DSGTOOLS:
a toolbox for database management and vector data quality in QGIS

FOSS4G BOSTON 2017
WHO ARE WE?

• Brazilian Army Geographic Service Bureau (DSG)

• 100+ years mapping the Brazilian territory

• One of the legal responsible for the Brazilian geospatial standards
DSGTOOLS TEAM

• Luiz Andrade:
  • Cartographic Engineer: Graduated @ Military Institute of Engineering in 2005
  • Python GIS Developer
  • https://github.com/lcoandrade

• Philipe Borba:
  • Cartographic Engineer: Graduated @ Military Institute of Engineering in 2012
  • Python GIS Developer
  • https://github.com/phborba
WHAT WAS OUR PRIMARY MOTIVATION?
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• Break the proprietary chains
WHAT WAS OUR PRIMARY MOTIVATION?

- Provide seamless way to execute complex tasks, because:
  - Our staff is mainly composed of GIS users
  - This means they are not DBAs, Programmers or anything like that
CHosen Technology

PostgreSQL

QGIS

Qt

SQLite

PostGIS

Spatial PostgreSQL
WHAT DOES DSGTOOLS PROVIDE?

First of all (and most important)

A seamless way to build the Brazilian conceptual model (226 layers omg!)
WHAT DOES DSGTOOLS PROVIDE?

User permission management
WHAT DOES DSGTOOLS PROVIDE?

Generic way to load PostGIS databases
WHAT ABOUT OUR "MAIN COURSE"?

Topological toolbox for PostGIS databases
PROVIDED PROCESSES

• 24 processes
• Separated in:
  • problem identification
  • problem correction
• Capable of dealing with problems such as occurrence of gaps and overlaps
• The processes are based on SQL queries or QGIS’ processing algorithms in a transparent way
• All processes make layer modification using the edit buffer, thus not making unwanted commits
GENERAL PROCESS STRUCTURE

1. Any required process can be executed before the actual processing.
2. The actual process is executed here.
3. Any post process can be executed after processing.
SIMPLE, YET USEFUL, SET OF PROCESSES

• Deaggregate geometries (only Python)

• Dissolve polygons with same attributes with size constraint (processing runalg)

• Identification/correction of invalid geometries (uses ST_MakeValid)

• Identification/removal of small geometries (only Python)

• Identification/removal of duplicated geometries (uses its own query)

• Removal of empty geometries (uses its own query)

• Snap to grid (useful do adjust coordinate precision)
CLEAN GEOMETRIES PROCESS

- Based on GRASS topology
- Executes v.clean (break, rmsa and rmdangle) using QGIS’ processing runalg
IDENTIFY VERTEXES NEAR EDGES

- Useful to determine geometry problems in general
SNAP LAYER ON LAYER

- Python implementation of QgsGeometrySnapper
- On DSGTools until QGIS 3.0 (no binding until then)
SNAP LINES TO FRAME

- Prolongs lines to a selected frame
SPATIAL RULE CHECKER

• Verifies topology predicates

• Uses cardinality

![Validation Rules Table]

<table>
<thead>
<tr>
<th>Layer #1</th>
<th>Necessity</th>
<th>Spatial predicate</th>
<th>Layer #2</th>
<th>Cardinality</th>
</tr>
</thead>
<tbody>
<tr>
<td>cb.adm_area_pub civil_a</td>
<td>must (be)</td>
<td>equal</td>
<td>cb.adm_area_pub civil_a</td>
<td>1..1</td>
</tr>
</tbody>
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<tbody>
<tr>
<td>1 cb.loc_area_edificada_a</td>
<td>1_must not (be)</td>
<td>6_overlap</td>
<td>cb.veg_veg_cultivada_a</td>
<td>1..*</td>
</tr>
<tr>
<td>2 cb.loc_area_edificada_a</td>
<td>1_must not (be)</td>
<td>6_overlap</td>
<td>cb.veg_floresta_a</td>
<td>1..*</td>
</tr>
<tr>
<td>3 cb.loc_area_edificada_a</td>
<td>1_must not (be)</td>
<td>6_overlap</td>
<td>cb.veg_campo_a</td>
<td>1..*</td>
</tr>
<tr>
<td>4 cb.loc_area_edificada_a</td>
<td>1_must not (be)</td>
<td>6_overlap</td>
<td>cb.veg_cerrado_cerrado_a</td>
<td>1..*</td>
</tr>
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</table>
SPATIAL RULE ENFORCER

• Similar to Spatial rule checker

• Works on real time listening to the edit buffer signals
TOPOLOGICAL PROCESSES

Input layer A → Unified layer → Output layer → Output layer A
Input layer B → Unified layer → Output layer → Output layer B
Input layer N → Unified layer → Output layer → Output layer N
TOPOLOGICAL CLEAN (SIMILAR TO CLEAN GEOMETRIES)

- Great use to solve overlaps and gaps in all layers that form land cover (earth coverage)
• Great use to reduce the number of vertex without generating gaps and overlaps
DSG’S MAPPING PROJECTS USING DSGTOOLS

- Amapa state mapping
- Bahia state mapping
- Brazilian Army military exercise fields
- Other mapping projects around Brazil
EXÉRCITO BRASILEIRO

“Do. Or do not. There is no try.”

–Yoda (3 ABY)

https://github.com/lcoandrade/DsgTools/