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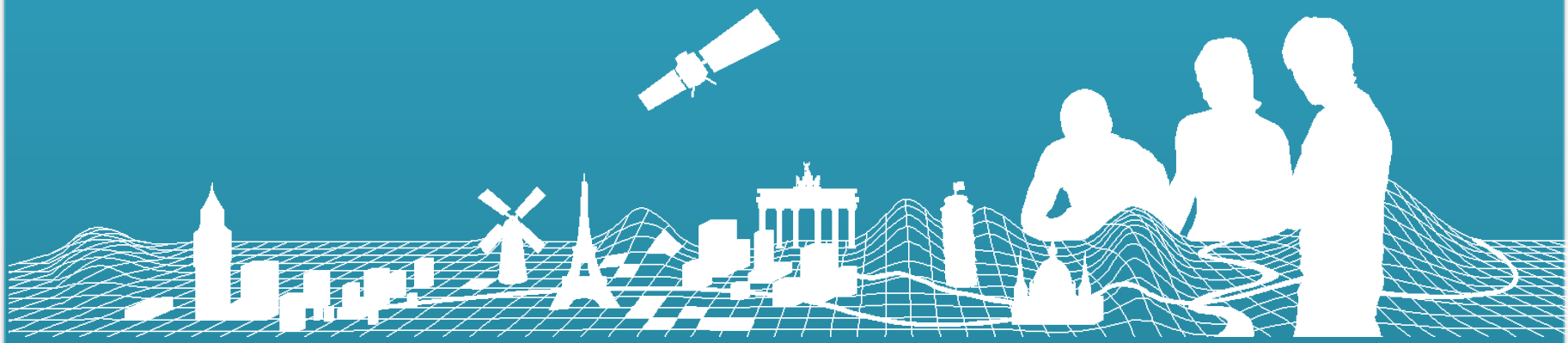
AUTHORITATIVE GEO-INFORMATION FRAMEWORK FOR EUROPE

EGM – Generalization Process

Noémie Grémeaux / IGN France

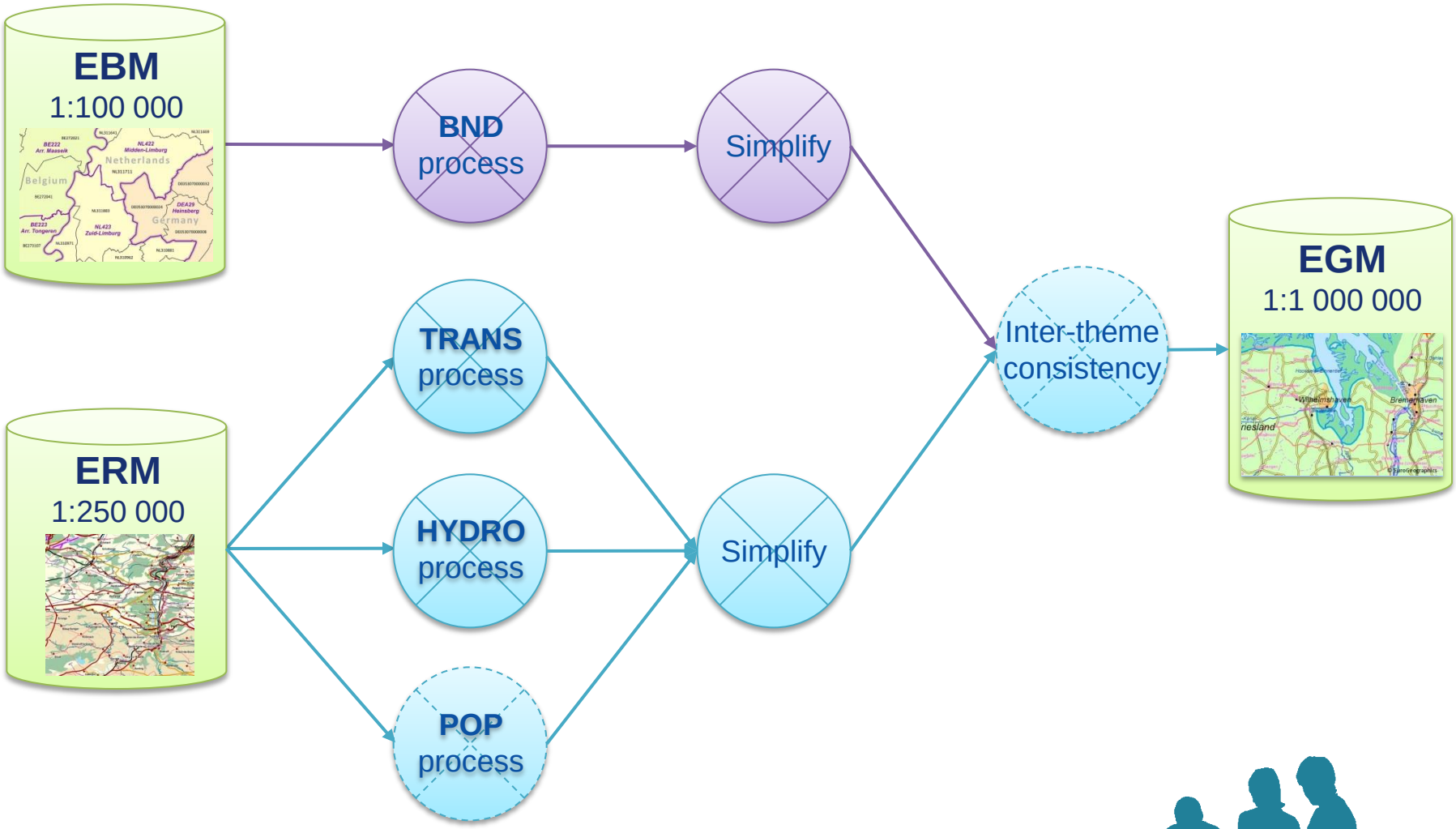
EG producers meeting, 31.03.2015



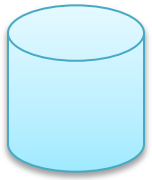
Contents

- Overview of the generalization tools
- How do the tools work?
- Quality issues
- What comes next?

