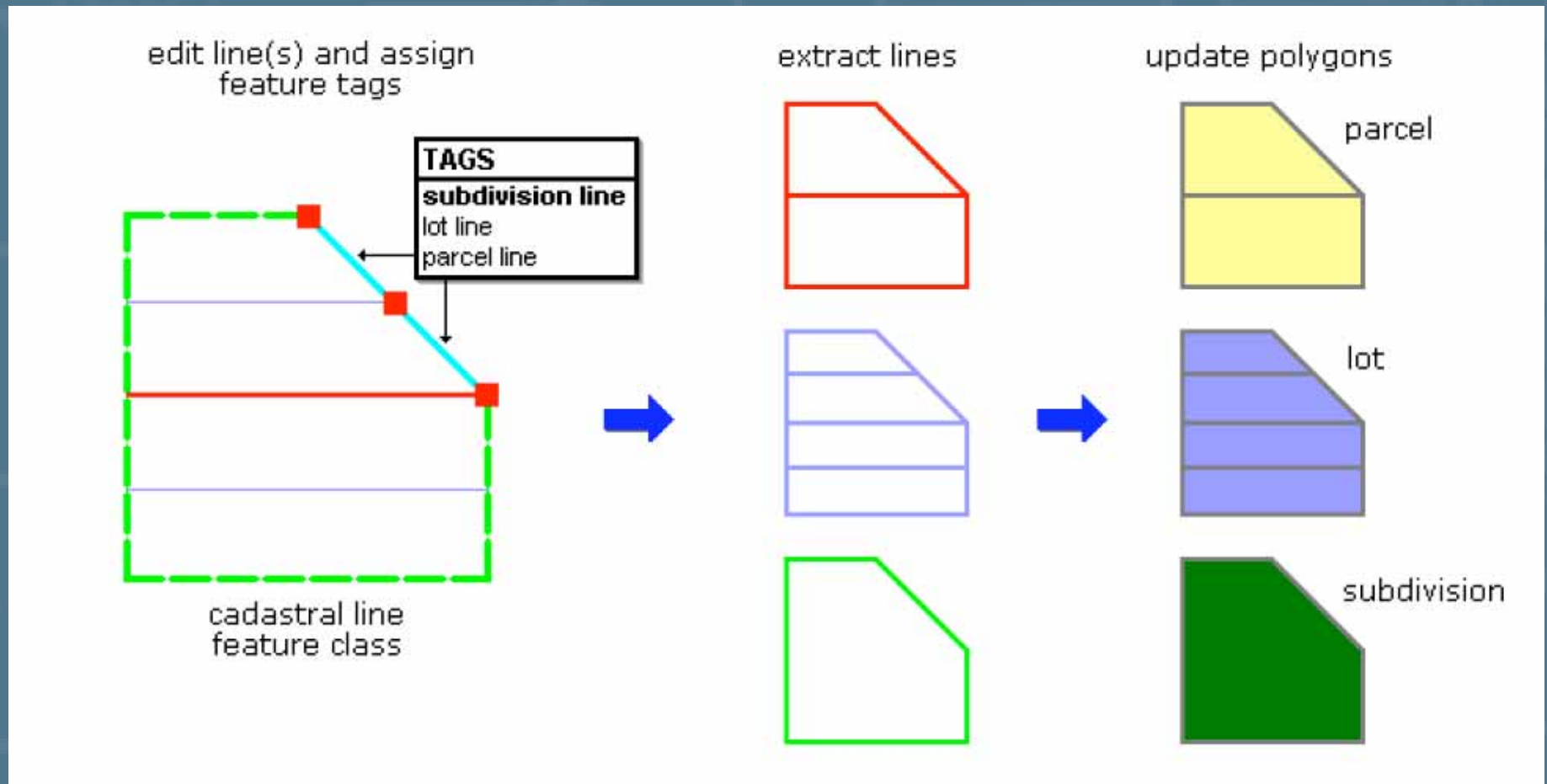
A Tagged Data Model within the ArcParcel Data Model



