COD Data Fixing Procedures

1) Converting shapefiles to UTF-8 encoding
2) Recovering non-Latin characters in non-utf-8 shapefiles
3) Converting a MultiPoint shapefile to a Point shapefile
4) Fixing Data Extent
5) Creating and/or Populating a Reference Name Field
6) Fixing/Converting to Proper Case
7) Creating a Higher Admin Level Layer by Dissolving from a Lower Level
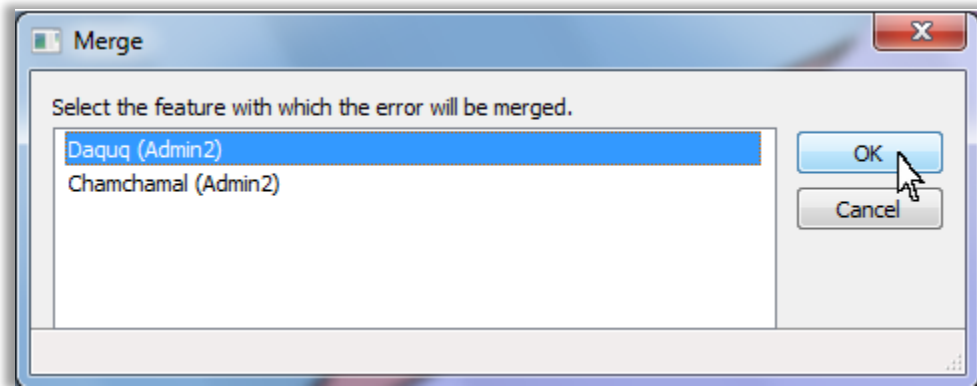8) Fixing Topology

Data Layers Topology

1. There are several different methods that can be implemented for fixing topology errors, and the method used will depend on the extent of the topology issues present. We will explore three different methods in this document.
2. **Method 1: Simple One at a Time Fixes**
   a) This method is the simplest to use and is the method of choice when there are only a few topology errors along a given border. However it would be extremely inefficient for fixing topology when there are several errors along a given border (as shown in the previous figure from section 2 step 11.) When there are several errors along a given border, one of the other two methods would be preferable.
   b) Start an editing session in ArcMap and turn on the 'Topology Toolbar' if not already active.

   c) Zoom to an error you would like to fix. You can do this by using the normal ArcMap zoom tools or you can open the 'Error Inspector' from the Topology Toolbar, click the 'Search Now' button to do a search for errors, and then right click on an error from the list and choose 'Zoom To'.
   d) First we will examine fixing an overlap error.
   e) Using the 'Fix Topology Error Tool' select the overlap error. The outline will turn black when it is selected.
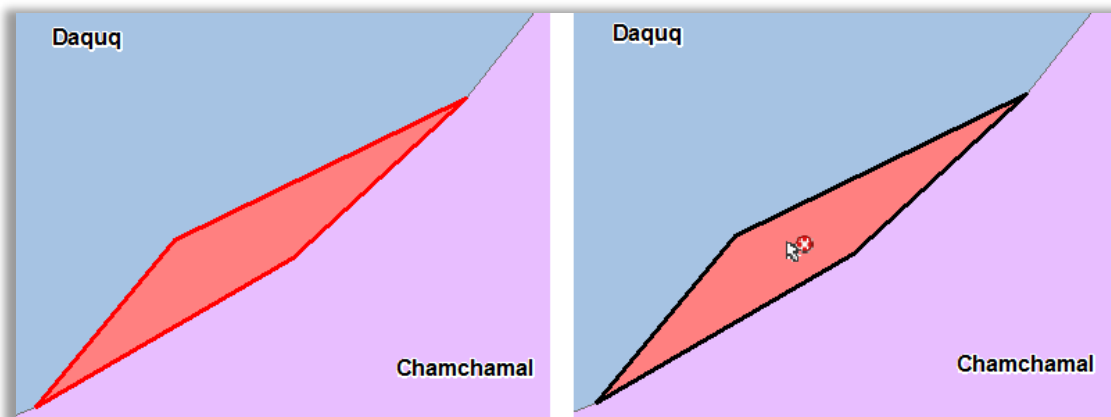
f) Right click on the selected error and choose 'Merge'.

g) You should have already made up your mind which Admin unit you are going to merge the overlap to (in the example above, either Daquq or Chamchamal). Usually these overlap and gap errors are tiny slivers between borders and there will be no way of discerning which way to do the merge, so in most cases you will just arbitrarily choose one. In some cases it may be obvious were the true border should be. For this example we will merge to Daquq.

