

Maintaining Parcels With ArcGIS 8.3

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Parcel maintenance has always been done easily and well in ArcInfo. With regions, topology, coordinate geometry (COGO) and, perhaps, the Land Records ArcTools applications, ArcInfo Workstation users could accomplish everyday parcel maintenance tasks including splits, combines, and resurveys. With the release of the ArcGIS 8.0 version of ArcInfo, users asked, “Can I do the same tasks as well in ArcGIS Desktop?”

Initially the answer was “maybe,” depending on how parcels were being maintained. Polygon editing was as good in ArcGIS at version 8.0 as in ArcInfo Workstation, but most users also needed to keep line layers, which typically had COGO attributes, synchronized with polygon layers. Although this could be accomplished by using various developer samples, for the majority of workstation users this was not reason enough to migrate to a geodatabase. Most decided to wait for a version of ArcInfo that incorporated polygon topology and improved handling of COGO attribute data.

With the release of ArcGIS 8.3, the wait is over. An advanced implementation of topology is built into ArcEditor and ArcInfo at ArcGIS 8.3 along with the ability to define, store, and update COGO attributes (e.g., bearing/angle, distance). In addition, much of the functionality traditionally performed at the command line, through ArcTools or by custom applications, is now available through the standard ArcGIS user interface. Advanced functionality, such as feature-linked annotation, can speed up basic parcel maintenance tasks even more by automating the placement of new annotation, updating annotation when features are split, and deleting annotation when associated features are deleted.

Although ArcGIS now possesses all the functionality needed to accurately maintain a parcel land base, many users may not be familiar with how these tools are implemented. This is the first installment of a two-part series that surveys different aspects of parcel land base maintenance in ArcGIS and, when applicable, compares and contrasts how these same tasks are performed in ArcInfo Workstation. Rather than an exhaustive discussion of these topics, this series highlights the tools available in ArcGIS for parcel maintenance. The first installment discusses topology, COGO, and text and annotation.

Topology

The cornerstone of a solid parcel maintenance, topology ensures the spatial integrity

ArcGIS Parcel Data Model Ranks

- 1 Corner (not always present)
- 2 Boundary (line layer for maintaining COGO attributes)
- 3 TaxParcel (polygon layer)
- 4 SimultaneousConveyance (polygon layer synonymous with subdivisions)
- 5 SurveyFirstDivision (polygon layer representing lots or blocks)
- 6 SurveySecondDivision (polygon layer representing lots if blocks are also present)

ArcGIS Parcel Data Model Rules

Layer	Rule
Corner	Must be covered by endpoint of Boundary
Boundary	Endpoint must be covered by Corner
Boundary	Must not have dangles
TaxParcel	Boundary must be covered by Boundary
SimultaneousConveyance	Boundary must be covered by Boundary
SurveyFirstDivision	Boundary must be covered by Boundary
TaxParcel	Must not overlap
SimultaneousConveyance	Must not overlap
SurveyFirstDivision	Must be covered by SimultaneousConveyance
SurveyFirstDivision	Must not overlap
SurveySecondDivision	Must be covered by SurveyFirstDivision
SurveySecondDivision	Must not overlap

of data by identifying problems. In ArcInfo Workstation, the implementation of topology is rather straightforward. The user only has to add or update line work and execute the CLEAN/BUILD command to update the topology. Errors are displayed as dangling nodes and/or label errors. Because only one line and one polygon layer can participate in a topology (with point data loosely participating as label points or nodes with attributes), simplicity is further enforced. Certain rules are inherent in the data structure—polygons cannot exist without lines underneath them, lines must be split at intersections for the construction of polygons, and lines cannot overlap (i.e., no duplicate arcs).

In ArcEditor and ArcInfo, geodatabase topology is a bit more sophisticated and much more flexible than coverage topology. For example, geodatabase topologies can have multiple participating polygon, line, and point feature classes. All the rules that exist in coverage topologies are available (along with additional rules) for geodatabase topologies, but it is up to the user to define these rules. The Validate command checks edited areas for topological errors after performing cracking

and clustering (i.e., snapping) on the data. The cracking and clustering algorithms are similar to the ones used by CLEAN, but which features move during the snapping phase is based on rankings set by the user when the topology was defined. Features known to be more accurate are given a higher rank and a lower number, so less accurate features are moved to them. As with ArcInfo Workstation, so-called fuzzy creep is not an issue.