A Queried Layer from a Tagged Data Model



Tagged Data Model Workflow



A Tagged Data Model may or may not be what you're looking for

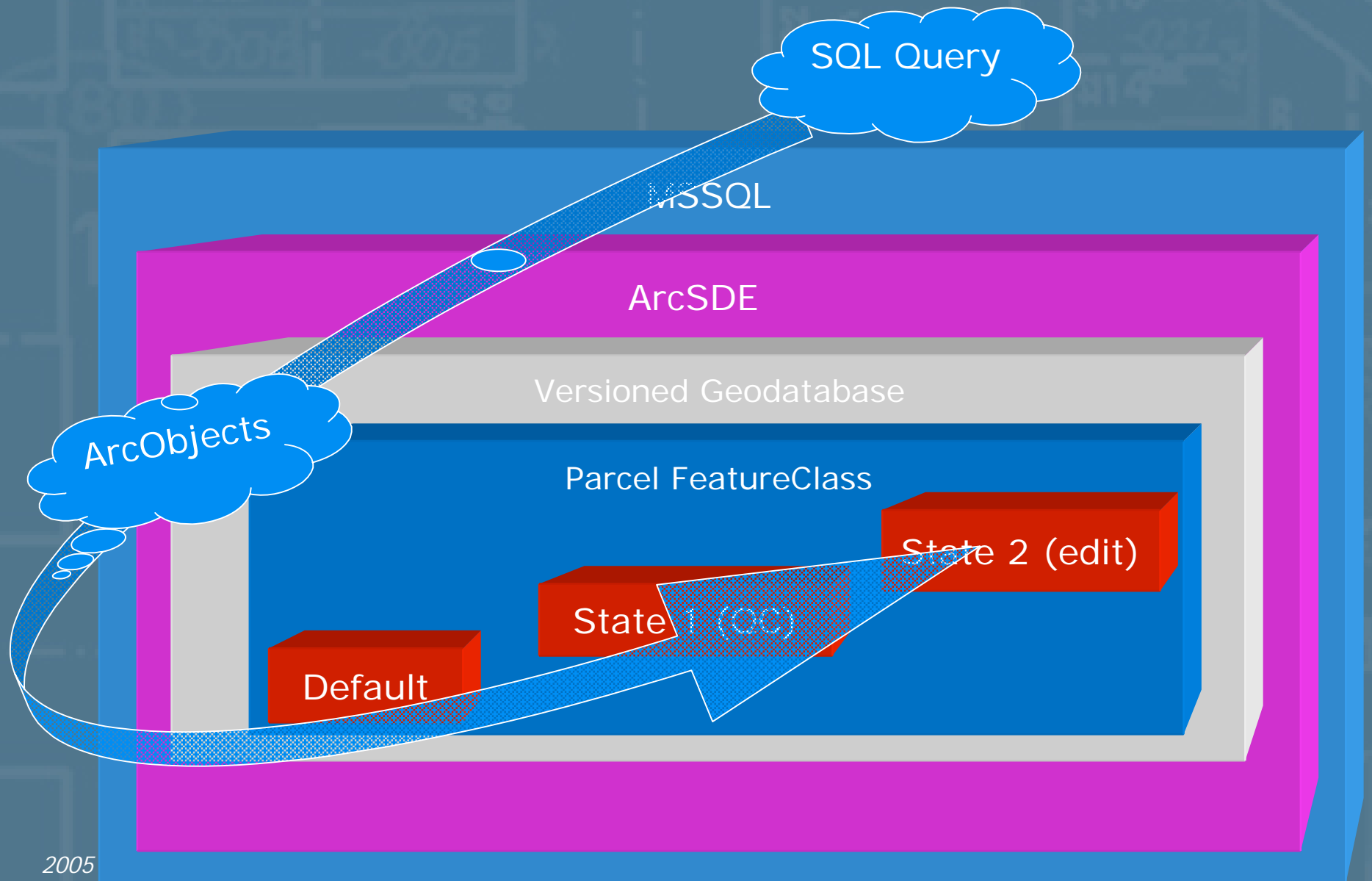
However.....

- ✓ 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?

