Generalization of the Topographic Database to the Vector Map Level 2

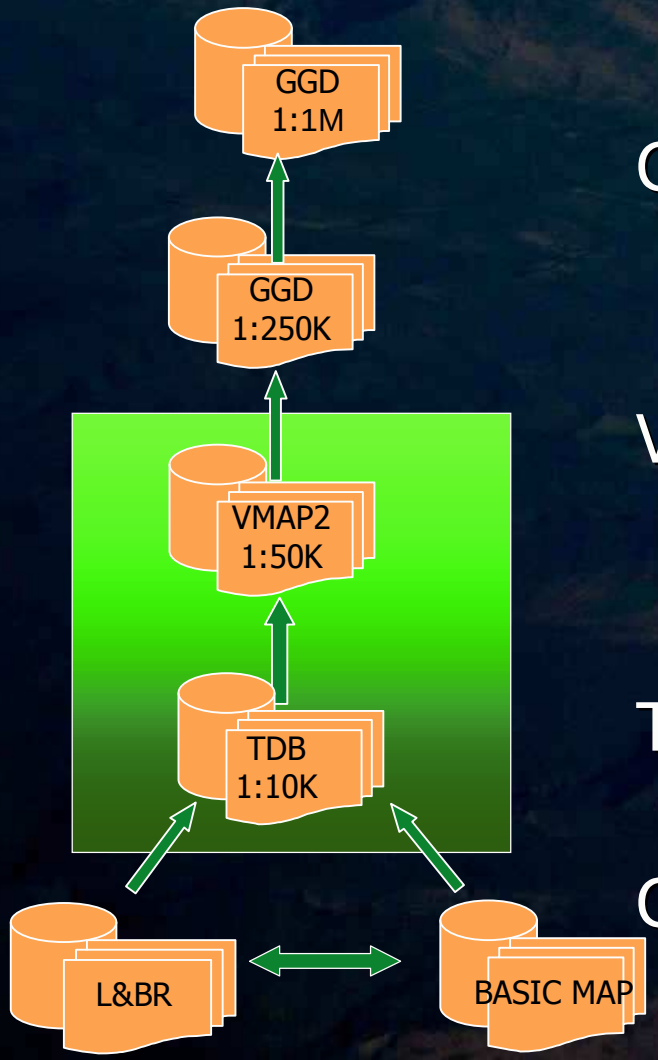
the components of the Polish National Geographic Information System

Izabela CHYBICKA, University of Warsaw

Adam IWANIAK, Agricultural University of Wroclaw

Wieslaw OSTROWSKI, University of Warsaw

Components of the Polish National Geographic Information System



General Geographic Database in a scale of 1:250K and 1:1M

VMAP2 database in a scale of 1:50K

Topographic database in a scale of 1:10K

Cadastral database --- Basic map

Topographic database - 10K and 50K

Topographic Database (**TDB**) is the official name for national system of collecting, managing and accessing topographic data, functioning under appropriate legal regulations. Its detail minuteness corresponds to a 1:10,000 scale. It is run by the National Agency of Geodesy and Cartography.

TBD consists of four components: **DLM,** DTM, DCM, Orthophotomap

Vector Map Level 2 **(VMAP2)** is run by the Military Geography Section of the Polish Army's General Staff. Its detail minuteness corresponds to a 1:50,000 scale. The database model of VMAP2 contains 110 classes of objects grouped in nine functional subject layers.

