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Boundary unification procedure

Version	*Date*	*Author*	*Comments*
1.0	20/02/2023	Noémie GREMEAUX (IGN-F)	

1. How to use the workbench

This workbench is divided into 8 steps. Each step produces output tables which are then used as input in the following step.

The steps have to be launched one by one, in order to allow for some manual work in between.

Before launching a step, make sure to:

- Activate the tables which need to be read.
- Deactivate any link from these tables to transformers from other steps (cf. steps 2.1 and 4.1).

2. Workbench description

Example : BE#NL

Source data:

- Belgium : table municipality from Belgium
- The Netherlands: table top10nl_registratief_gebied_multivlak (to have a complete coverage)

Step 1.1 : Extract outer international boundaries from administrative units.

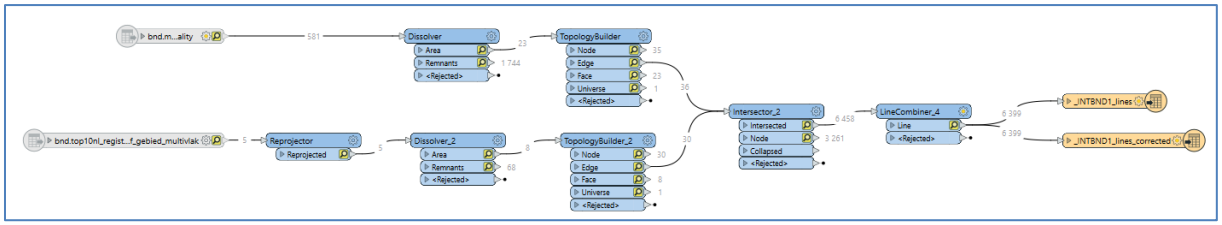
Input:

- be_national/bnd.municipality
- nl_national/bnd.top10nl_registratief_gebied_multivlak

Steps:

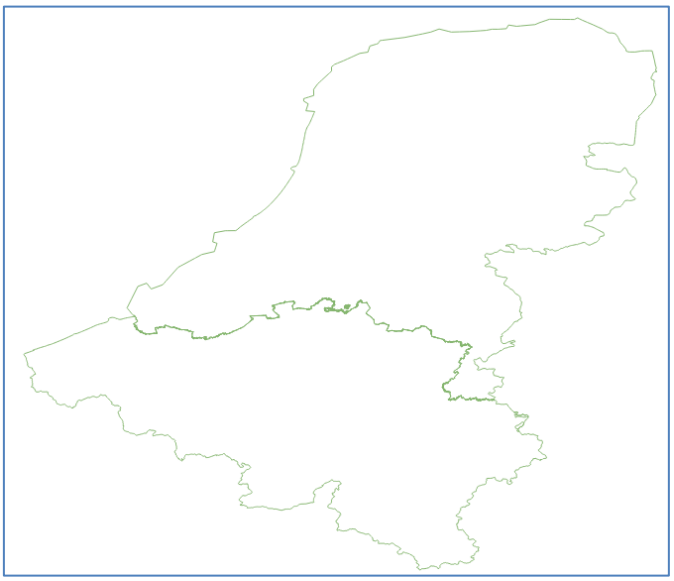
1. Project the data to WGS84 if necessary.
2. For each country, dissolve administrative units into single part polygons.
3. Extract edges from the dissolved polygons → these are the outer boundaries, which then need to be cleaned.
4. Gather edges from BE and NL into a single table and planarize the data.

5. Merge the lines to remove pseudo-nodes: the remaining lines are split only where at least 3 objects intersect.



Output:

- ome_2/public._INTBND1_ lines (backup copy)
- ome_2/public._ INTBND1_lines_corrected (to be corrected in the next step).



Since we are working on the BE#NL international boundary, all lines which do not belong to this boundary need to be deleted manually in the next step.

