Guide to Editing Shared Features (aka "Topological Editing")

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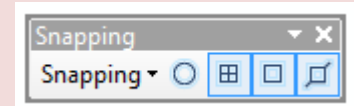
About Map Topology

Many vector datasets contain features that share geometry. Features can share edges (line segments) or nodes, the points at the ends of segments. For example, parcel polygons might share their edges with parcel boundary lines. Three parcels might share a single node at a surveyed town boundary marker. The **Topology toolbar** in ArcMap contains tools for working with such topologically related features.

ArcGIS for Desktop users with a Basic license level (formerly ArcView) can create and edit a map topology. Users with a Standard (formerly ArcEditor) or Advanced (formerly ArcInfo) license also can edit geodatabase topology, which defines a set of rules about the relationships between feature classes in a feature dataset; the rules are stored in a geodatabase. This document provides instruction on creating and editing map topology. These instructions are written for the specific context of editing assessor parcel maps.

A **map topology** creates topological relationships between the parts of features that are coincident. While you can create a map topology for an entire data set, more typically map topology is only created for features in a specific area where you want to do editing. You can specify the feature classes that you want to participate in the map topology. You can also choose the distance, or cluster tolerance, that defines how close together edges and vertices must be in order to be considered coincident. You can simultaneously edit shared edges and nodes with the **Topology Edit tool** when you create a map topology.

==*The instructions below are intended for users with a Basic license working with Map Topology.*==

> **Tip:** It is a good idea to turn on the **Snapping Toolbar** and click the feature types you want to snap to while editing. In the screen shot at right snapping is turned on for End, Vertex and Edge. The first button, Point Snapping is not turned on. The features you snap to will be determined by features in your map and your workflow.
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NOTE: See information at the end of this document for instructions on obtaining information on topology errors If you are maintaining standardized parcel mapping and you only have an ArcGIS Basic (aka "ArcView") license.

How to Create a Map Topology

1. Start ArcMap and display the **Editor**, **Snapping**, and **Topology toolbars**.
2. Click the **Editor** menu on the Editor toolbar and click **Start Editing**.
3. **Zoom in to the area that you want to edit**. *Before you create the map topology, zooming in to an area reduces the number of features that the map topology analyzes when building the topology cache.*
4. Click the **Map Topology button** on the Topology toolbar.
5. The Map Topology dialog box appears. You can **select the feature classes that will participate in the topology**, such as parcel polygons and parcel boundary lines, and choose a cluster tolerance. The cluster tolerance defines how close together parts of features must be before they are considered coincident.

Finding Shared Features

1. Click the **Topology Edit tool** on the Topology toolbar.
2. Click the edge you want to modify. It will change color to pink.

3. You can click the **Show Shared Features button** ⊞ on the Topology toolbar to see which adjacent features share that edge (common boundary).

Editing a Shared Edge in a Map Topology

1. With the Topology Edit tool **double-click the pink edge**. The vertices that define the shape of this edge appear in green.
2. When you are working with the vertices of an edge, the **Edit Vertices toolbar** appears, providing an easy way to select vertices, add and delete them, and modify segments.
3. When using the Topology Edit tool, **the actions performed on a selected edge apply to all the features that share that edge**. For example, when you insert a vertex, it is added to all features with that shared edge, *altering adjacent polygons and also any line feature that is coincident with the polygon boundaries*. Below are some of the ways you can modify an edge with the Topology Edit tool.