VMap2 includes **DLM** and DCM

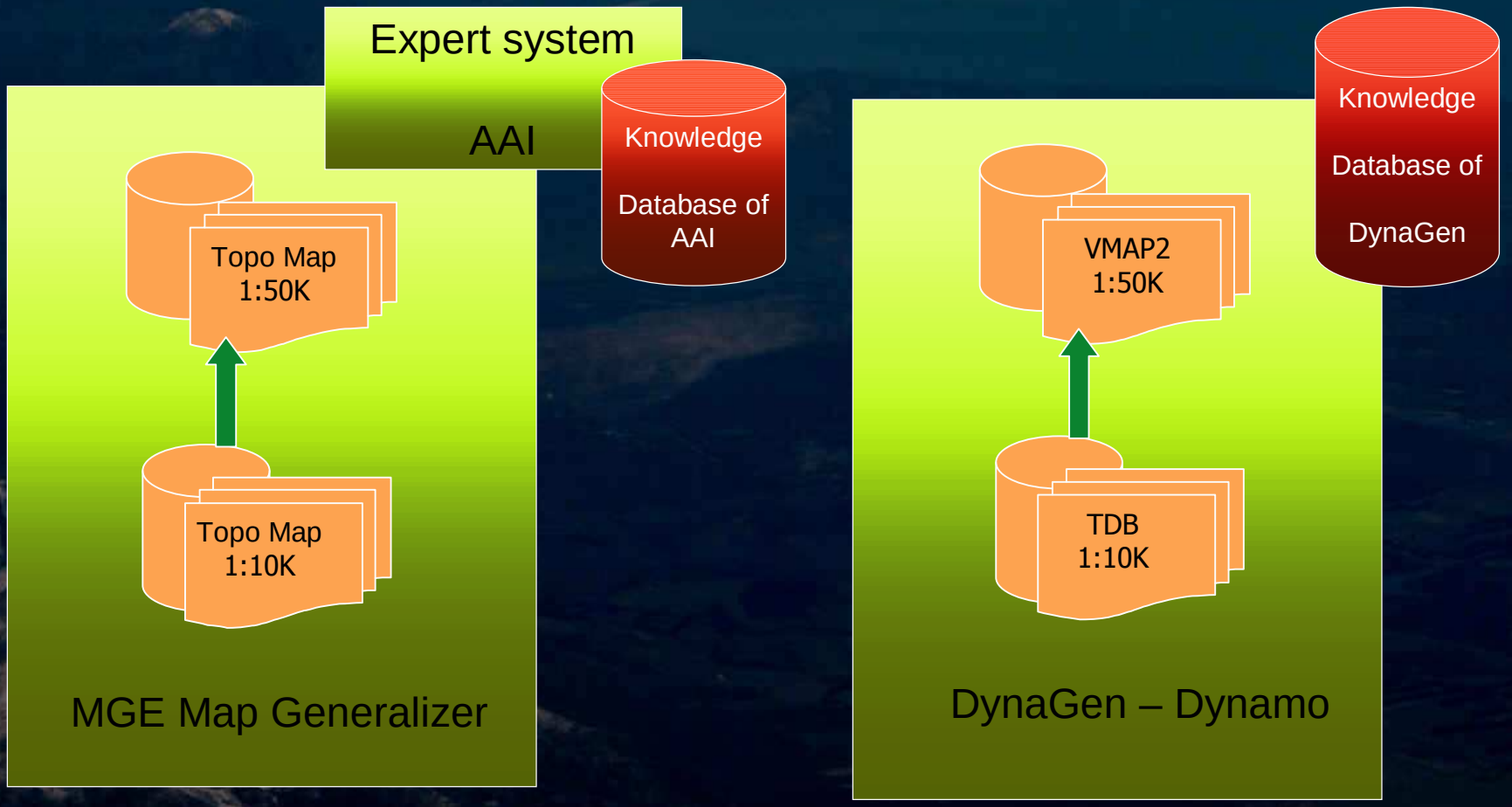
Main Objectives

- To formulate the workflow of generalization process from DLM of TBD to DLM of VMAP2
- To build knowledge base in DynaGEN format.

Definition of rules in DynaGEN includes:

- **Input** - the name of a generalized object and conditions of implementing particular methods
- **the operator -** the algorithm and the values of algorithm parameters,
- **Output** – the name and values of attributes referring to objects created as a result of generalization ,
- description of **disallowable topological changes** (describing prohibited spatial relations between generalized objects).