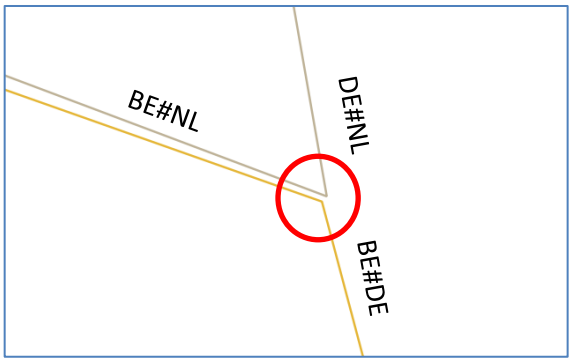
Step 1.2 (manual): Clean the outer edges to keep only BE#NL data

Input:

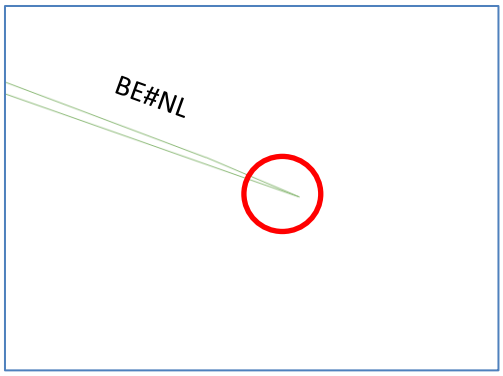
- ome_2/public._INTBND1_ lines_corrected (before correction)

Steps:

1. Manually delete the lines which do not correspond to the BE#NL boundary (coastlines, boundaries with other countries, Belgian enclaves in Germany).
2. If necessary, snap the endpoints of the two lines representing the BE and NL version of the main international boundary (for the test, it was necessary on the junction with Germany).



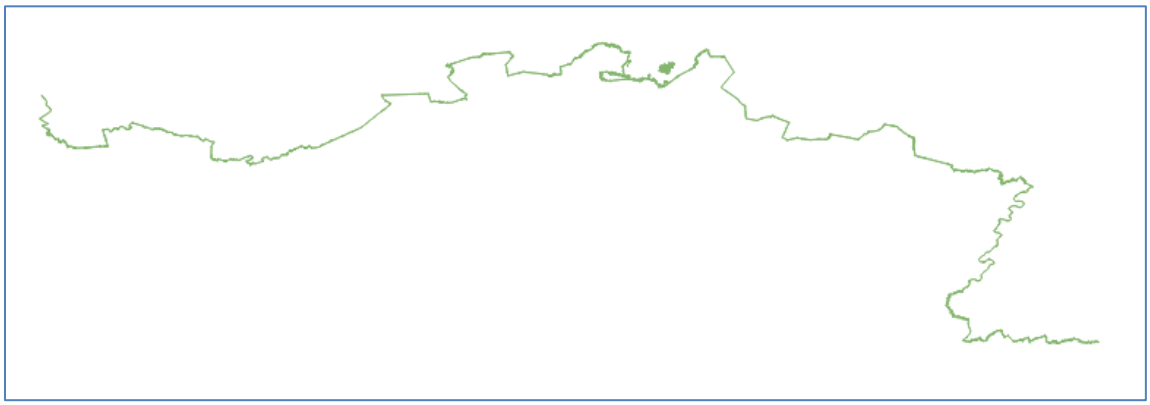
Intial state



After correction

Output:

- ome_2/public._INTBND1_lines_corrected (corrected version)



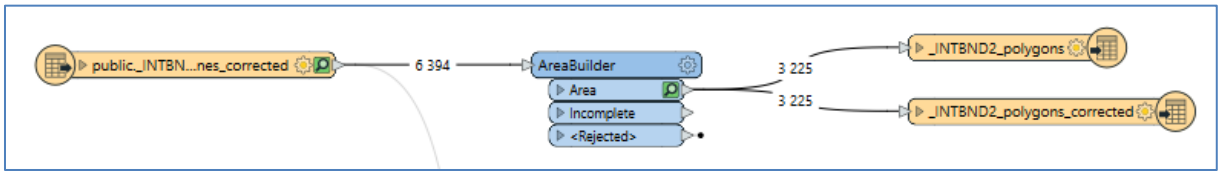
Step 2.1: Create polygons wherever the two versions of the boundary differ

Input:

- ome_2/public._INTBND1_lines_corrected (before correction)

Steps:

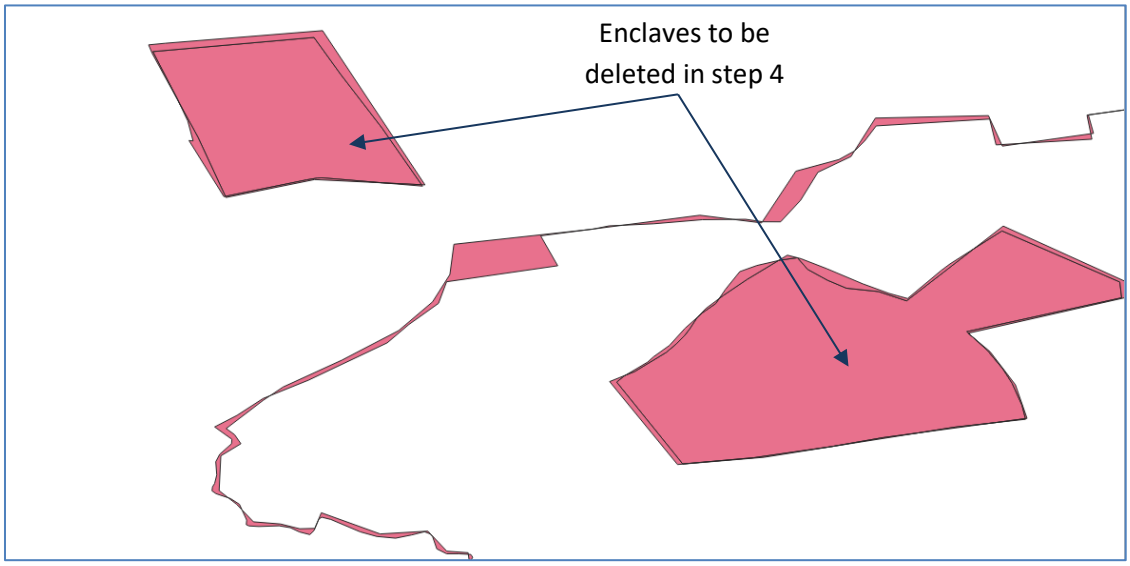
1. Generate polygons from the input table → all in-dispute areas between the two boundaries will be transformed into polygons. However, this also creates polygons inside enclaves, which need to be deleted before the next step because we do not need them for the following steps.



Output:

- ome_2/public._INTBND2_polygons (backup copy)

- ome_2/public._INTBND2_polygons (to be corrected in the next step).



Step 2.2 (manual): Delete polygons corresponding to enclaves

Input:

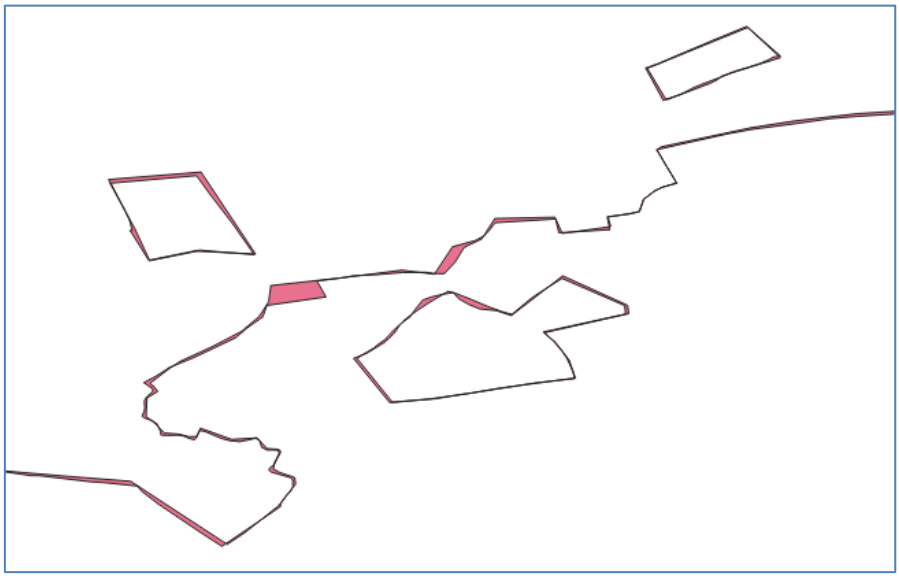
- ome_2/public._INTBND2_polygons_corrected (before correction).

Steps:

1. Delete all enclaves i.e. all the polygons inside which we shouldn't calculate a new boundary.

Output:

- ome_2/public._INTBND2_polygons_corrected (corrected version).