h) After clicking 'Merge' a 'Merge' dialog box will appear which will allow you to select the feature with which the error will be merged. You can switch your selection back and forth within this dialog. Each time you select a feature from the list, that feature will flash on your screen to allow you to know which feature is which before completing the merge.

i) Once you have selected the feature you want to merge to, click 'OK'.

j) The overlap has now been fixed (in our example it has been merged to Daquq).
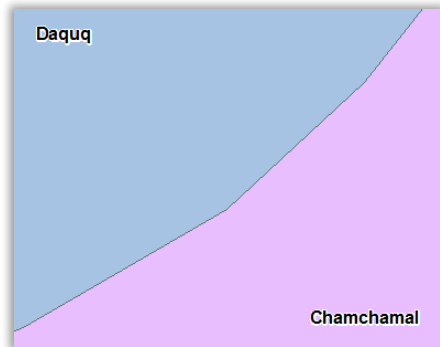
k) Continue this process until all the overlap errors that you want to fix using this method have been fixed.

l) Now let's examine fixing a gap error.

m) Using the 'Fix Topology Error Tool' select the gap error. The outline will turn black when it is selected.
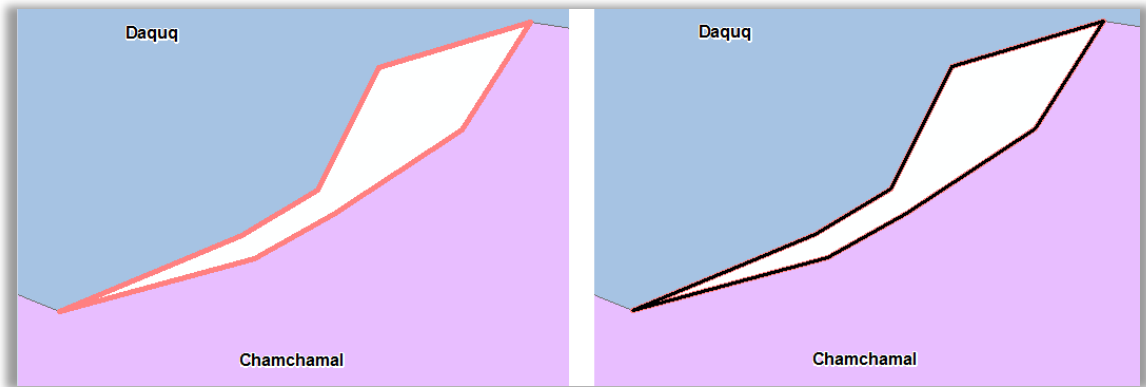
n) Right click on the selected gap and choose 'Create Feature'.
o) This will create a new feature with <Null> attribution that fills in the gap. This will automatically fix and remove the error from the topology.
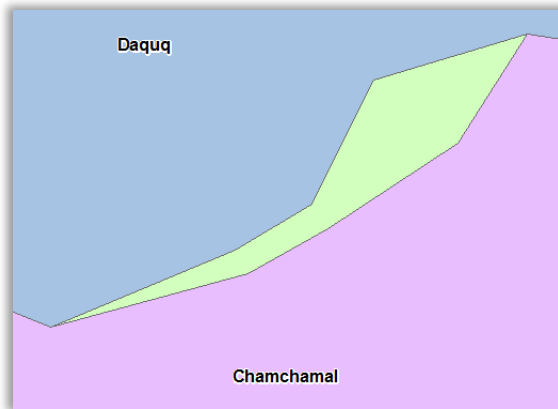
p) You will now merge the newly created feature to one of the two polygons that had the original gap between them. For this example we will merge it to Chamchamal but like we discussed for overlap errors, these gaps will usually be tiny slivers and the choice as to which feature to merge it to will most often be arbitrary.
q) Using ArcMap's regular select tools select both the new feature and the feature you are merging to, and with both features selected choose 'Merge' from the Editor ▾ drop down list.
r) In the 'Merge' dialog box make sure to choose the original attributed feature and not the newly created feature and then click 'OK'.
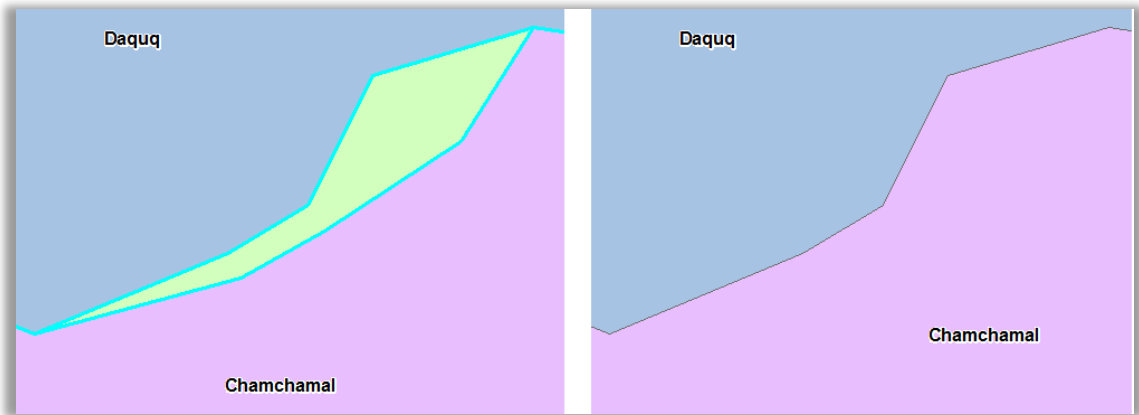
s) The new feature will be merged to the original and the gap will have been successfully removed. When the merge is completed the feature that you merged to will automatically be selected, so it is a good idea to go ahead and clear your selection now before proceeding.