Overview of the generalization tools



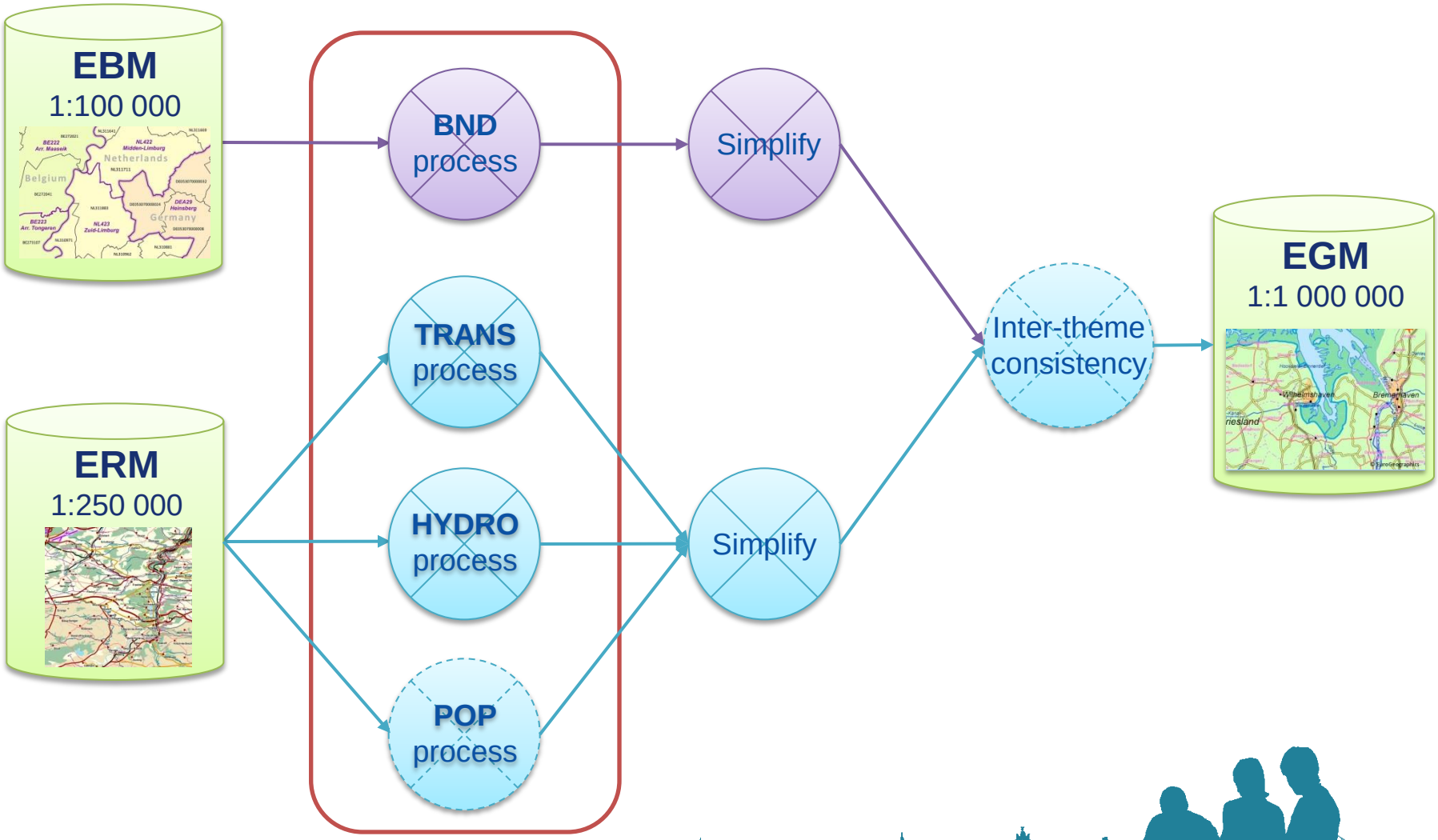
Technical characteristics of the tools

	BND tool	Others
Input/output data format	Shapefiles 	PostgreSQL database 
Implementation language	Python with ArcGIS 	C++ with internal IGNF libraries 

Why is BND different?

→ ArcGIS was enough for BND but other functionalities were needed to deal with TRANS and HYDRO (network analysis, graph manipulation).

How do the tools work?



How do the tools work?

