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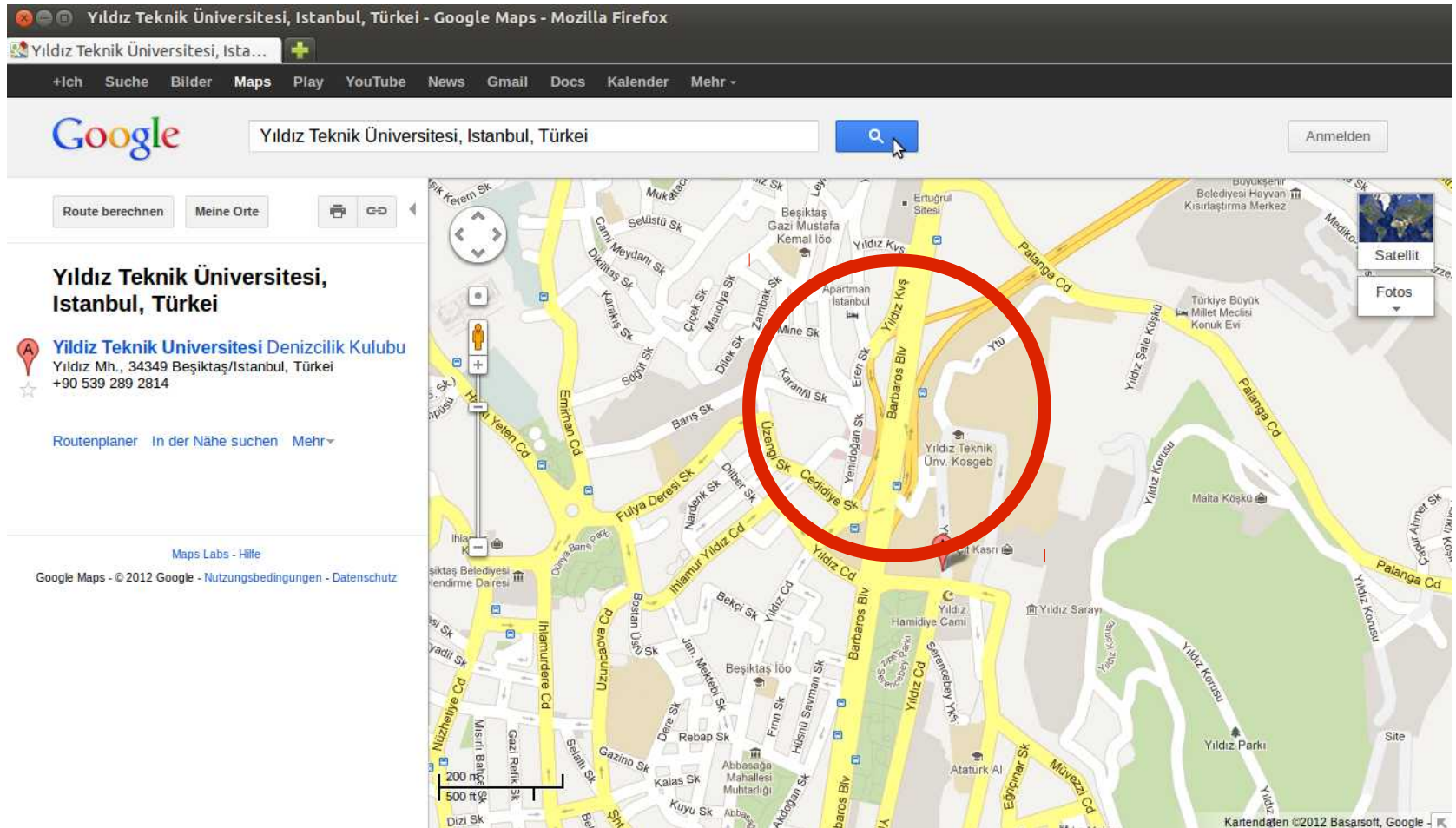
Faculty of Forestry, Geosciences and Hydrosiences, Department of Geosciences, Institute for Cartography