t) Continue this process until all the gap errors that you want to fix using this method have been fixed.

u) Be careful when fixing gap errors which are in the vicinity of corners where three or more Admin units come together. Consider the following example:
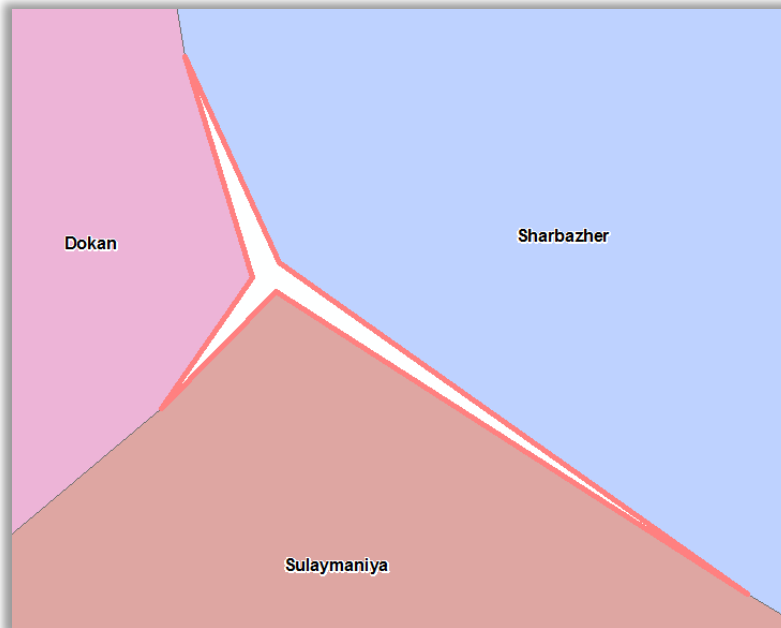

In all likelihood, there should be one common point where these three admin units come together.

v) If a feature were created to fill the gap, and then this feature were to be merged with one of the three original polygons, you can see from the following image that you would not get the desired result even though the topology error would be fixed:
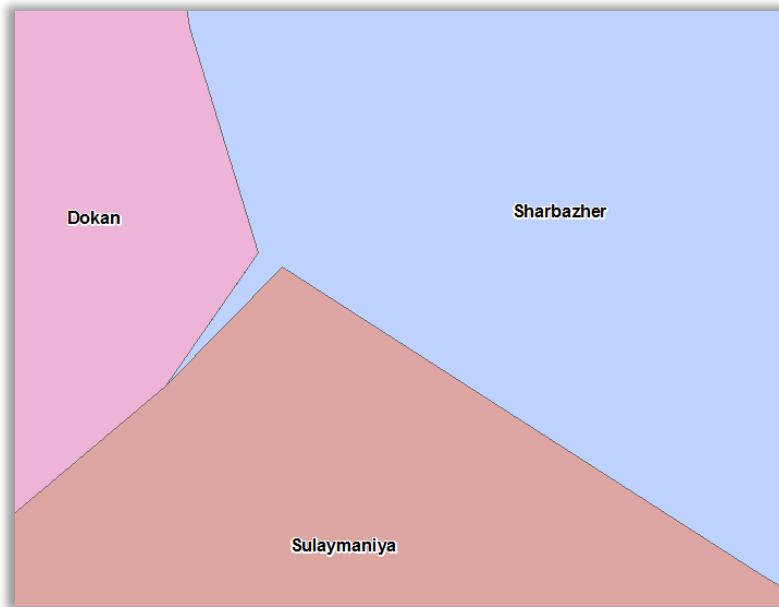
w) For this reason, it makes more sense in these situations to edit two of the polygons and snap their corner point to the corner point of the third polygon. After snapping to create a common corner, validate the topology for the current extent ☑ and if the corner is now clean the topology gap error will be fixed and removed.
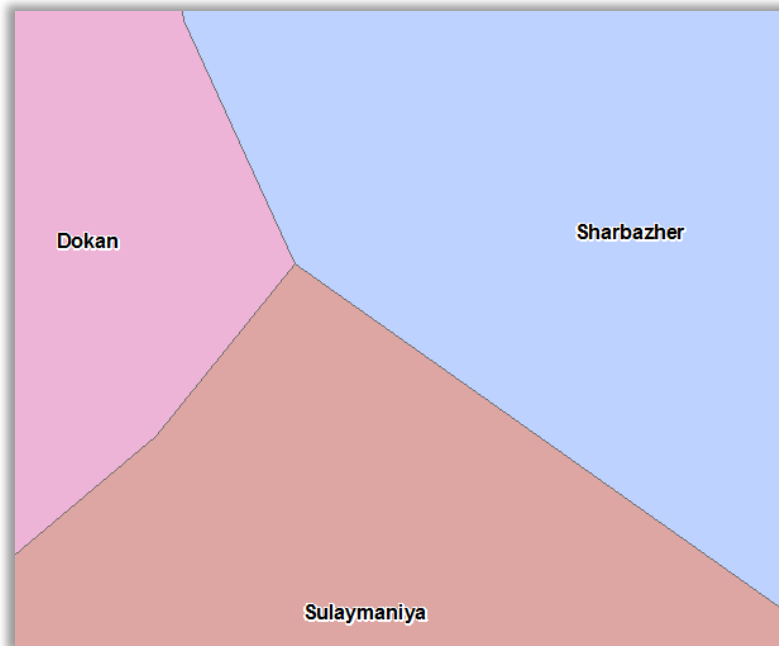