- Different parameters for each theme and country

  → xml or text parameter files

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  <SELECTION_SQL_2>
    <SQL_2>rrc = 16 and exs != 6</SQL_2>
  </SELECTION_SQL_2>
  <SELECTION_SQL_3>
    <SQL_3>tfc != 32 and tfc != 33 and tuc != 25</SQL_3>
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  </SELECTION_NUMBER_OF_INHABITANTS>
</COUNTRY>
```

- For each theme: 4 main steps

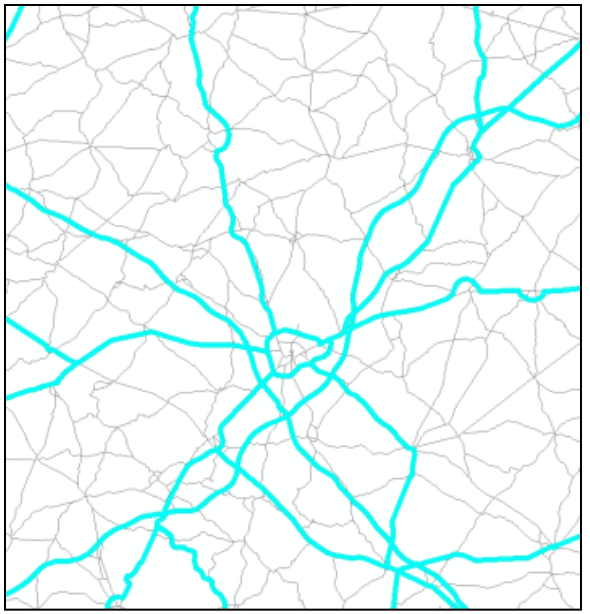
Step 1: Selection

Step 1: Selection

1. Semantic criteria (SQL queries)

Examples:

ROADL – FR	`f_code = 'AP030' and rtt in (16,14,0) and tuc != 36`
WatrcrsL – LU	`wch IN (1,2,3)`
LakeresA	`ARA > 3 km²`
…	

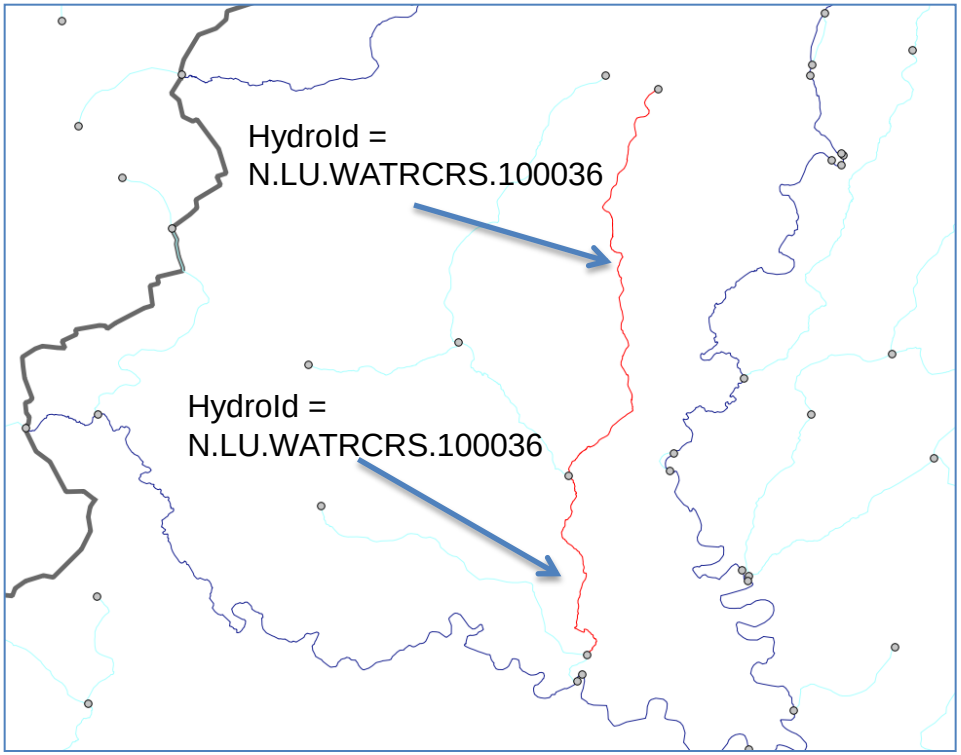


→ Result: 1st selection, usually with topological issues to be solved (connectivity, missing objects…)

Step 1: Selection

2. Geometric criteria

Ex 1: *WatrcrsL → Select all edges which belong to a hydrographic component (same HydroID) with length > threshold*