The key to using geodatabase topology effectively is the appropriate specification of ranks and cluster tolerance as well as using appropriate rules. The general rule of thumb with ranks is to give higher ranks (lower numbers) to more accurate layers, such as the boundary layer that was presumably entered with COGO operators, and lower ranks and higher numbers to the less accurate layers.

For the cluster tolerance, use the default value that was specified by the wizard when the new topology was created or some other relatively small value. The rules specified will naturally depend on the layers included in the topology as well as other factors unique to how parcels will be modeled. The ArcGIS Parcel Data Model, which can be downloaded

from ESRI Support Web pages, specifies the topology ranks and rules in the accompanying tables.

All of the layers listed do not have to be included in a specific implementation of the model. The Parcel Data Model should be viewed as an example of one approach and modified appropriately. For instance, if the Corner layer is missing, simply move the subsequent ranks up one and drop the rules associated with the missing layer.

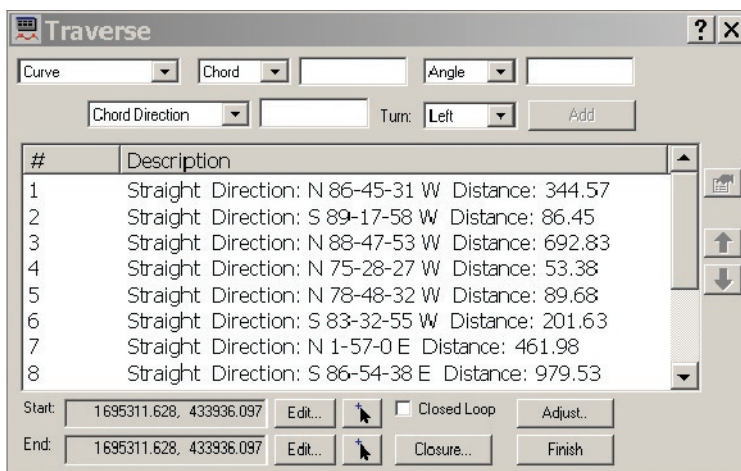
Other entities, such as lots, can be modeled differently. For instance, if lot lines will only be displayed and not queried as polygons, modeling lot lines as a subtype of the Boundary layer might be a better approach. Geodatabase topology does not automatically build polygons on all line work, so it is possible to have nondangling lines (i.e., lot lines) that do not have parcel polygons on top of them. To learn more about the Parcel Data Model, visit www.esri.com/datamodels and select the Land Parcels section.

COGO

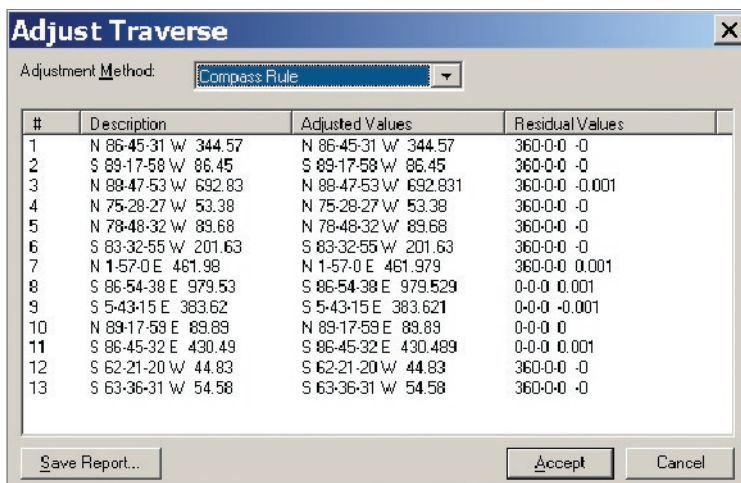
During parcel maintenance updates in ArcInfo Workstation, COGO is primarily used for entering bearing and distance information gleaned from new or updated parcel plats. Traverse, the basic workstation command, allows bearing and distance information to be entered, as well as curves and other information, and can adjust the courses based on industry-standard techniques. The bearing and distance information entered from a parcel deed is stored as an attribute value of the line feature class. Additional commands often used with parcel maintenance are PROPORTION (for precisely splitting a line into multiple pieces) and BREAKLINE (for performing a single split at a specified distance).

The same functionality, with virtually the same command names, exists in ArcEditor and ArcInfo at version 8.3. The Traverse command, located on the Advanced Editing toolbar, is used to enter bearing and distance information. Courses are adjusted using the same techniques used in ArcInfo Workstation. Direction and distance formats, as well as precision settings, are specified on the Units tab of the Editor Options dialog box that is accessed by selecting Options from the Editor pulldown menu.