x) After fixing all the overlap and gap errors that you wish to fix using this method, it is a good idea to revalidate the topology for the entire extent to make sure none of your editing created any new topology errors. Use the 'Validate Entire Topology' button ☑ to do this.

3. **Method 2: Redraw Entire Shared Border on One Side Then Fix**

    a) In some cases you may have a situation in which one shared border between two Admin units has several gap and overlap errors running along it. For example:
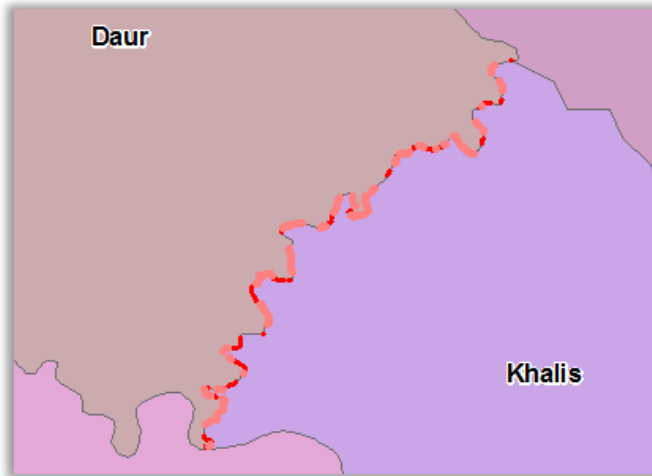

    b) This is probably the result of a slight shift in the border of one of the polygons, resulting in several tiny slivers of gap and overlap errors.

    c) It would be very time consuming to visit each of these errors one at a time and do the fixes as explained in **Method 1**.

    d) So a better method for dealing with a situation like this is simply to redraw the border for one of the polygons so that it is completely removed from the border of the other polygon. For example:
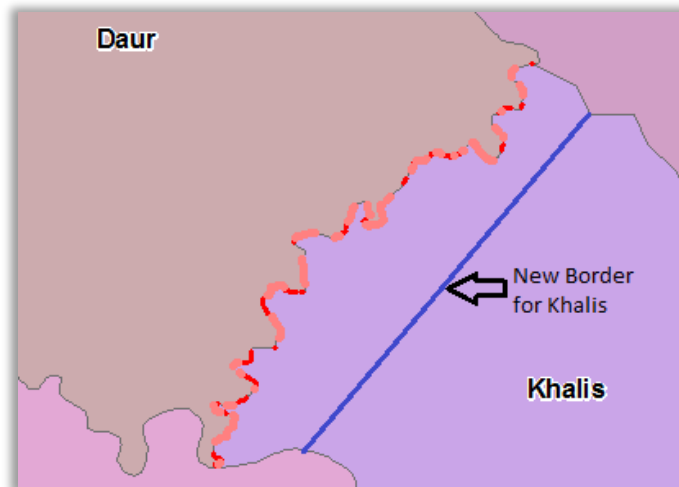
The blue line represents where the new border for Khalis can be drawn; it simply needs to be drawn so that it no longer touches or crosses the border of Daur.