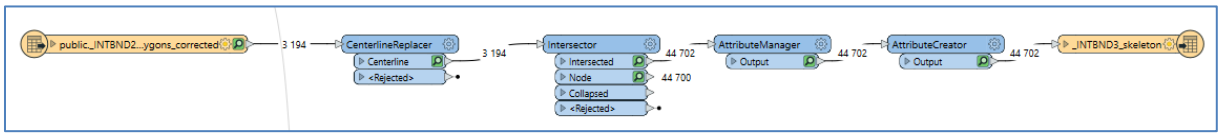
Step 3: Generate skeletons (~centerlines) from the boundary polygons

Input:

- ome_2/public. _INTBND2_polygons_corrected (corrected version).

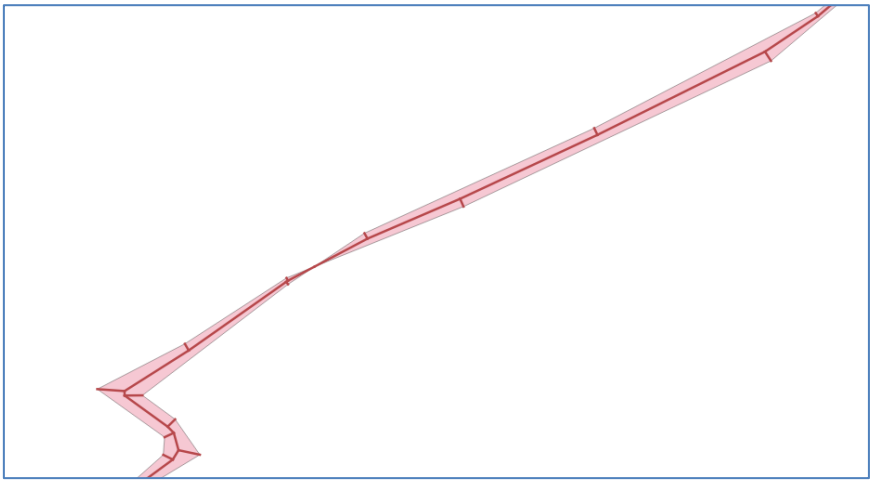
Steps:

1. Generate the skeletons of all polygons from the corrected table.
2. Use Intersector to planarize the resulting lines.
3. Manage attributes to keep only the information needed for OME2.



Output:

- ome_2/public._INTBND3_skeleton (backup copy).

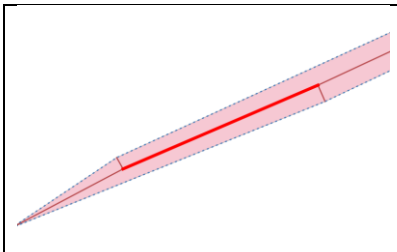
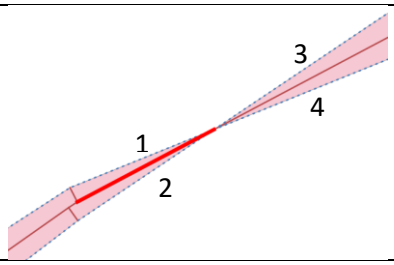
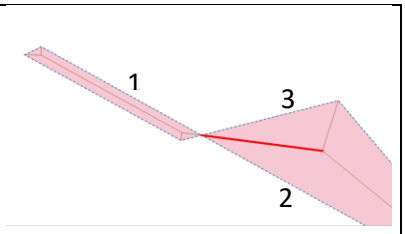


From these skeletons, we want to extract the main central line i.e. eliminate all small objects growing out of the central line.

Step 4.1: Identify irrelevant lines to be deleted

The lines to be kept answer to the following characteristics:

- Either they do not intersect _INTBND1_lines_corrected at all (represented as blue dashed lines in the following pictures),
- OR they intersect at least three objects from _1_be_nl_lines_corrected,
- OR they are located at the very end of the main international boundary line and therefore intersect an object for ib_boundary_node.