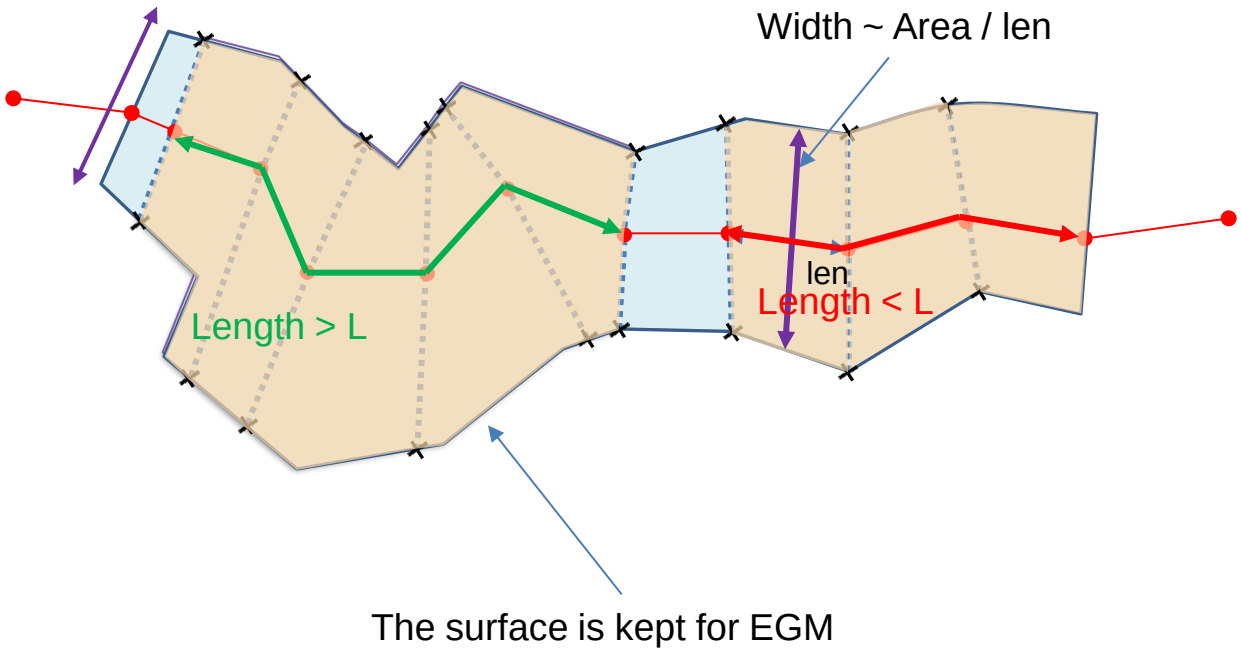


Step 1: Selection

2. Geometric criteria

Ex 2: *WatrcrsA → Selection based on elementary surfaces*

→ Issue: there is only a width threshold in the specifications



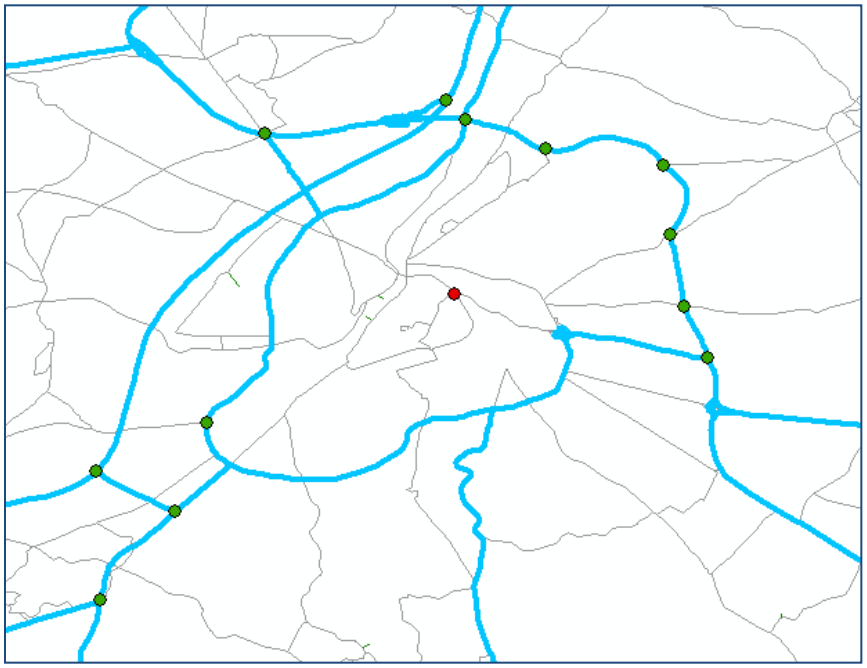
- Create main axis
- Project intermediate points on surface
- Estimate elementary surfaces' width
- Keep the surface or not according to length criteria (L)

Step 1: Selection

3. Topological criteria

Ex: *Selection of point objects (IntercC, DamC…)*

→ *ERM points which are connected to selected EGM linear objects are kept.*



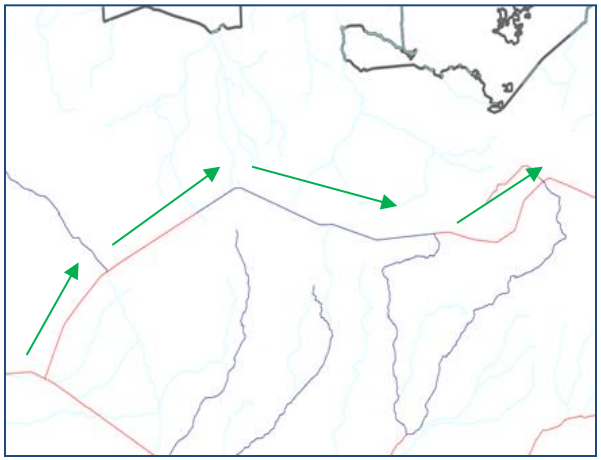
Legend:

- RoadL selected for EGM
- RoadL not selected for EGM
- IntercC selected for EGM
- IntercC not selected for EGM

Step 1: Selection

4. Network continuity within and between countries

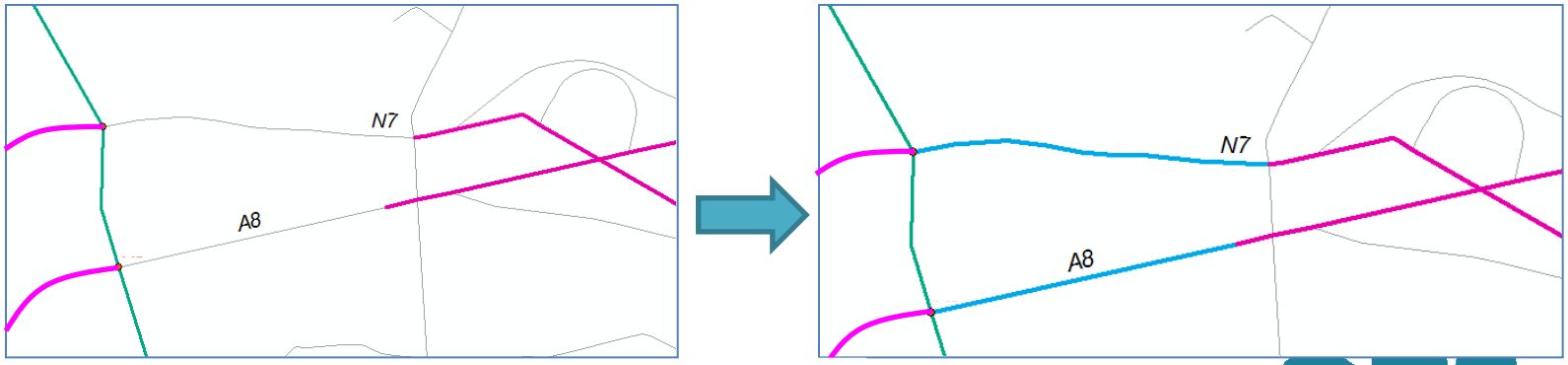
Ex1: *Geometrical continuity in WatrcrsL*



Selected network

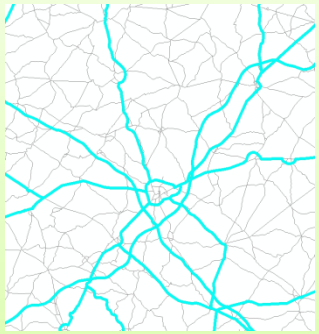
Objects added to ensure network continuity