    e) It should be noted that like described in the previous method, corners where three or more Admin units come together can be an issue. Therefore, just as described starting with step u) of **Method 1**, you should fix the corners first if necessary before redrawing the border.

f) Once the border is redrawn, revalidate topology for the current extent. This will create one large gap error in the newly opened space that was created by the redrawing of the border.
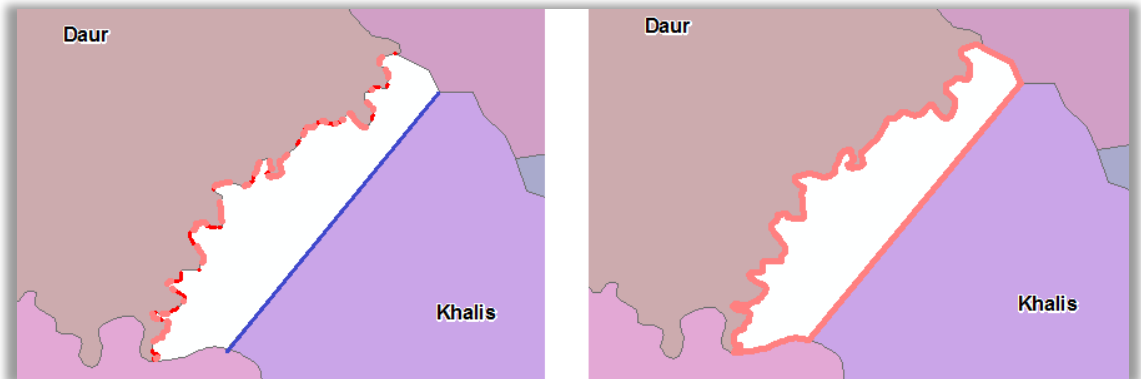

g) Now you can simply fix this one large gap error using the same procedure as described in **Method 1**, and then merging the newly created feature to the Admin unit that was redrawn:
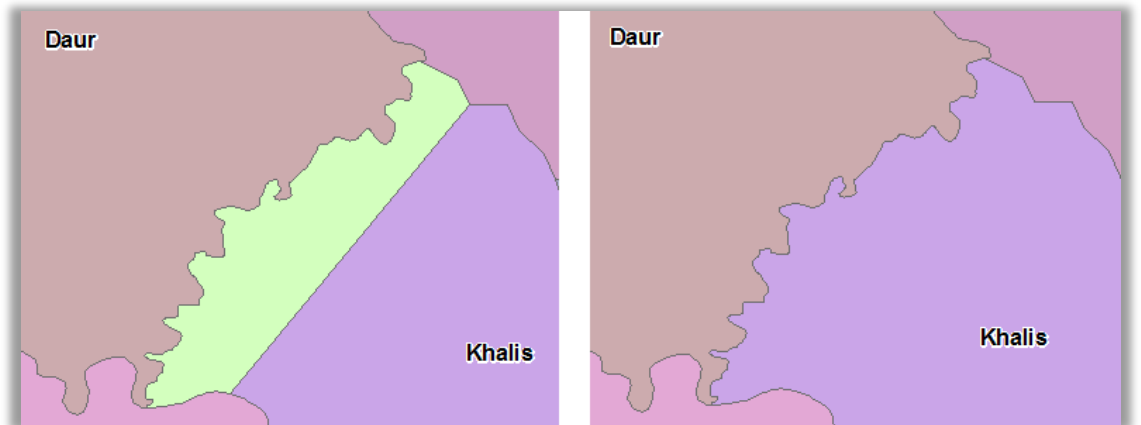
h) So by using this method, you could potentially fix hundreds or perhaps even thousands of tiny gap and overlap errors along a common border by simply doing a redraw of one of the polygons and then fixing the one resulting gap error that gets created when revalidating the topology.

i) The decision as to which polygon to redraw will in most cases be arbitrary, but sometimes you may have enough knowledge to know which of the borders is more accurate. The more accurate border, or the border you would like to preserve, should be the border of the polygon that does not get redrawn. Then when the gap error gets fixed the two Admin units will be sharing that preferred common border.

j) Continue using this method to fix all of the shared borders in your Admin layers that have several gap and overlap errors along them.

k) After fixing all the topology errors that you wish to fix using this method, it is a good idea to revalidate the topology for the entire extent to make sure none of your editing created any new topology errors. Use the 'Validate Entire Topology' button ⊠✓ to do this.