MGE Map Generalizer & AAI vs DynaGen



Conclusion after the MGE experiment

There is no way to fully automate the process of generalization within the MGE Map Generalizer environment and at this stage of knowledge.

To generalize maps we need:

- Data in digital format
- Standard of data
- Hierarchy and Topology of data
- Knowledge how to generalize maps (top level – workflow, low level to solve local problems)
- Method to choose correct objects
- Sophisticated intelligent algorithms

Experiments

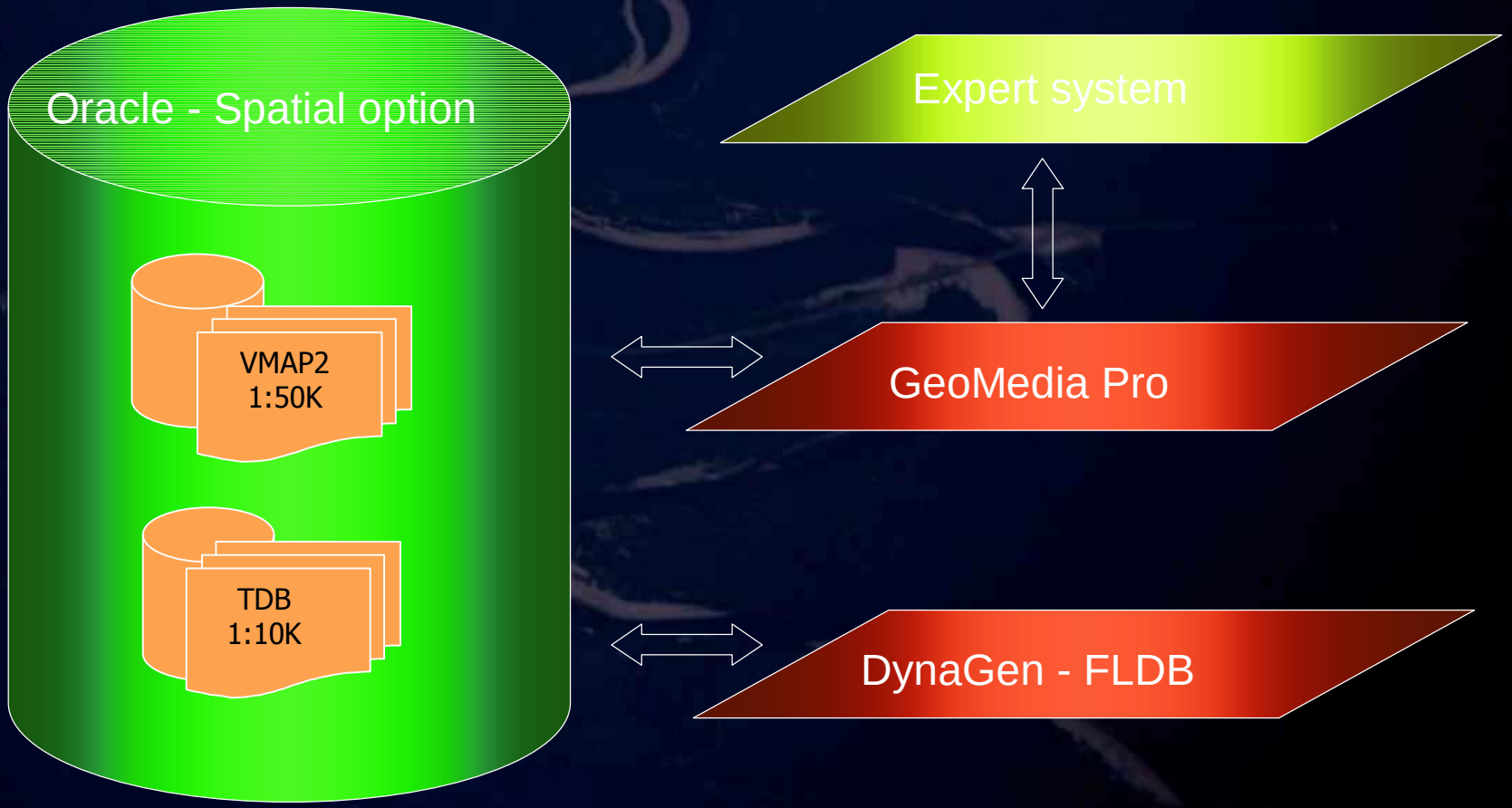
Generalization knowledge base

- Quantity generalization of unsurfaced roads:
  - rejection of segments of unsurfaced roads – "hanging",
  - rejection of short access roads,
  - selection of representative unsurfaced roads,
  - simplification of the routes of unsurfaced roads, operator 'Simplify', algorithm 'Douglas Global Tolerance Band' value of tolerance parameter =0.05.
- Quantity generalization of paths:
  - selection of representative paths,
  - simplification of the routes of paths, operator 'Simplify', algorithm 'Douglas Global Tolerance Band' value of tolerance parameter =0.05. aggregation of adherent or closely-
  - - the areas which are not adjacent to each other but situated within a distance smaller than 5mm (50m) with at least two one-family houses will also be added. Built-up areas fulfilling the mentioned condition have been selected using dynamical query (the number of houses within the particular area has been counted) and furthermore, by using the operator 'Aggregate Areas', additional areas will be joined to the areas created in the previous step (the algorithm 'Orthogonal'; default parameters value set to 5mm).
  - - built-up areas which were not joined to the selected areas but still covering the minimal number of two one-family houses and
- these farmsteads have been chosen with a query,
- extending the borders of built-up areas to neighboring objects, operator Extend, algorithm Areas To Line, Areas. The parameters values individually adjusted in the following ranges: Threshold Tolerance 0.10 – 0.20 mm, Zone Tolerance 0.10 – 0.20 mm.
- taking into account a significant changeability of parameters of particular algorithms, the values of parameters should be suited to a particular

DynaGen experiment – problems and limitations

1. The difficulties result from changeability of values of parameters, dependent on:
   - - the shape of an object
   - - the spatial layout of objects
   - - the neighborhood of other objects
   - - the way of capturing data, i.e. the number of vertics creating a line may have influence on final result
2. There is no standarization. Each map is generalized in a different way.
3. It is difficult to solve local problems automatically
4. The bigger number of more datailed generalization steps, the better solution