Approaches for enhancing tile-based mapping with cartographic generalisation

Ralf Klammer, Dirk Burghardt
15th ICA Generalisation Workshop
Istanbul, 12.09.2012



DRESDEN
concept
Exzellenz aus
Wissenschaft
und Kultur



source: <http://maps.google.de/maps>

0. Structure of the presentation

1. Motivation

2. Terminology

3. Possible architectures

4. Exemplary implementation

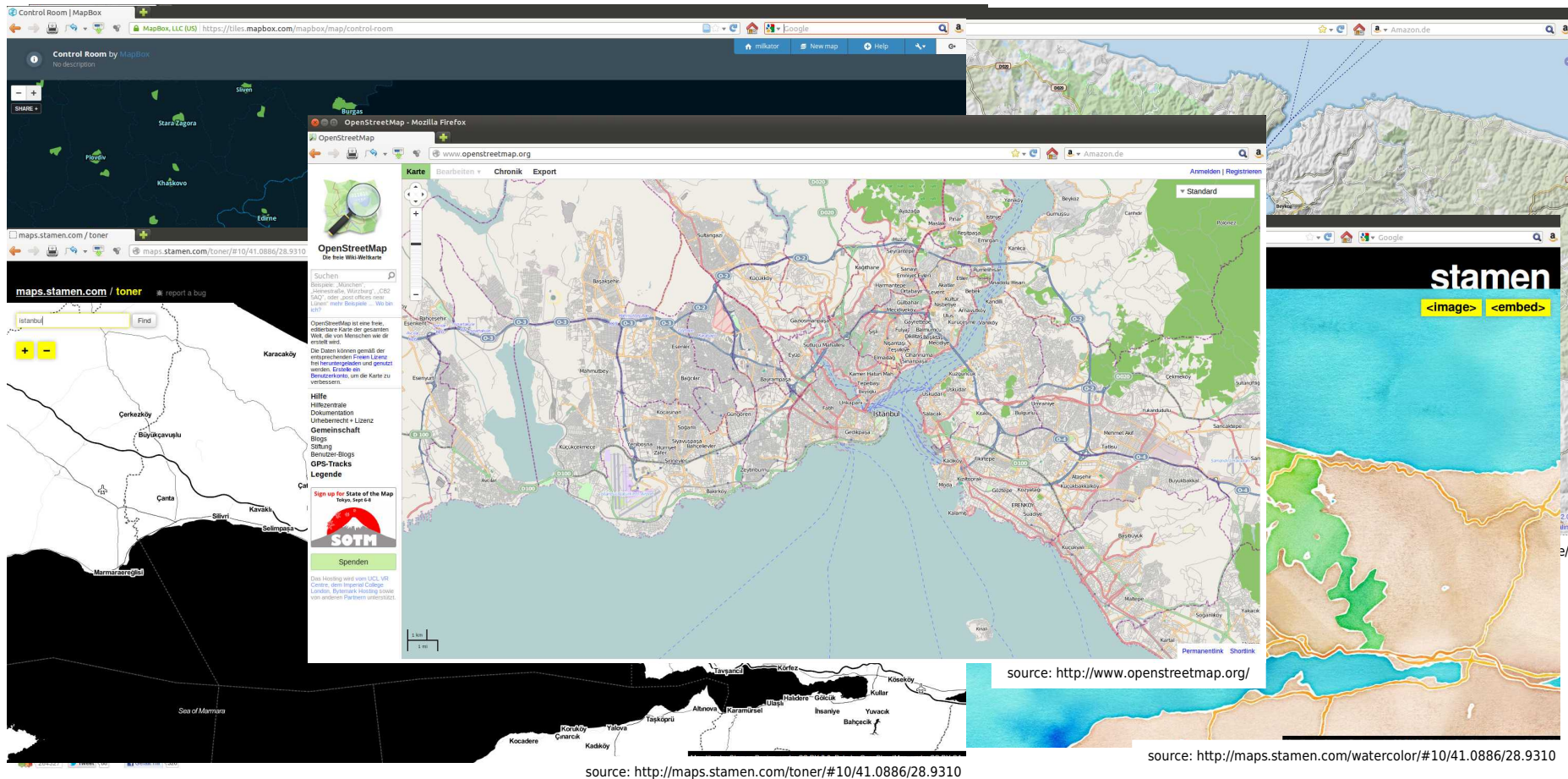
5. Results & future work

Progression in use of technology and internet

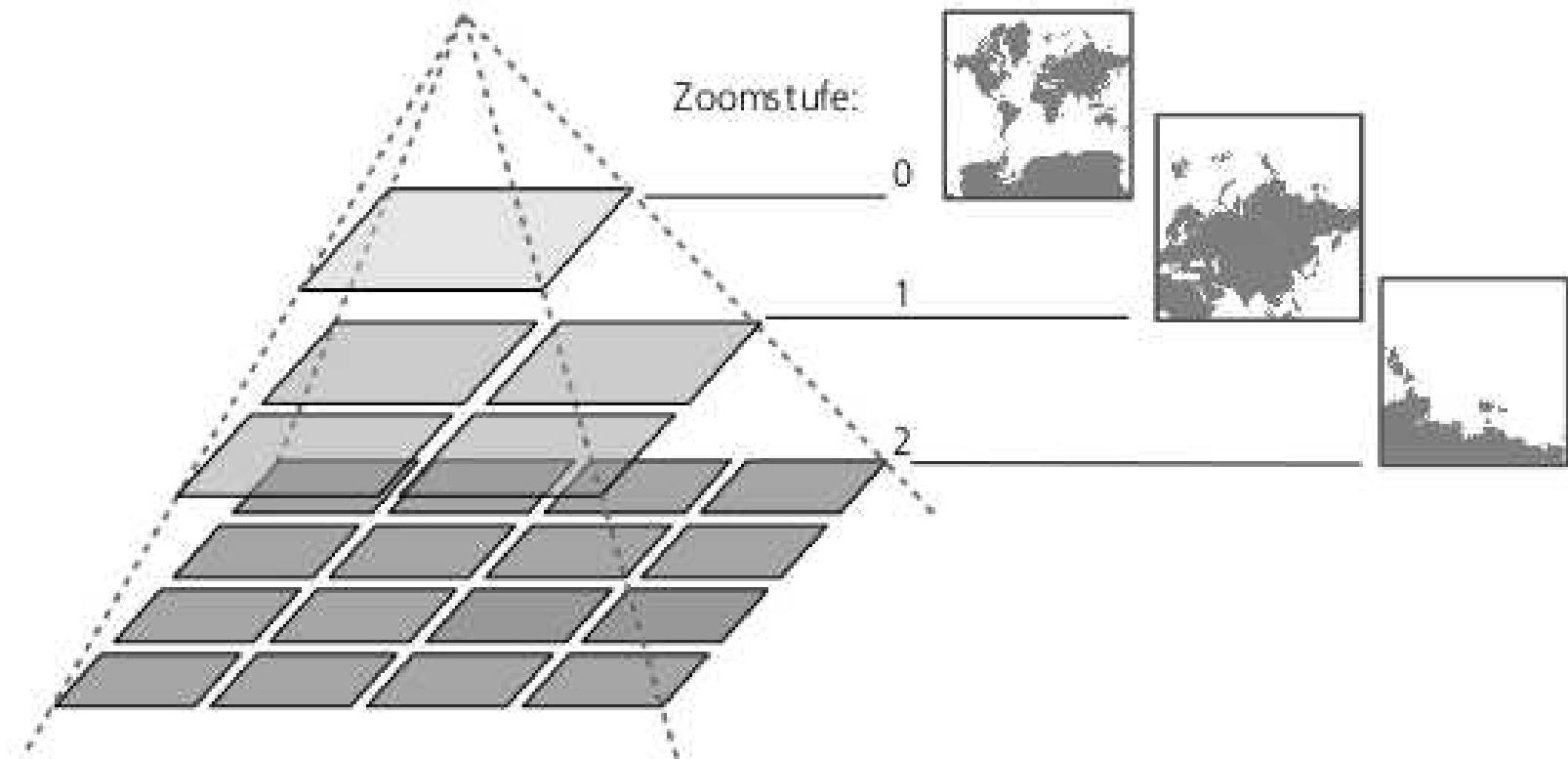


source: <http://kosmar.de/archives/2005/11/11/the-huge-cloud-lens-bubble-map-web20/>