To maintain bearing and distance information as attributes of a line layer, use the Create 2-Point Line Feature edit task instead of the standard Create New Feature task. Both tasks, set in the Editor toolbar, can be used to cre-



The Traverse command, located on the Advanced Editing toolbar, is used to enter bearing and distance information. The Traverse and Adjust Traverse dialog boxes are shown here.



ate new features, but the Create 2-Point Line Feature task will create individual line features for each course (i.e., segment) entered and will automatically assign the appropriate COGO attribute values. The Create New Feature task will only create one feature and will not assign COGO attributes. See *Editing in ArcMap*, one of the manuals that comes with ArcGIS 8.3, for more information about the COGO editing tools in ArcGIS.

Text and Annotation

In ArcInfo Workstation, almost all parcel maintenance users store text as annotation. For various reasons, few people take advantage of the dynamic labeling capabilities of ARCTEXT. In ArcGIS, labeling does become a viable alternative although most users will still opt for annotation to retain complete control over placement and ensure that text always shows up in exactly the same location. ArcGIS users can also employ a hybrid approach that takes advantage of both labeling and annota-

tion by using labeling for things such as parcel numbers and area designations and relying on annotation for dimensions and other text that requires more precise placement.

When migrating existing text and annotation to a geodatabase, consider loading annotation as feature linked even though it is likely ArcInfo Workstation coverages have links. With feature-linked annotation, new text can automatically be added with new features, text can be moved or deleted when the associated features are moved or deleted, and text is automatically updated when the feature attributes they linked to are changed.

These advantages can mean substantial time savings when performing standard parcel maintenance edits on the database. Having new annotation automatically added with new line and polygon features is reason enough to warrant using feature-linked annotation. Existing annotation can be feature linked in a piecemeal fashion from within ArcMap after converting an

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annotation coverage by manually creating links when updating an area. Alternately, the task could be automated by creating ARC Macro Language (AML) routines in ArcInfo Workstation that tag the attributes before performing the conversion or Visual Basic for Applications (VBA) scripts that work in ArcMap after conversion. For example, a VBA script could select a parcel number, perform a query to find the polygon that contains it, and tag the annotation string with the object ID (OID) of the parcel.

Before loading coverage annotation in the geodatabase, create the new feature class. During the creation of this feature class, specify whether or not it will be feature linked. Choosing the feature-linked option requires specifying the feature class the annotation will be linked to and an expression for identifying the fields that will be the source of the annotation. These expressions can handle input from a single field or can contain advanced VBA scripts with multiple fields, prefixes, suffixes, and HTML tagging strings to vary the font, size, and color. The same expression functionality used with labeling can be applied to feature-linked annotation. Listing 1 provides an example of a complex annotation expression defined for a dimension feature class linked to a parcel boundary layer.

The expression in Listing 1 annotates the line

Listing 1

```
Function FindLabel ( [Shape_Length], [DISTANCE], [ARCLENGTH] )
  if [ARCLENGTH] = "" or [ARCLENGTH] = "" or isnull([ARCLENGTH] ) then
    if [DISTANCE] = "" or [DISTANCE] = "" or isnull([DISTANCE]) then
      FindLabel = "(" & round([Shape_Length], 2) & ")"
    else
      FindLabel = round([DISTANCE], 2)
    end if
  else
    FindLabel = round([ARCLENGTH], 2)
  end if
End Function
```

feature based on the value in the ARCLENGTH field. The presence of a value indicates a curve. If an ARCLENGTH value is not present, the DISTANCE field, which indicates a straight course with COGO attributes, is used. If neither value is available, the generic length of the line contained in the Shape_Length field will be used surrounded by quotation marks. Scripting adds tremendous possibilities to feature annotation and eliminates the need for things such as redefined items when they are used simply for text purposes. See the revised ArcMap online documentation for more information on labeling and annotation including labeling expressions that use HTML tags.

Conclusion

This article discusses how ArcGIS handles topology, COGO, and text and annotation. The second installment in this series will address layer construction and editing. With the release of ArcGIS 8.3, ArcEditor and ArcInfo possess all the functionality needed to accurately maintain a parcel land base. Familiar operations from the ArcInfo Workstation work flow have been created in ArcGIS Desktop, but some of the restrictions that guided work flows have been removed so that users have an opportunity to improve and further streamline the maintenance process.