4. **Method 3: Remove the Entire Polygon and Recreate Feature**
   a) Another common situation you may encounter when fixing topology is the scenario in which all of the surrounding borders of a given Admin unit have several gap and overlap errors on them. For example:
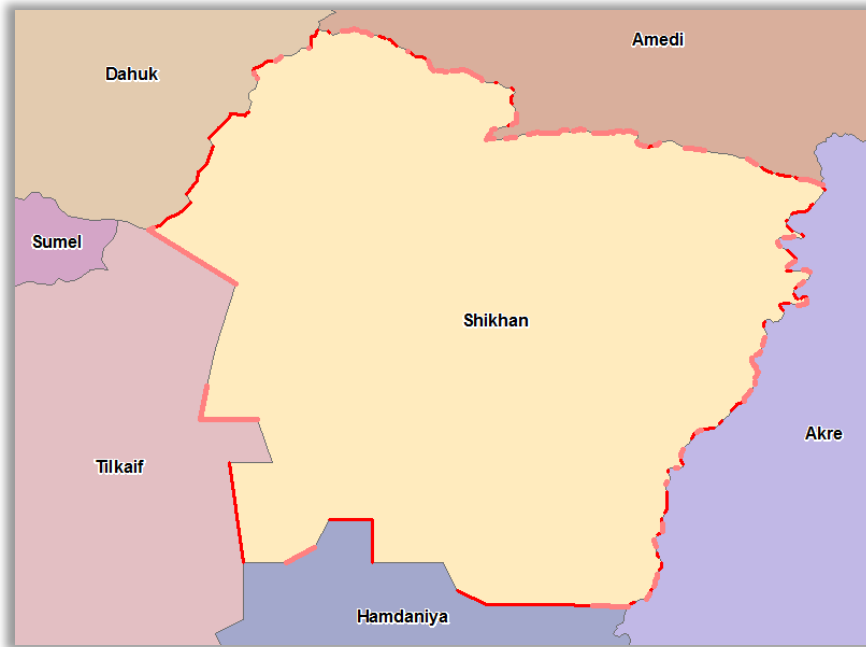

   This is most likely caused by one polygon (in this case Shikhan) having been slightly shifted and thus no longer coincident with all of its surrounding Admin units.

   b) You could fix all of these topology errors one at a time using **Method 1** (127 errors in this example) or you could fix each of the five coincident borders using **Method 2**.   However, a third option can be employed when dealing with a situation like this which could save valuable time.
   c) This method involves physically moving the problem polygon outside of the International Boundary of the country and then creating a new polygon in its place and then reattributing it based on the original polygon.
   d) As with the previous methods, corners where three or more Admin units come together can be an issue. Therefore, just as described starting with step u) of **Method 1**, you should fix the corners first if necessary before moving the polygon.
   e) Select the problem Admin unit (in this case Shikhan) and drag it so that it lies outside the border of the entire country:
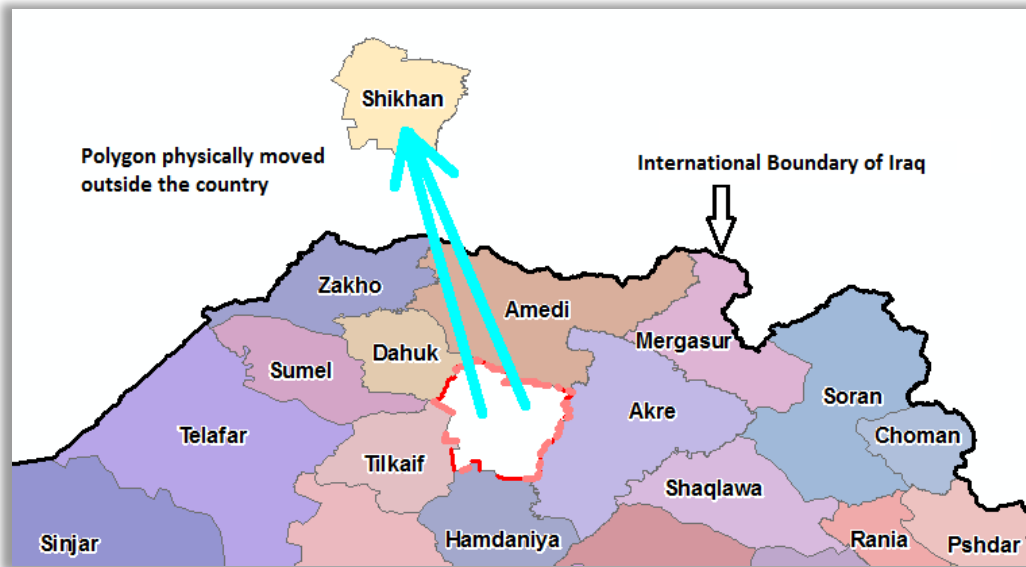
f) After moving the Admin unit outside of the country, revalidate topology for the extent. You should now have one large gap error in the open space where the Admin unit used to be and one large gap error surrounding the moved polygon:
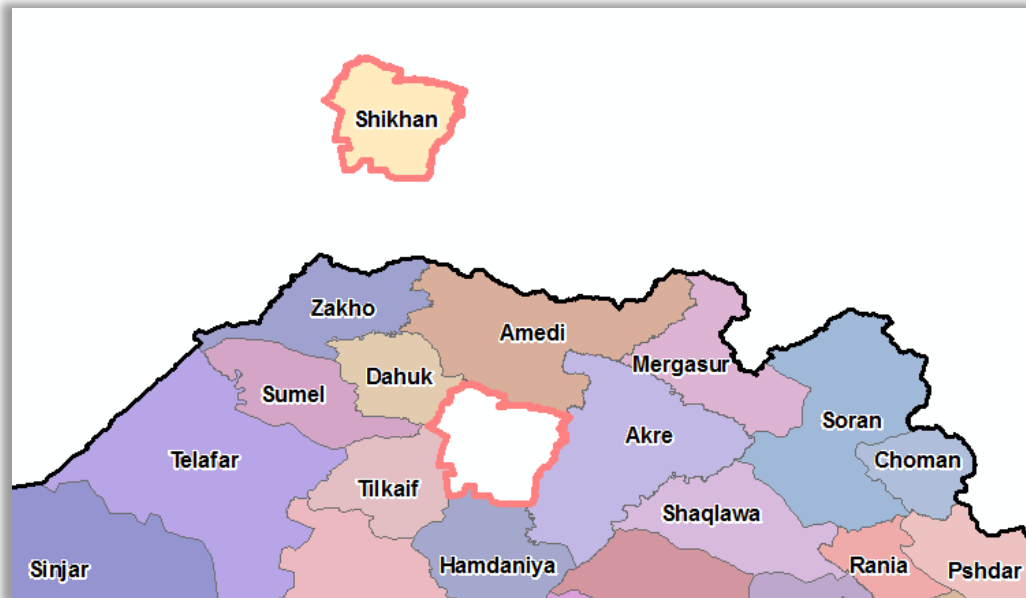
g) Use the procedure described in **Method 1** for fixing gap errors to fix the gap error in the open space where the Admin unit used to be, thus creating a new feature with <Null> attribution.