Ex2: *Selection for edge-matching*



Step 1: Selection

- Semantic selection
- Geometric selection
- Topological criteria
- Network continuity within and between countries

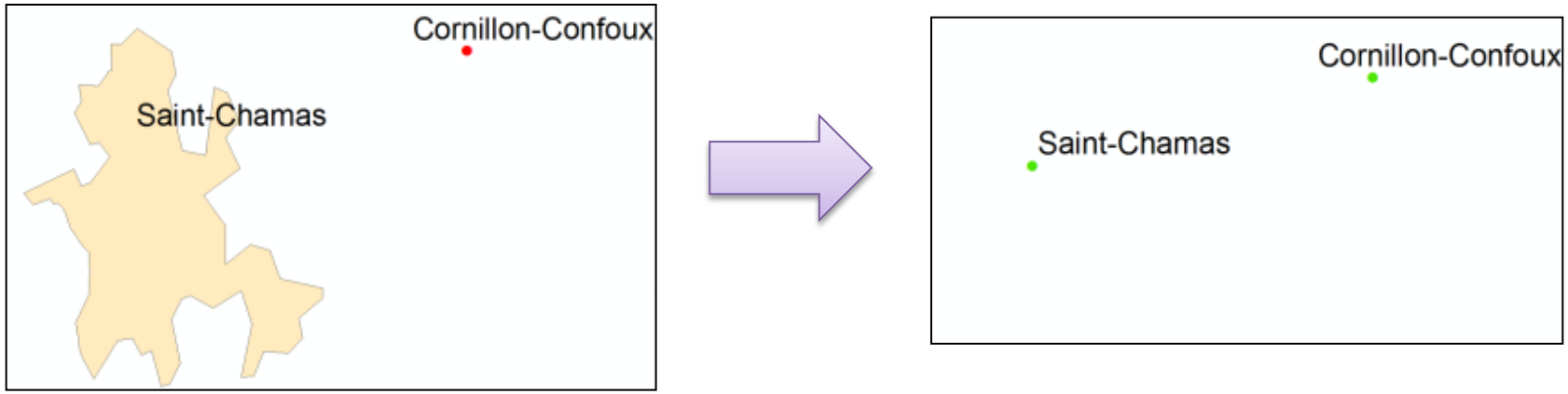


Step 2: Model conversion

Step 2: Model conversion

- Geometric transformations

Ex: *BuiltupA smaller than threshold becomes BuiltupP*



- Attribute transformations

Ex: *WatrcrsL WD7/WD8 in ERM become WIC in EGM*

Step 1: Selection

- Semantic selection
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- Topological criteria
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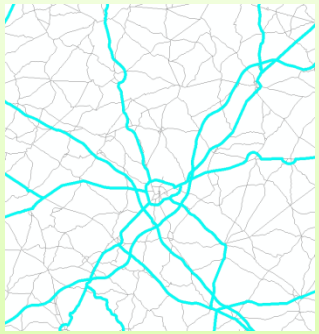
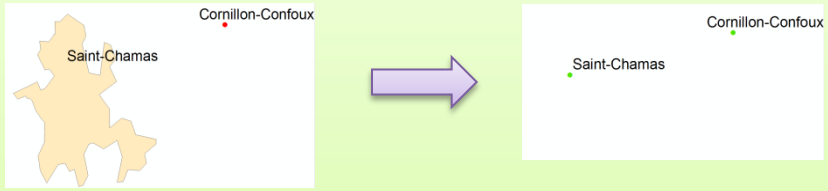


Step 2: Model conversion

- Change of geometry type



- Attribute modifications

Step 3: Intra-theme consistency

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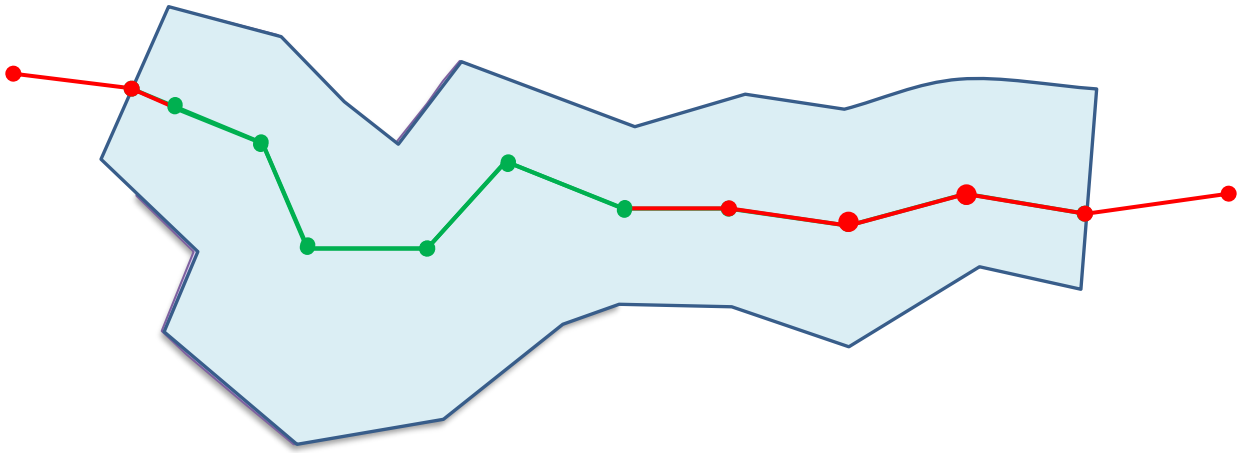
1. Ensure consistency between objects from the same theme

Ex: *Consistency between fictitious WatrcrsL and WatrcrsA*