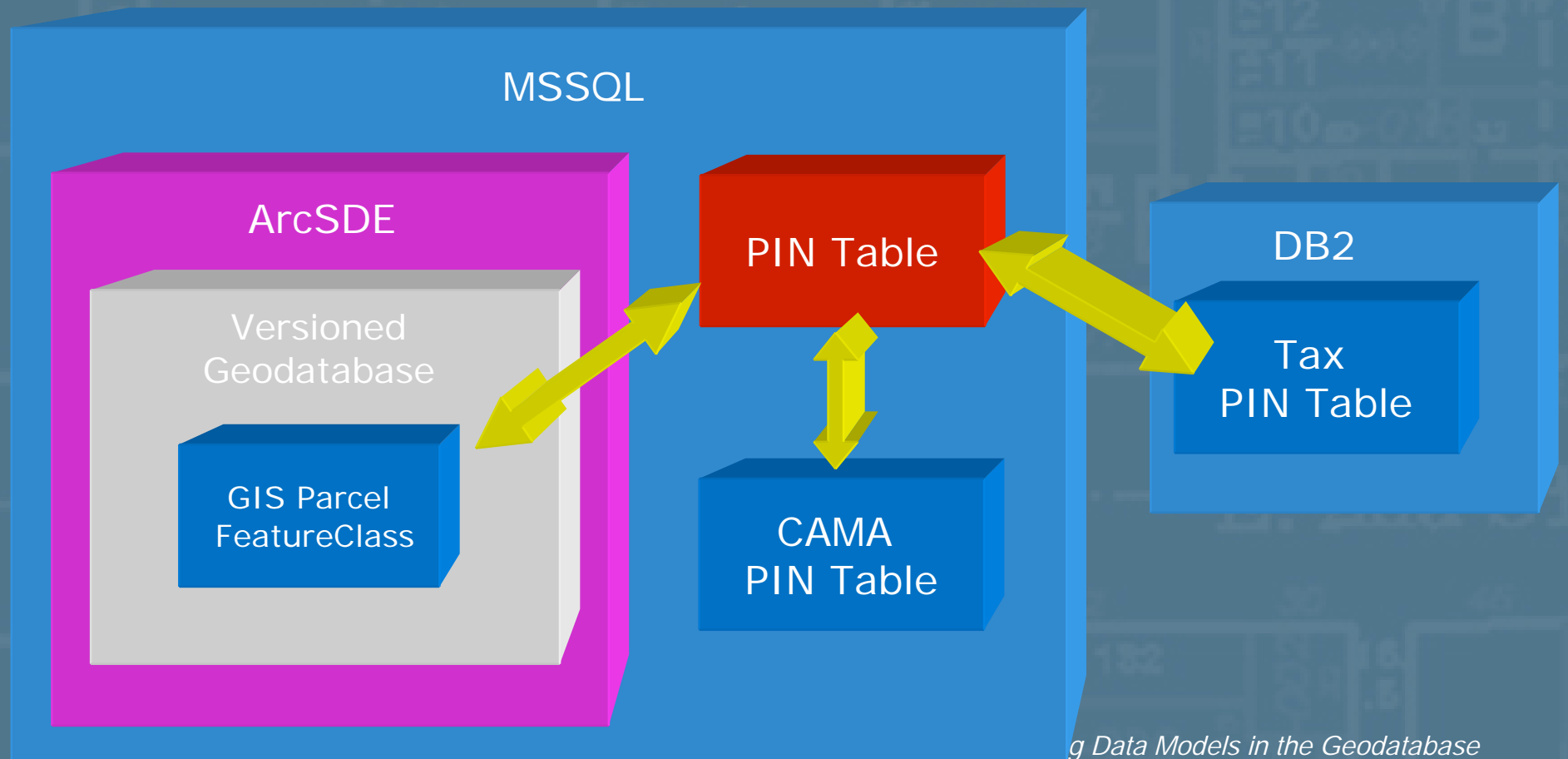
- ✓ A versioned parcel inventory does not provide a single table that can be simply queried by external applications, because the entire version tree must be considered.
- ✓ However, we must protect multiple editors from colliding with one another.