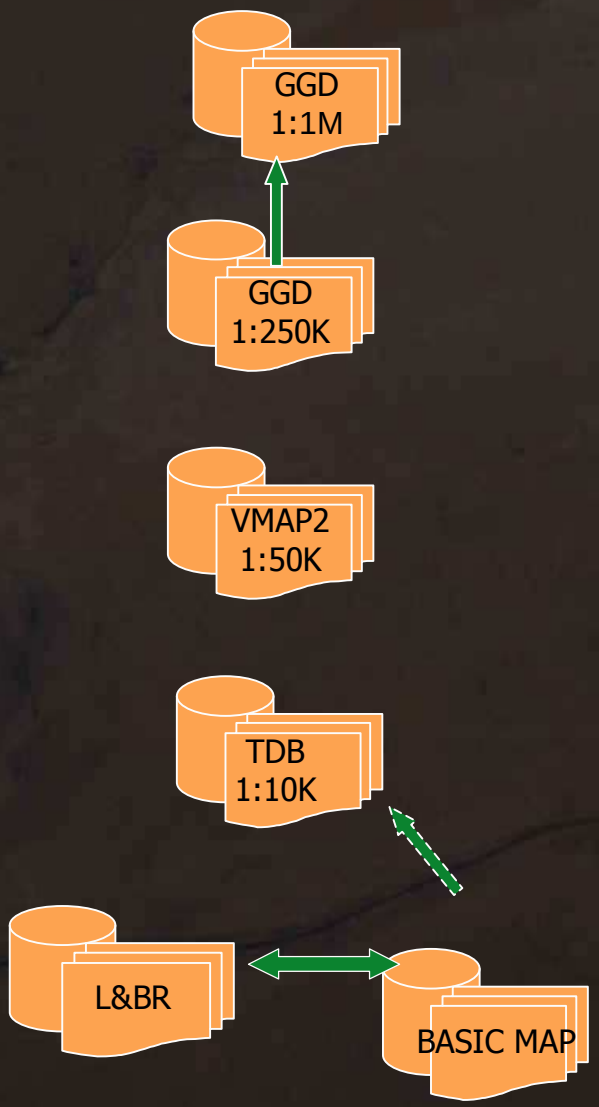
Challenges for the future



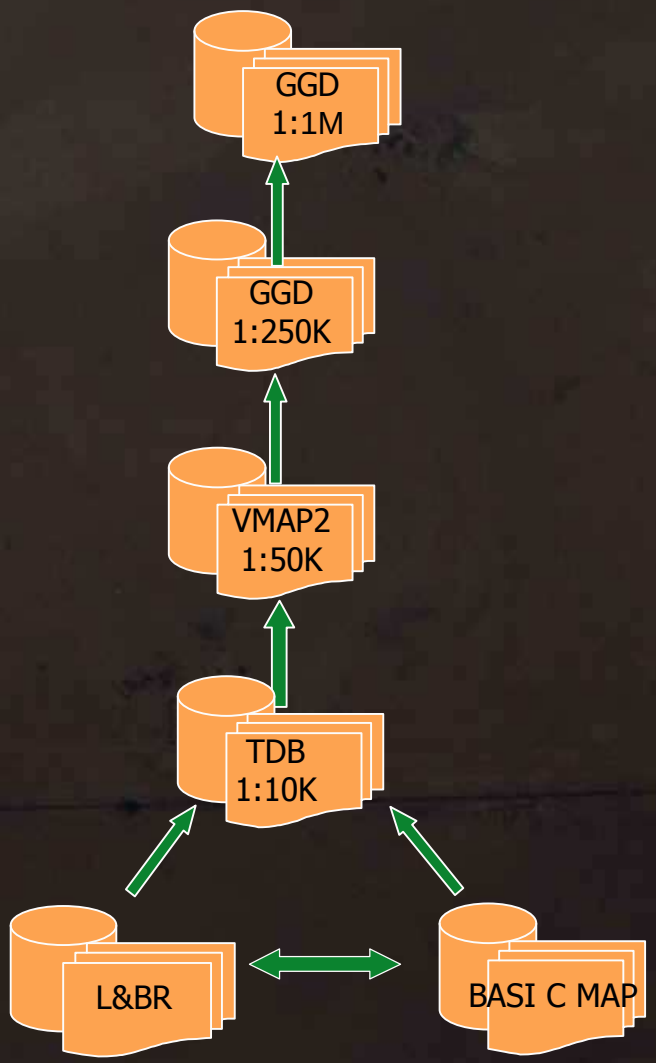
Conclusions after experiment with DynaGEN

- DynaGEN is a good program but requires working in an interactive mode
- There is no way to fully automate the process of generalization within the DynaGEN environment and at this stage of knowledge.
- Experiments should be continued to build bigger and better knowledge base
- Extension of our project to ORACLE, GeoMedia, Dynamo LFDB and expert system may not bring visibly improved results, but for sure it is a very exciting challenge.

Who? When? How? What with?