WatrcrsA ERM

WatrcrsA EGM

Fictitious axis (LOC = 984)

Other WatrcrsL (LOC ≠ 984)

Step 3: Intra-theme consistency

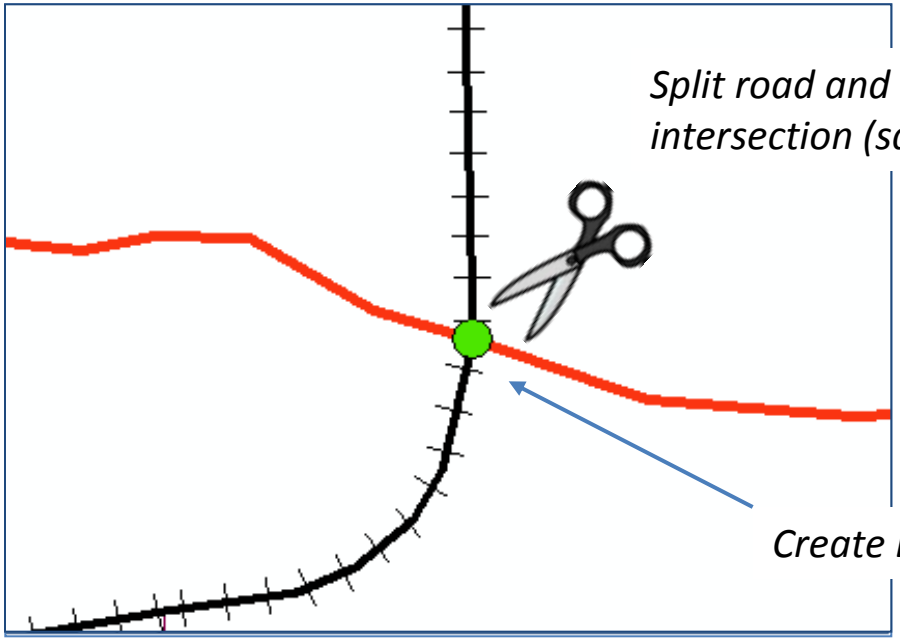
2. Create new feature types where needed

Ex: *LevelcC - LevelCrossing*

RoadL

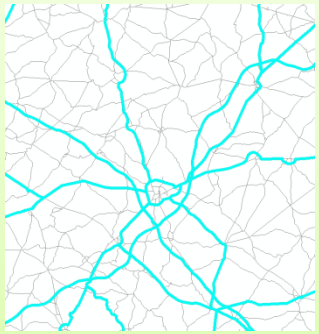
RailrdL

LevelcC



Step 1: Selection

- Semantic selection
- Geometric selection
- Topological criteria
- Network continuity within and between countries



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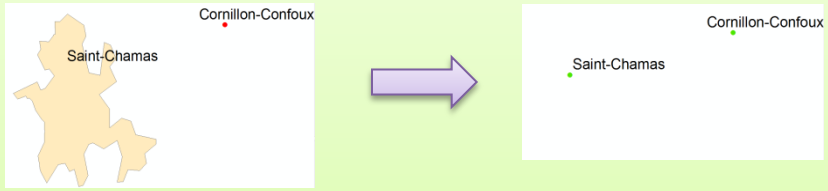
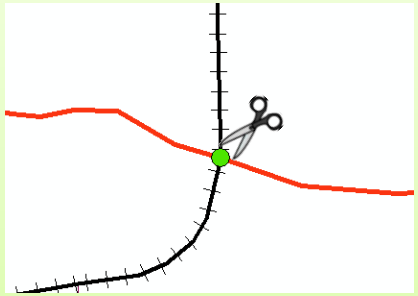


- Attribute modifications

Step 3: Intra-theme consistency

- Ensure consistency between objects from the same theme
- Add new feature types where needed



Step 4: Edge-matching

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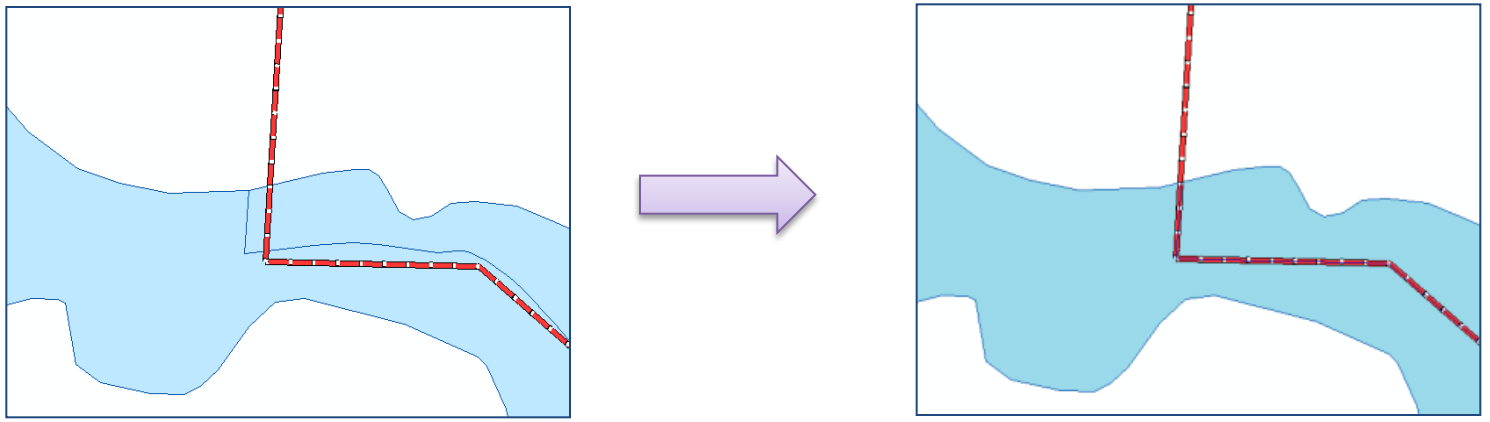
- Make the selected data geometrically compliant with the EGM boundaries
  - Point objects
  - Linear objects touching the boundaries
  - Linear objects aligned on the boundaries