Versioned enabled SQL Queries carry significant overhead

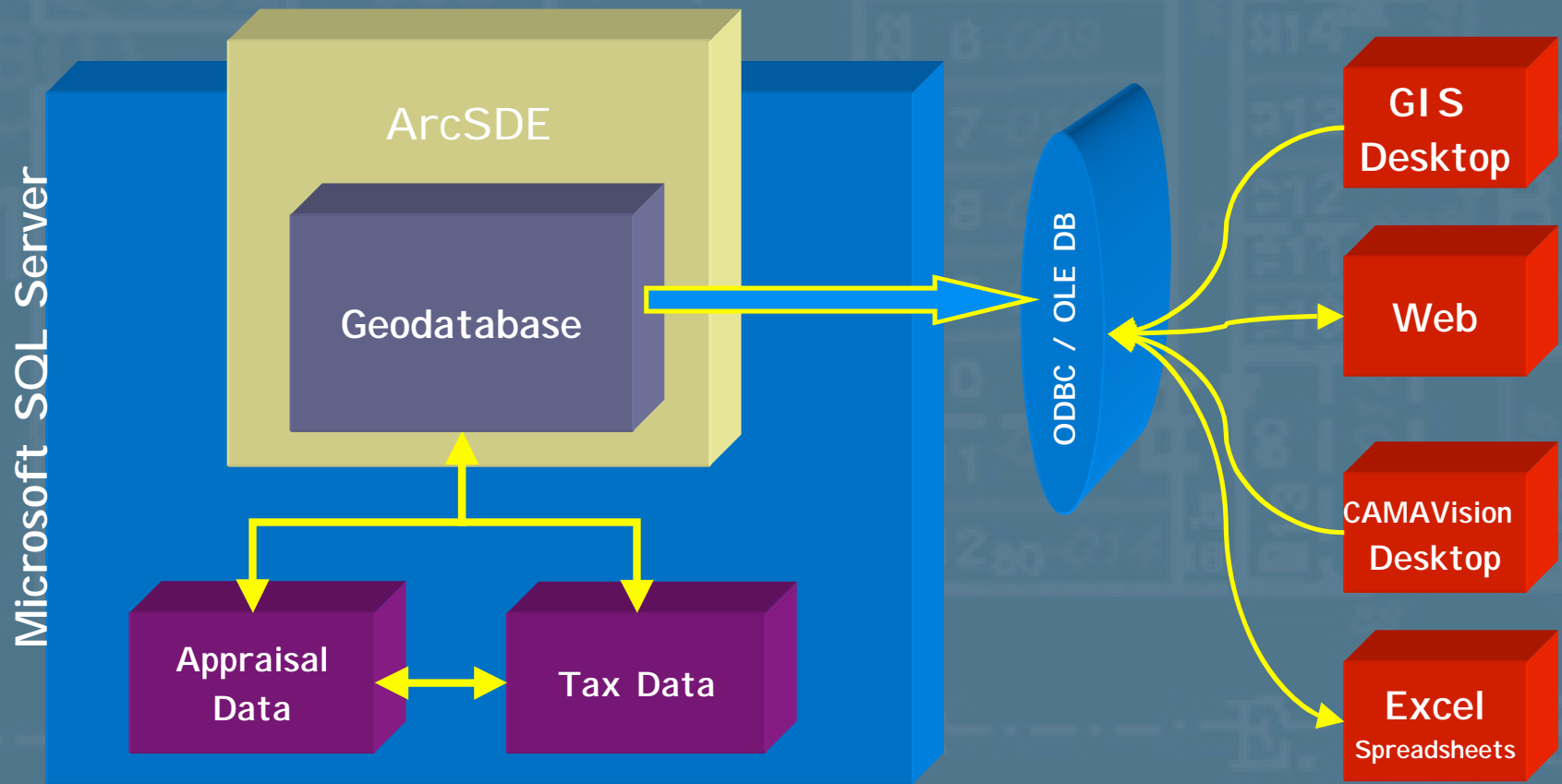


A Solution: Independent Parcel Number Administration

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



Simpler Integration is Better Integration

Loosely coupled Integration Between ArcGIS and Appraisal Software Works!

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

The screenshot displays the ArcMap interface with a map of a residential area. A parcel is being created on the map, indicated by red lines and labels like '201-000' and '226-004'. The 'To-do List Manager' window is open, showing a list of operations with checkboxes and columns for PIN, Created, Completed, and Notes. The 'Parcel Builder Administrator' window is also open, showing a tree view of 'Woodbury County' with 'Block 201' selected. A table in the bottom right corner shows the 'Woodbury' parcel data.

Area	Sec	Block	Parcel ID	ACREAGE	PIN	LEGAL
8947	08	201	001	19	894708201001	
8947	08	201	002	20	894708201002	
8947	08	201	003	21	894708201003	
8947	08	201	004	22	894708201004	
8947	08	201	005	4418	894708201005	See c...

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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

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Always focus on your "return on investment"

Thanks!