| Insert a vertex	Click the Add Vertex tool ⫏ on the Edit Vertices toolbar. You can also right-click a segment and click Insert Vertex, or hold down the A key and click.
Insert a vertex and move it in one step	Hold down A and click and drag the new vertex.
Delete a vertex	Click the Delete Vertex tool ⫏ on the Edit Vertices toolbar and click the vertex to delete. You can also right-click a vertex and click Delete Vertex, or hold down the D key and click.
Delete multiple vertices	Click the Delete Vertex tool ⫏ on the Edit Vertices toolbar and drag a box around the vertices to delete. You can also hold down D and drag a box, or press BACKSPACE, to delete selected vertices.
Move a vertex by dragging it	Select one or more vertices and drag and drop them to the new location.
Move a vertex by a relative x,y distance	Select one or more vertices, right-click, then click Move.
Move a vertex to an absolute x,y location	Right-click the vertex and click Move To.
Change the segment type	Right-click a segment; point to Change Segment; then click either Straight, Circular Arc, or Bézier.
Change the shape of an arc segment	Click and drag an arc segment, or press the R key and type a radius.

4. When done, right-click anywhere on the map and click Finish Sketch, or hit the F2 key to finish the edits.
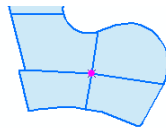

Example of modifying a line and polygon by adding a vertex to edge and dragging it.
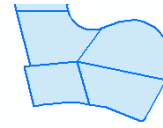
Moving a Topology Node

1. Click the Topology Edit tool ⊞ on the Topology toolbar.
2. Click the node you want to move. You can ensure that edges are not selected by holding down the N key while selecting the node.
3. Drag the node.
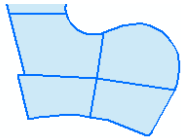
1. Original parcels

2. Node selected with the Topology Edit tool

3. After node is dragged with the Topology Edit tool, the four poylgons and lines are all adjusted

Splitting a Polygon

Without using geodatabase topology and an ArcEditor or ArcInfo license, splitting a polygon will require two steps: splitting the polygon and then creating a line feature to match the new polygon boundary. (With geodatabase topology, a polygon could be split and a line feature could be created when topology is validated.)

Spit the polygon:

(NOTE - you probably want to deploy the snapping tool bar and snap to vertices; see first page of this document)

1. Click the Edit tool ▶ on the Editor toolbar.
2. Click the polygon you want to split.
3. Click the Cut Polygons tool 🔲 on the Editor toolbar.
4. Click the map to create a line that cuts completely through the original polygon as desired.

Add a line feature:

1. Choose a feature template for your line layer (if you need to create a feature template, see box below).
2. Choose Line in the Construction Tools window.
3. If it is a simple line, click the map at the start, click a vertex each time the line changes directions, then double-click at the last point. (*You should be snapping to vertices and endpoints.*)
   Note: If the line is more complex, it may be easier to trace along the boundary of the split polygon. See the section "Adding a Line by Tracing" below.
4. Update the attributes of the line feature if necessary.

If you need to create a feature template for your line layer:

1. Click **Organize Templates** 🔳 on the **Create Features** window or right-click the layer in the table of contents and choose Edit Features > Organize Feature Templates.
2. Click **New Template** on the **Organize Feature Templates** dialog box.
3. Check the layers for which you want to create new templates.
   📒 Note: If the layer is symbolized as a single symbol, the wizard is completed in one step.
4. Click **Next**.
5. If any of the layers have subtypes or are symbolized by categories, choose the classes for which to create templates.
6. Click **Finish**.

Adding a Line by Tracing:

1. Choose Line in the Construction Tools window.
2. Click **Trace** 🔲 on the **Editor** toolbar.

3. Click the map to create the first vertex and start tracing.
4. Drag to trace along a feature. If you trace too far or trace in the wrong direction, you can move the pointer backward over what you have traced.
   (To pan the map while tracing, press either the C key or the middle mouse button. You can also use continuous map panning if you are using basemap layers.)
5. Click to create the last vertex.
6. Right-click anywhere on the map and click **Finish Sketch** (or hit the **F2** key).

**Splitting existing lines where new lines intersect**

If you've added any new lines to match the split polygon boundaries as described above, you will need to split the existing boundaries at the points where the new lines meet them. To split the existing lines:

1. Click the Edit tool ▶ on the Editor toolbar and click the line you want to split.
2. Click the Split tool ✕ on the Editor toolbar.
3. As you move your pointer over the line, a marker is visible on the line at the place where it will be split. You can use snapping to split the line at an exact location—for example, the endpoint of the line you just added.
4. Click to split the line.
5. The line is split into two features, where the split operation updates the shape of the existing feature and creates a new feature using the default attribute values for the feature class.