  - More complex process for polygons



Step 1: Selection

- Semantic selection
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- Topological criteria
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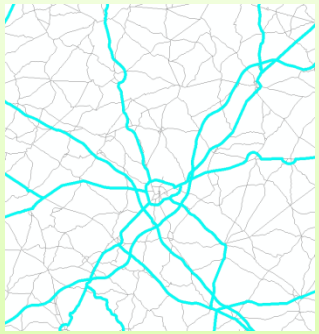

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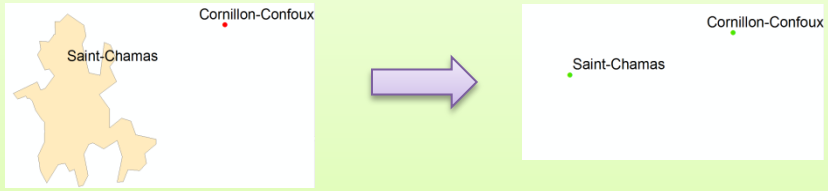

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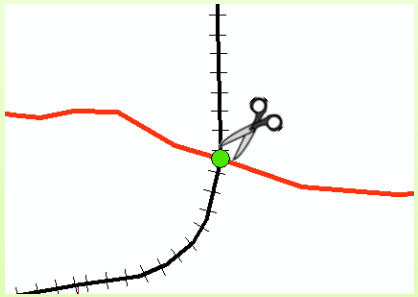
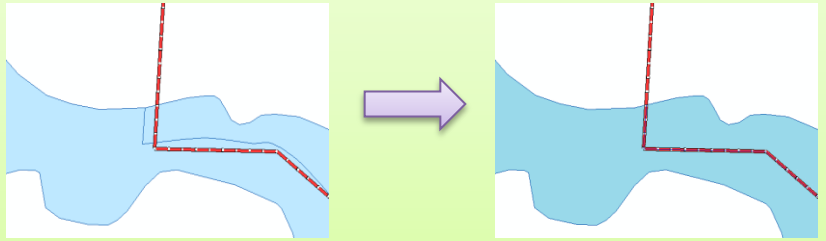
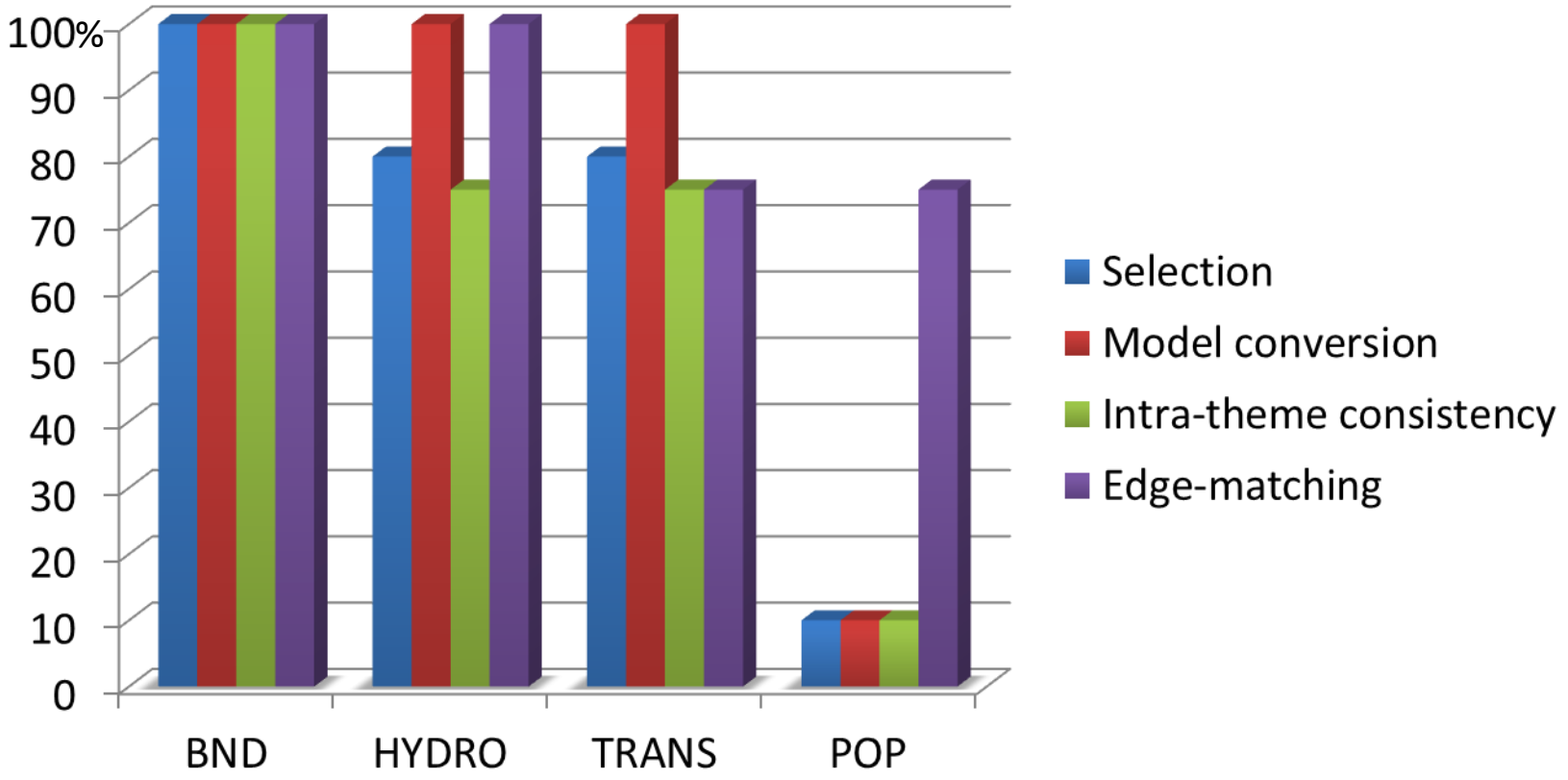


Step 4: Edge-matching

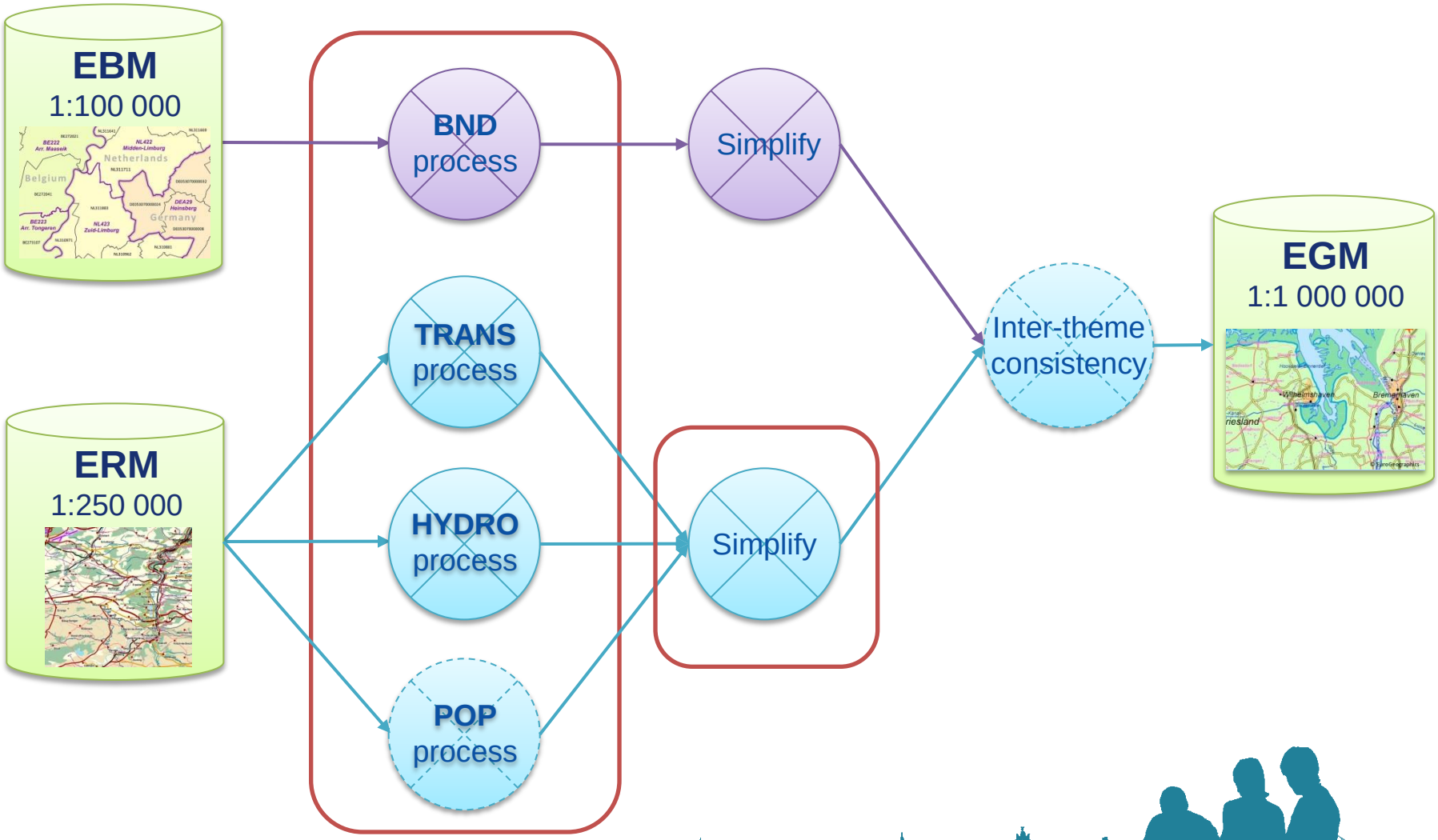
Ensure consistency of the selected ERM objects with the EGM boundaries



Status of the work for each theme



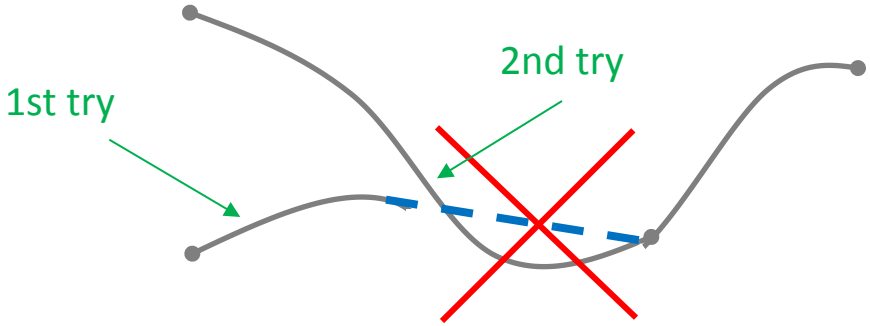
How do the tools work?



Simplification

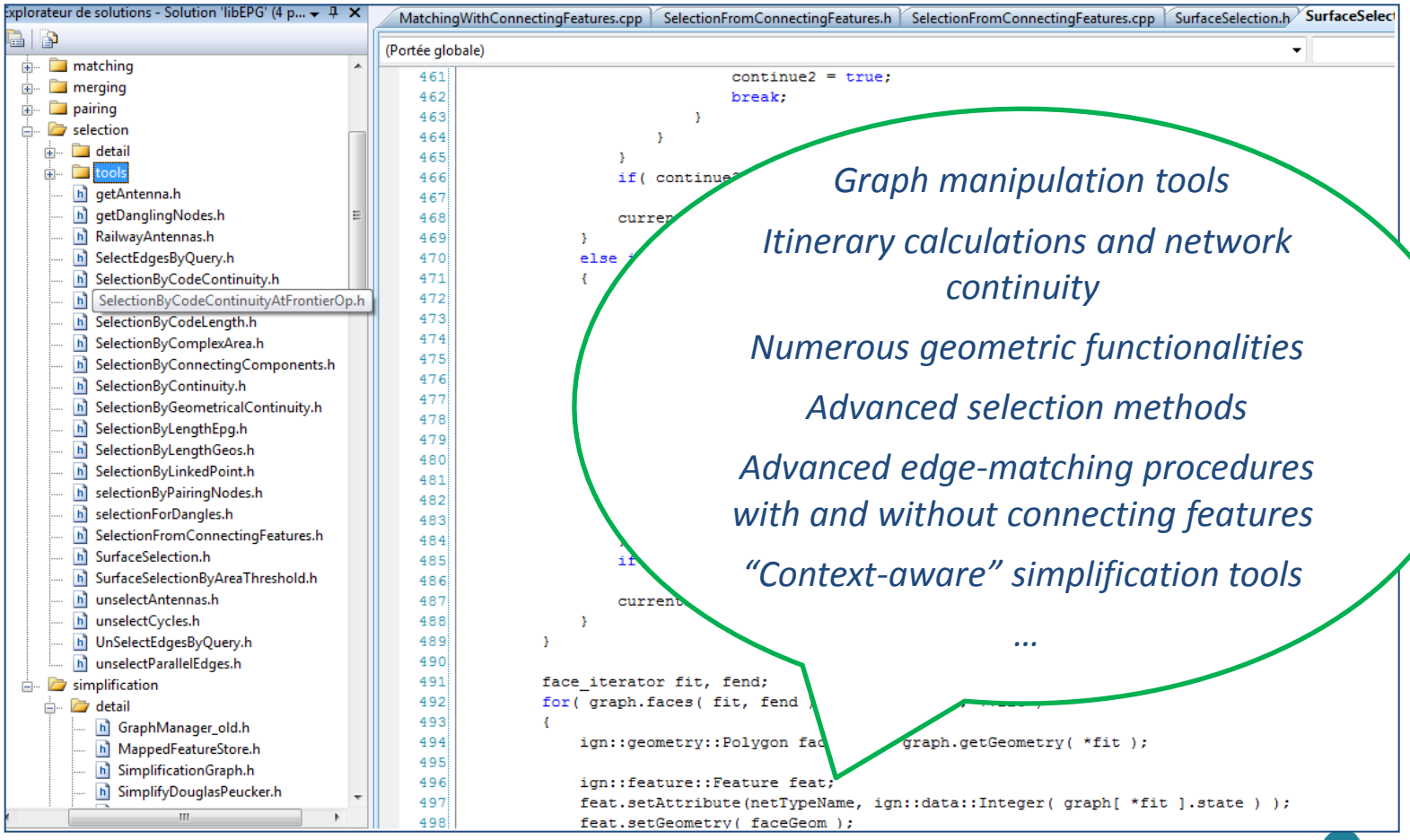
- Same tool used for all themes (except BND)
- Already implemented:
  - Two simplification algorithms (Douglas-Peucker and Visvalingam-Wyatt)
  - "Context-aware" simplification