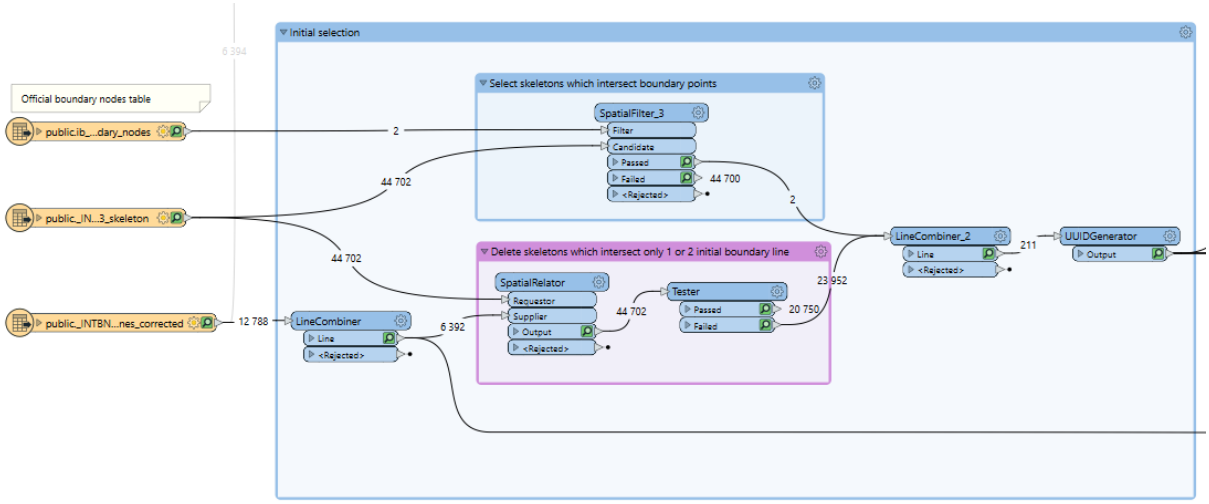
		
Skeleton line intersecting no boundary line	Skeleton line intersecting 4 boundary lines	Skeleton line intersecting 3 boundary lines

Input:

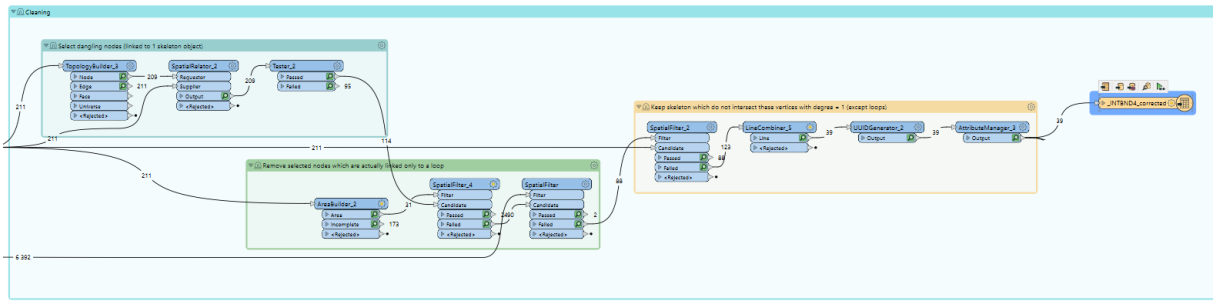
- ome_2/public._INTBND3_skeleton.
- ome_2/public._INTBND1_lines_corrected (corrected version).
- ome_2/public.ib_boundary_node

Steps:

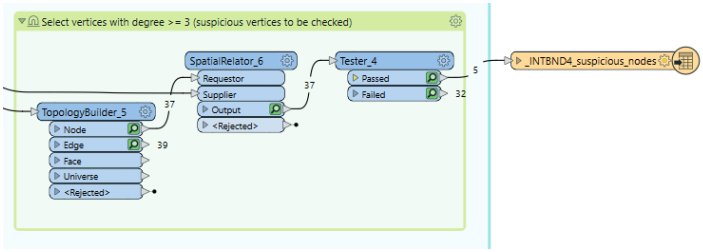
1. Initial selection:
    a. Select objects from _INTBND3_skeleton which intersect ib_boundary_nodes → they are kept in the initial selection.
    b. Remove the objects from _INTBND3_skeleton which intersect only one or two objects from _INTBND1_lines_corrected.
    c. Dissolve all the selected objects from _INTBND3_skeleton so that they are split only at the intersection of three or more objects.
    d. Manage UIDs.