h) Open the attribute table and select both the original moved polygon and the newly created polygon and copy all of the attribution from the original into the new.

i) Once all the attribution has been transferred, you can delete the original moved polygon.

j) Revalidate topology for the current extent and all of the previous topology errors surrounding this problem polygon should now be fixed:

New feature created · Attribution transferred · Original moved polygon deleted
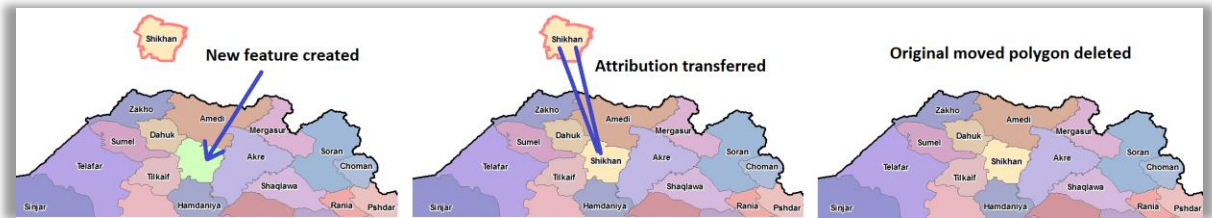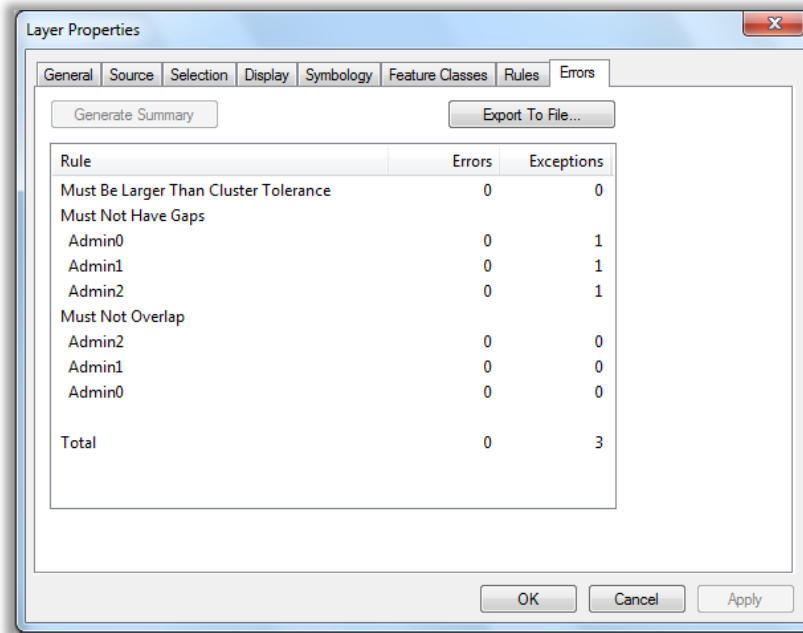
k) Continue fixing all topology errors where this method can be applied.
l) After fixing all the topology errors that you wish to fix using this method, it is a good idea to revalidate the topology for the entire extent to make sure none of your editing created any new topology errors. Use the 'Validate Entire Topology' button to do this.