    → topological relationships are preserved during simplification



- To be implemented:
  - More advanced functionalities (simplification of parallel lines, roundabouts…)

Creation of a library dedicated to generalization



Quality issues

- Attribute population
  - Heterogeneous way of populating attributes across countries because of different interpretations of the specifications

    → difficult to find a common process for all countries

  - Attributes required for generalization not always fully populated (RTN, HydroID…)

    → other solutions have to be found, which makes the process more complex

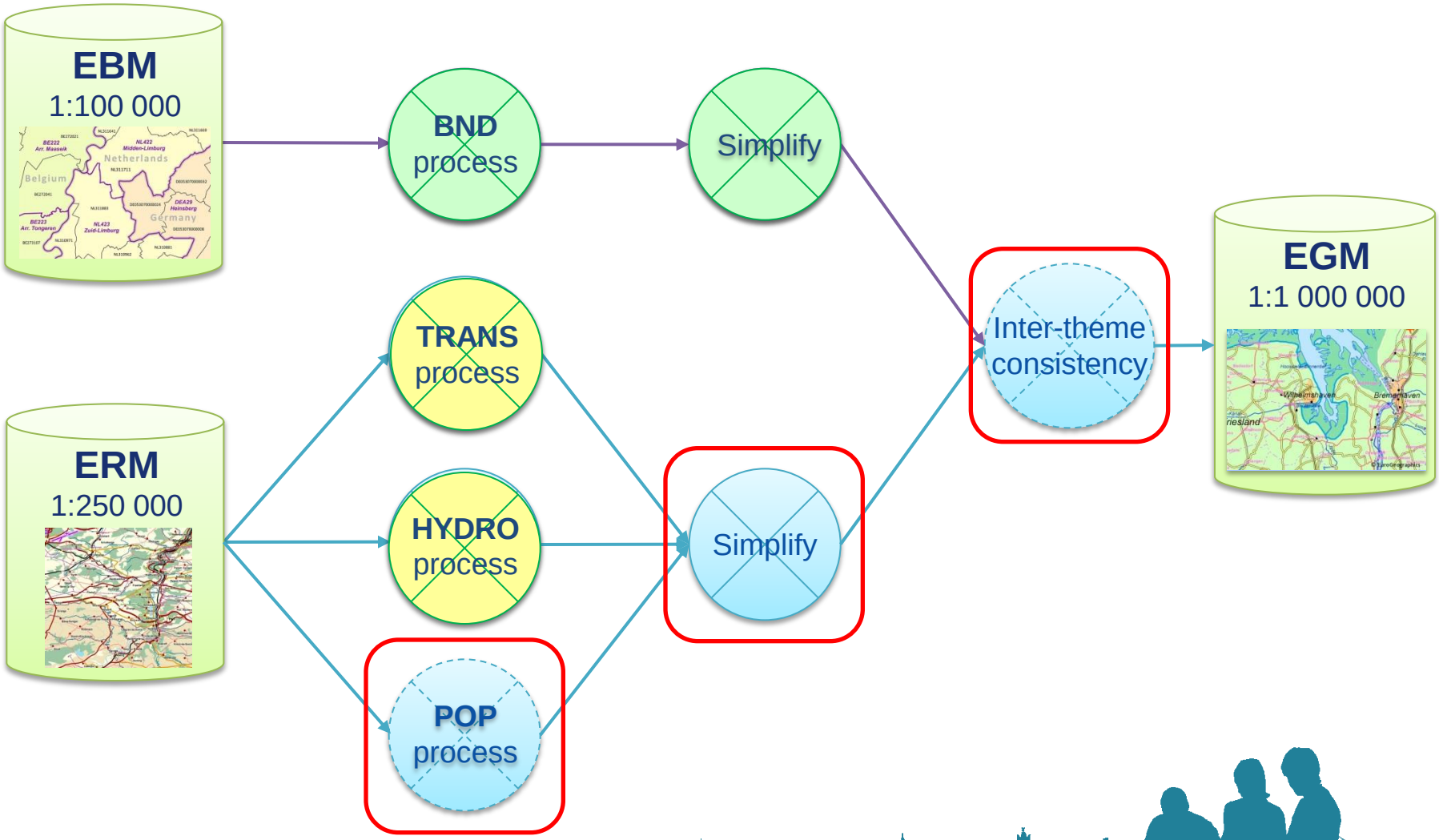
  - Errors in attribute population:

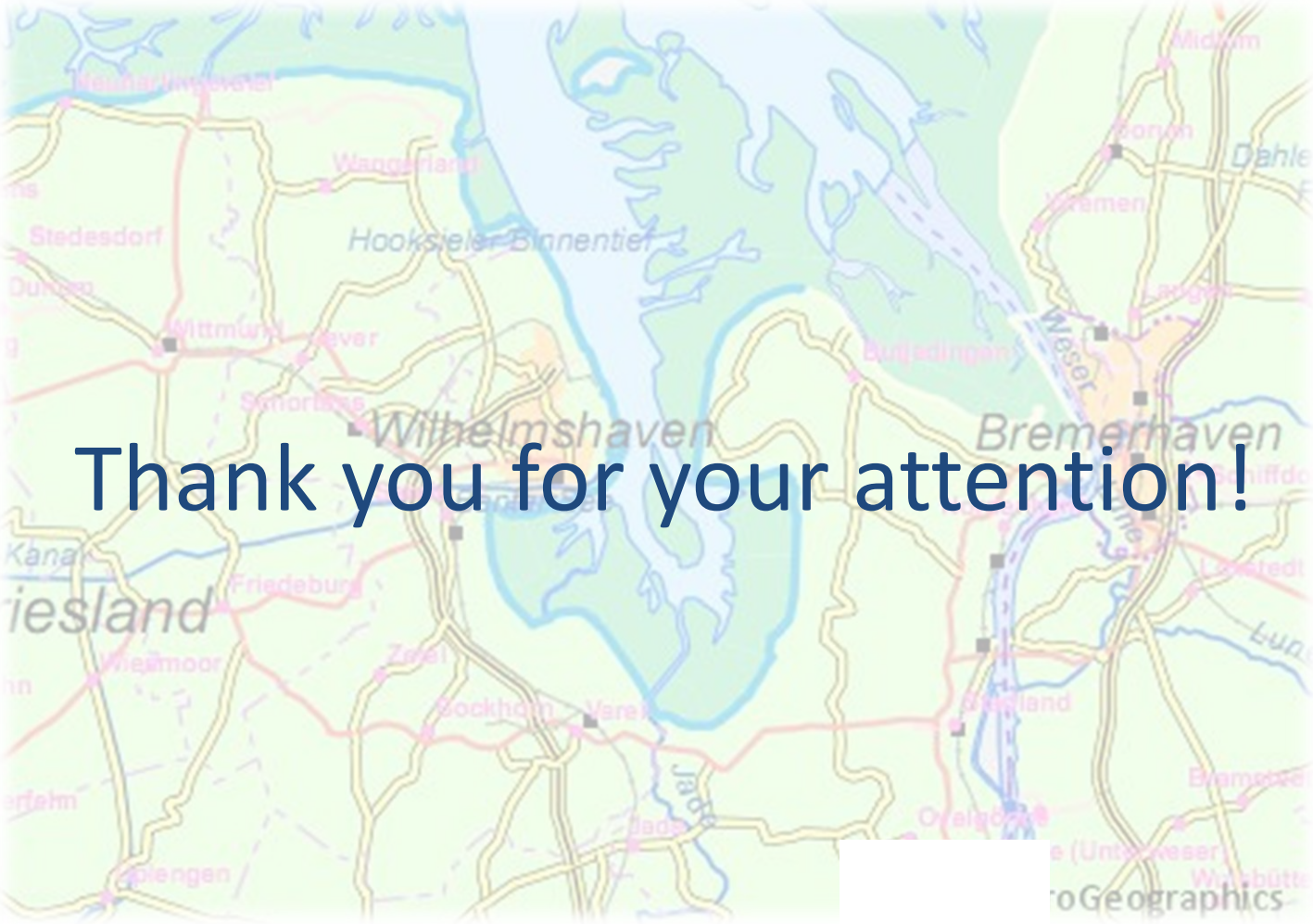
    Ex: incorrect use of double ICC codes inside countries / use of simple ICC codes on boundaries

- Topological inconsistencies across and between countries

⇨ The quality of EGM largely depends on ERM

What comes next?





Thank you for your attention!