2. Clean the resulting objects: at this stage, there are still some small dangling segments sprouting from the main line in the table. This step aims at deleting as many of these dangles as possible.
    a. Generate nodes from the objects coming out of step1.
    b. Identify dangling nodes by selecting nodes, i.e. nodes linked only to 1 skeleton object from step 1.
    c. Among these nodes, some are actually connected to loops and are not really dangling nodes: remove them from the selected nodes.
    d. Keep only the objects from step 1 which do not intersect the selected dangling nodes → these objects are recorded in _INTBND4_corrected (to be corrected in the next step).



e. Generate nodes from these selected skeleton objects and select those which are connected to at least 3 objects → record them in _INTBND4_suspicious_nodes.



Output:

- ome_2/public._INTBND4_corrected (before correction).
- ome_2/public. _INTBND4_suspicious_nodes.

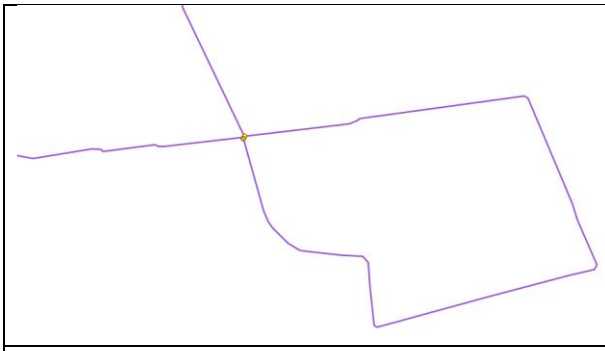
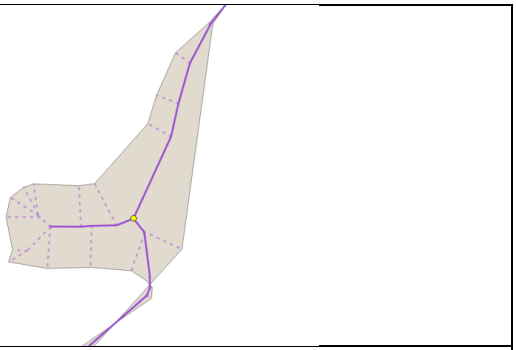
Step 4.2 (manual): Delete irrelevant objects

Input:

- ome_2/public._INTBND4_corrected (before correction).
- ome_2/public. _INTBND4_suspicious_nodes.

Steps:

1. In QGIS, open both tables and go through the suspicious nodes. Each node should correspond to the location of an object sprouting from the main line, to be deleted.
2. Manually delete the irrelevant objects.

	
Case 1: small segment connecting two sides of a polygon.	Case 2: intermediate dangle which gave birth to several other dangles in the initial skeleton table.

Output:

- ome_2/public._INTBND4_corrected (corrected version).

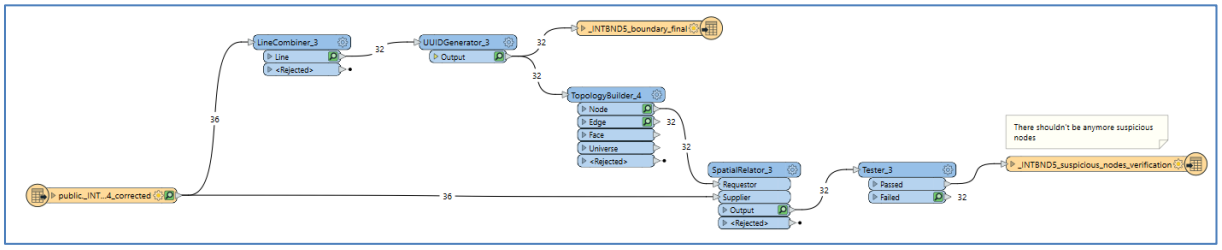
Step 4.3 : Finalization

Input:

- ome_2/public._INTBND4_corrected (corrected version).

Steps:

1. Dissolve all lines.
2. Add UUIDs.
3. Generate suspicious nodes to control the data: this table should be empty.



Output:

- ome_2/public._INTBND5_boundary_final.
- ome_2/public._INTBND5_suspicious_nodes_verification (not created if empty).