5. Which methods you choose to employ will depend on the country you are dealing with and the extent of the topology errors present.
6. In some cases you may end up employing all three methods or some combination of the methods.
7. Sometimes you may need to employ one method in an area prior to employing an additional method.
8. Occasionally you may encounter topology errors that are not actually errors. An example of this would be a country which has a large body of water within its borders which is typically displayed as a hole in the country, e.g. - Azerbaijan. Another example would be a situation like South Africa which has the country of Lesotho completely within its borders so that the Admin layers which make up South Africa would appear to have a hole in them.

The "holes" in these countries would be tagged as gap errors when topology is validated
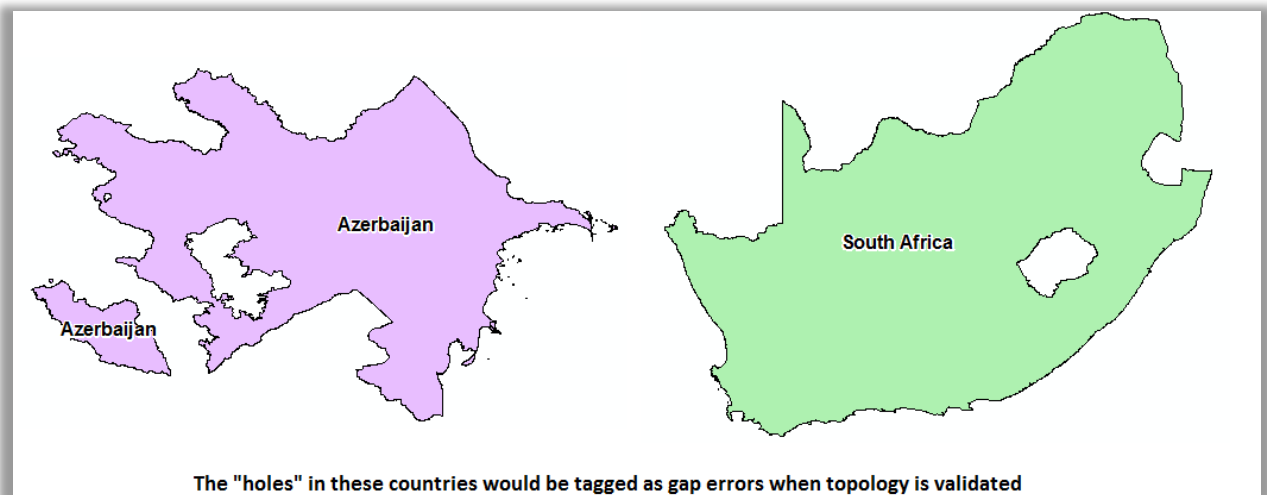
9. The above examples would generate gap errors in all the Admin layers of the country even though they are not actually errors in the data.
10. Also there will be a gap error for the entire international border of the country in all layers as well as any islands that exist.
11. These gap errors will need to be marked as exceptions.
12. To mark them as exceptions simply use the 'Fix Topology Error Tool' to select the gap error and then right click and choose 'Mark as Exception'.

13. After fixing all the topology errors and marking the necessary exceptions, you should revalidate the topology for the entire extent to make sure none of your editing created any new topology errors. Use the 'Validate Entire Topology' button ☑ to do this.
14. You should now generate an error report to verify that all of the topology has been fixed.
15. If all the topology has been successfully fixed the report should look something like this, with zero reported errors and the few exceptions that were marked also reported:

Admin Lines Topology

1.

9) Building the Admin Layers from the Line and Points Layers
10) Populating the 'popPlaceClassTitle' field with Administrative Capital designations
11) How to Generate a polygon where a hole exists
12) How to split lines in order to select only the portions which participate in the coastline
13) The next heading
14) Resolving topology issues related to non-adjacent features (Example: island features)
15) The next heading