Current data workflow

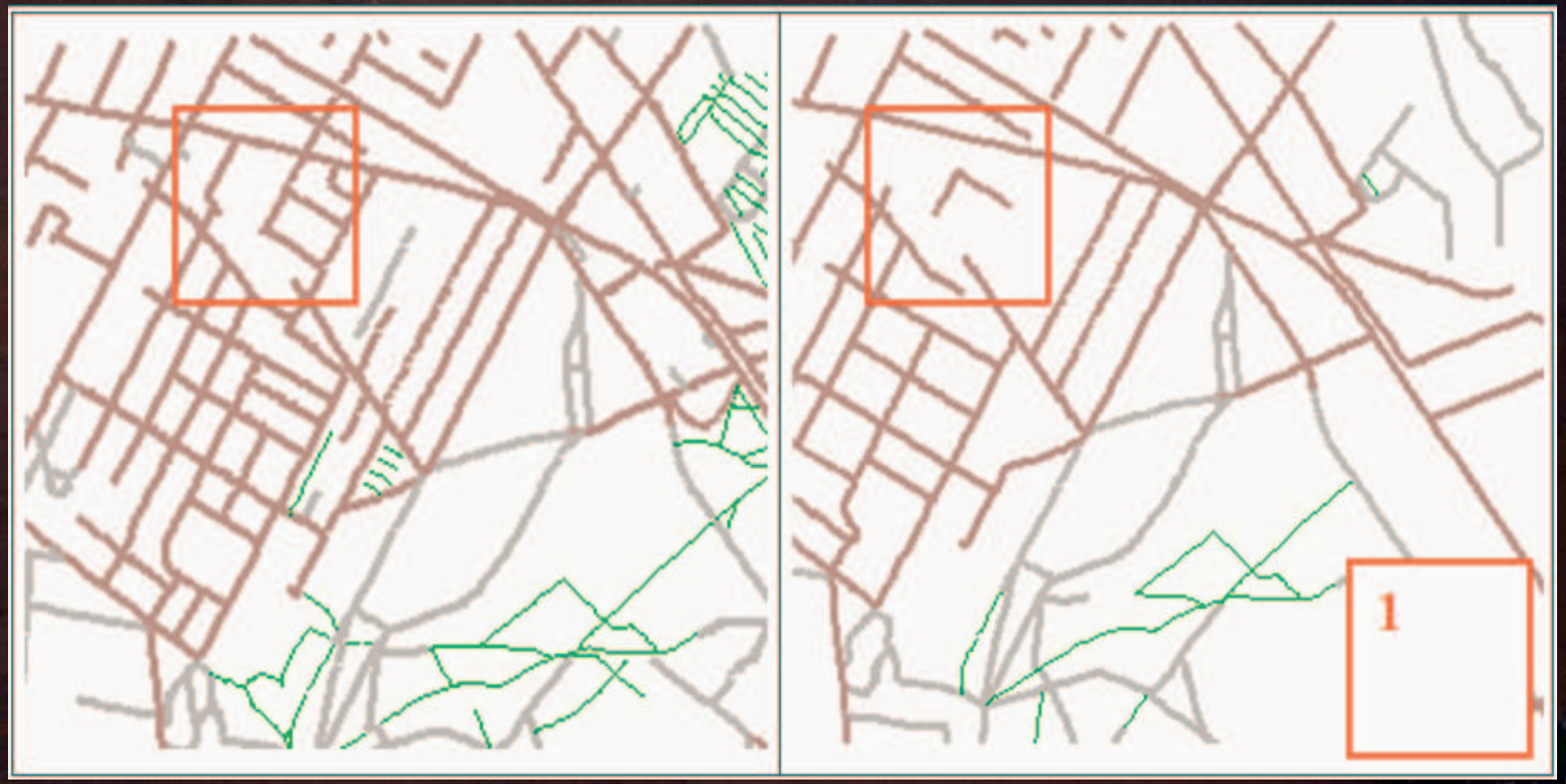


Target data workflow


Thank you

Problems

Problems



Problems

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