Process of splitting polygon, adding a line and splitting lines that meet the added line:
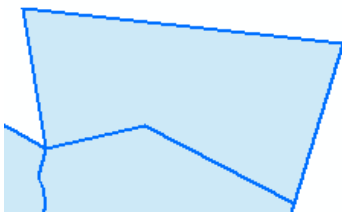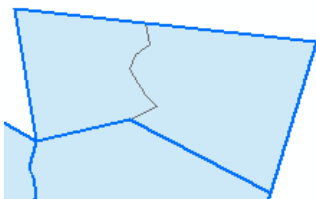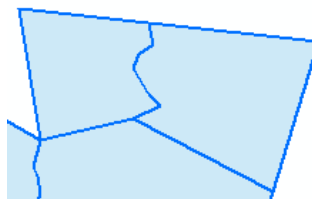

The original polygon to be split.
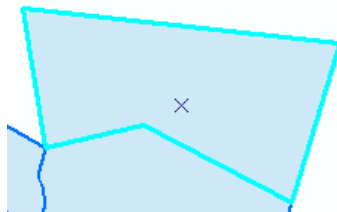
1. Select the polygon.

2. Split the polygon.

3. Though the polygon is split, no new line has been added.

4. Add a line that matches the split boundary.

5. Select the line above the new line and split it.

6. Select the line below the new line and split it.

Note that the split lines now may be selected individually.

For more help see:

http://desktop.arcgis.com/en/arcmap/latest/manage-data/editing-fundamentals/exercise-4a-editing-shared-features-with-a-map-topology.htm
http://desktop.arcgis.com/en/arcmap/latest/manage-data/editing-topology/editing-shared-geometry.htm
http://desktop.arcgis.com/en/arcmap/latest/manage-data/editing-topology/creating-a-map-topology.htm
http://desktop.arcgis.com/en/arcmap/latest/manage-data/editing-topology/modifying-a-topology-edge.htm
http://desktop.arcgis.com/en/arcmap/latest/manage-data/editing-existing-features/splitting-a-polygon.htm
http://desktop.arcgis.com/en/arcmap/latest/manage-data/editing-existing-features/splitting-lines-manually.htm
http://desktop.arcgis.com/en/arcmap/latest/manage-data/creating-new-features/creating-segments-by-tracing-features.htm

Obtaining Information on Topology Errors in your Standardized Parcel Mapping

Once you have completed your map topology editing with an ArcGIS Basic license, the only way to see your topology errors (if any) is to have someone with an ArcGIS Standard or Advanced license create geodatabase topology. If you send your standards compliant parcel mapping (fGDB format) to MassGIS (contact Neil MacGaffey neil.macgaffey@state.ma.us or Paul Nutting paul.nutting@state.ma.us), we can create geodatabase topology and return the data to you. Then with a Basic license the **Export Topology Errors** tool is available from the Catalog Tree > Toolboxes\System Toolboxes\Data Management Tools.tbx\Topology\Export Topology Errors (Note that the Topology Toolset is not in ArcToolbox at a Basic license so you have to navigate to it from the Catalog Tree).

The tool exports the errors from a geodatabase topology to the target geodatabase. All information associated with the errors and exceptions, such as the features referenced by the error or exception, are exported. Once they are exported, the feature classes can be accessed using any license level of ArcGIS. The feature classes can be used with the Select by Location dialog box or the Select Layer By Location tool and can be shared with other users who do not have access to the topology itself. Then a Basic user could use map topology to fix them with simple editing tools.

Tool Help at http://desktop.arcgis.com/en/arcmap/latest/tools/data-management-toolbox/export-topology-errors.htm