“Explosion of digital 'interactive' maps”



Technological motivation



source: Jurk, F. (2010). Integration von Tiled Map Services in Geodateninfrastrukturen. diploma thesis, university of applied sciences, dresden

2. Terminology

tile
tile-based mapping system
tile-based
tile-based mapping
tile-based map
renderer
cartographic parameter
automatic rendering

Tile-based mapping system

Core properties:

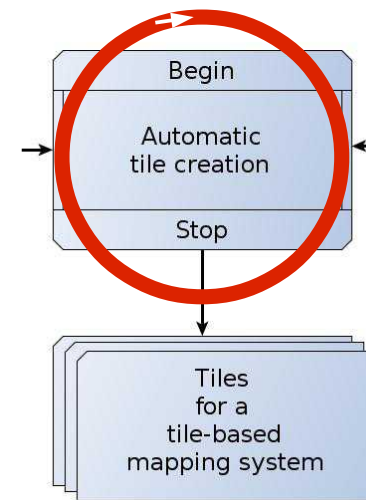
1. Map views are based on multiple discrete zoom levels
(corresponding to a fixed map scale)
2. Multiple image tiles are used to virtualize a single map view
3. Image tiles are accessible using discrete addressing scheme
4. Tiles are sent to client with minimal processing – as much as possible is done ahead of time

(cf. Sample & Ioup 2010)

Tile-based mapping

Properties:

- fully automated process
 - pre-definition of cartographic parameters
 - generalisation has to fit to structure of tile creation
- automatic generalisation!?!





3. Possible Architectures

1. On-the-fly-generalisation during rendering

2. Multiple representation database system

On-the-fly-generalisation during rendering

Advantages:

- keep the computation of tiles completely automatic
- possibility to generalise features in relation to symbolisation

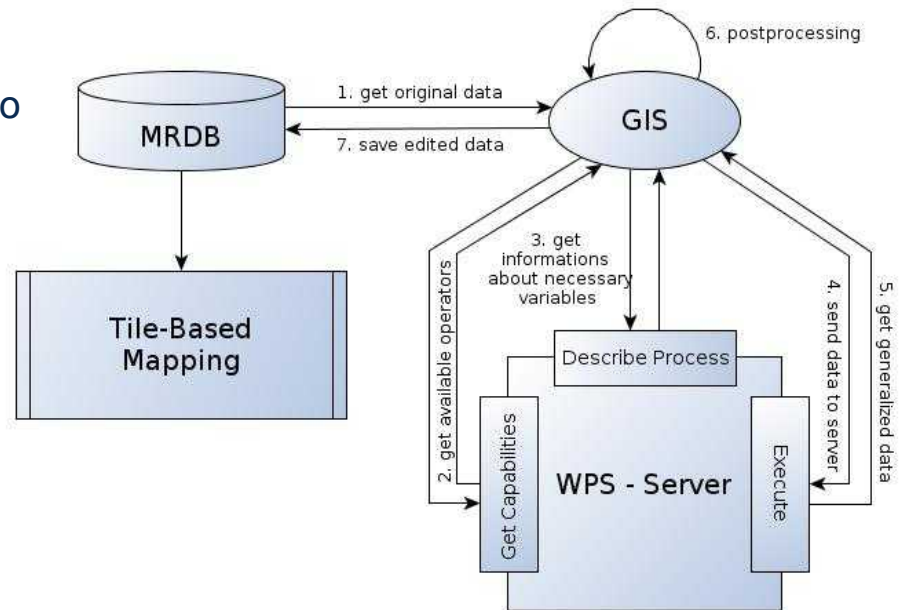
Integration of generalisation functionalities:

- 1.) implement algorithm to rendering software
- 2.) call algorithm from an external library
- 3.) external processing of features (WPS)

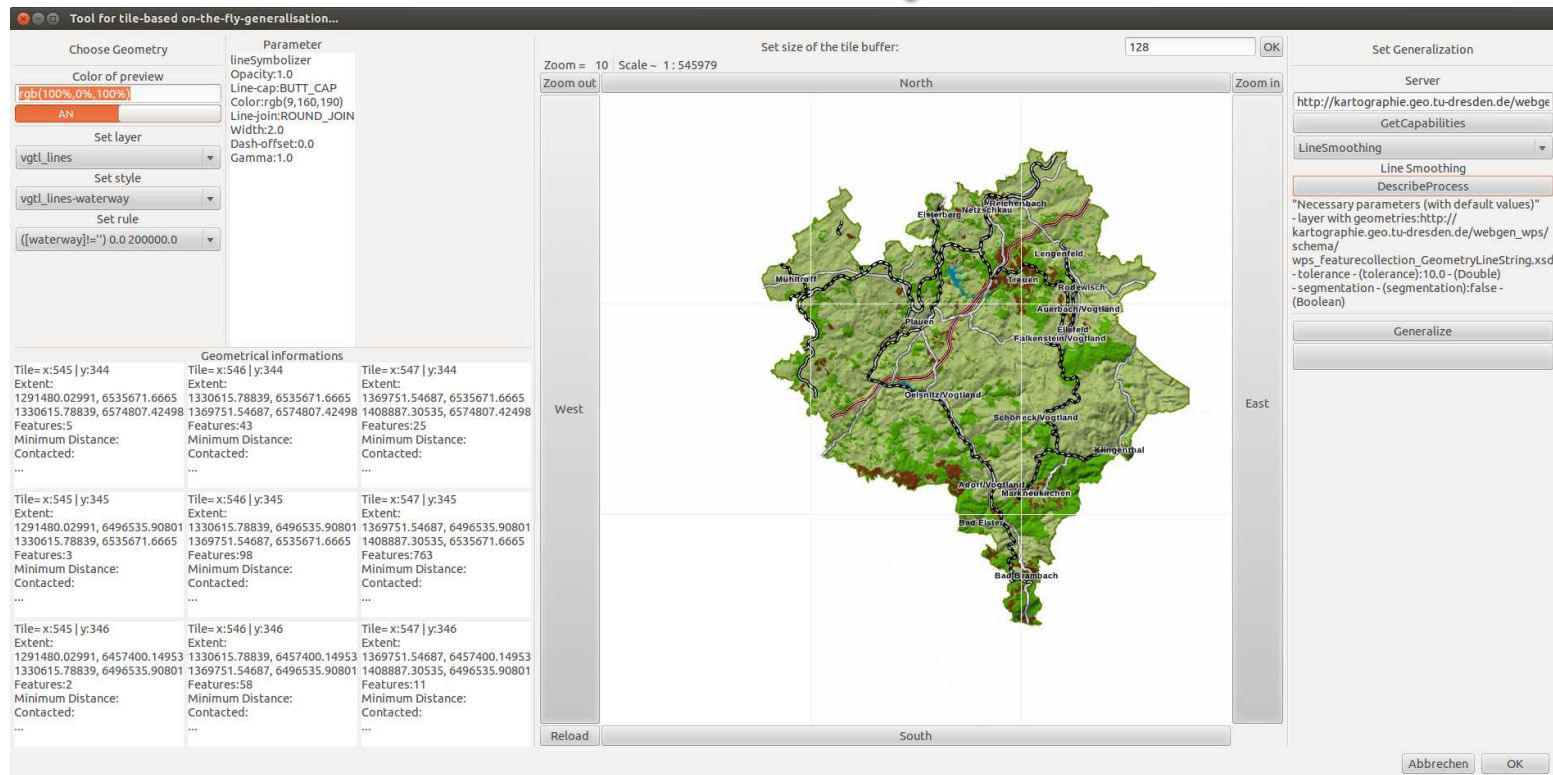
Multiple Representation Database System

Used as aiding tool when:

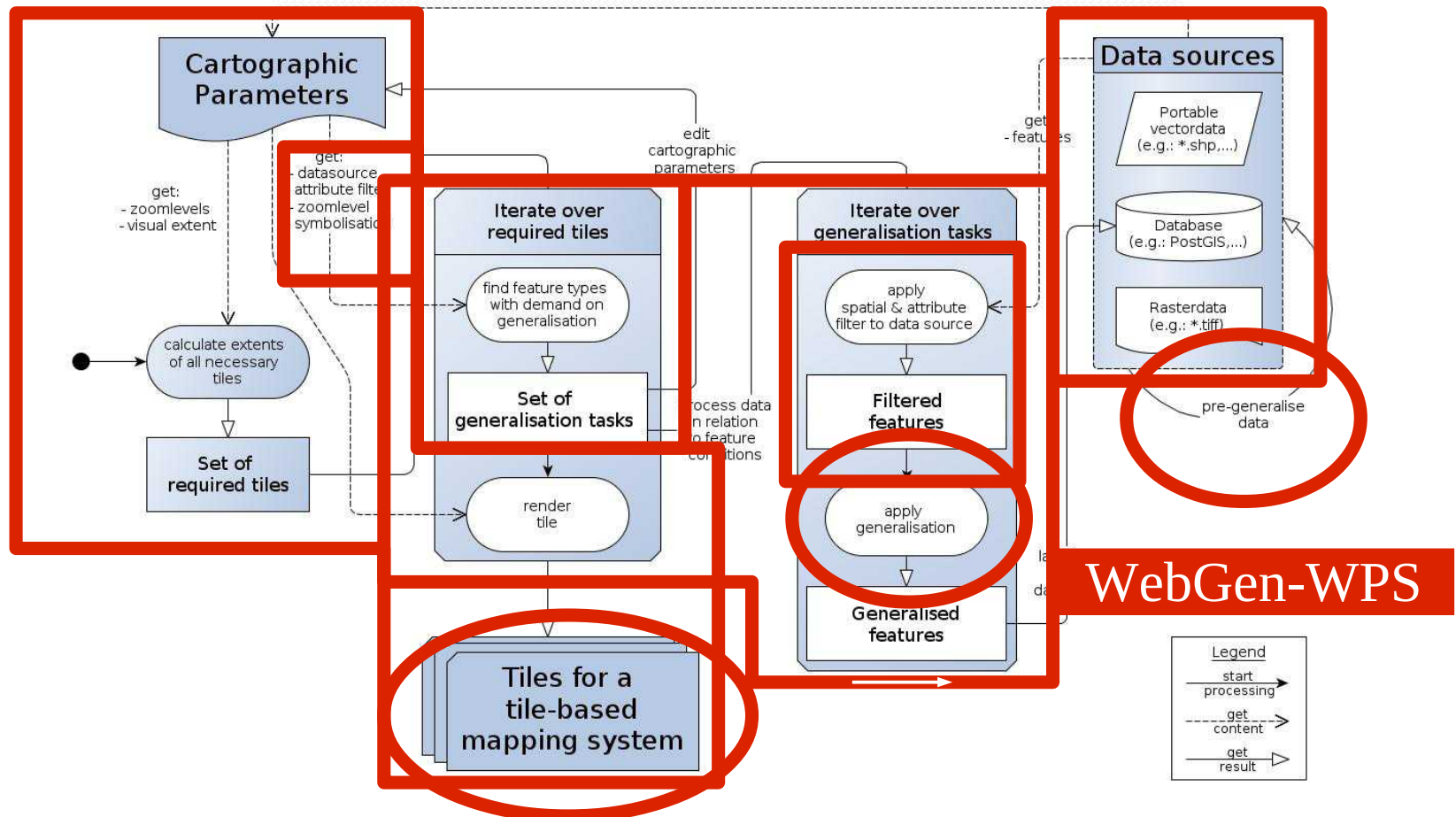
- user-interaction is unavoidable
- functionality cannot be integrated to a fully automated process chain



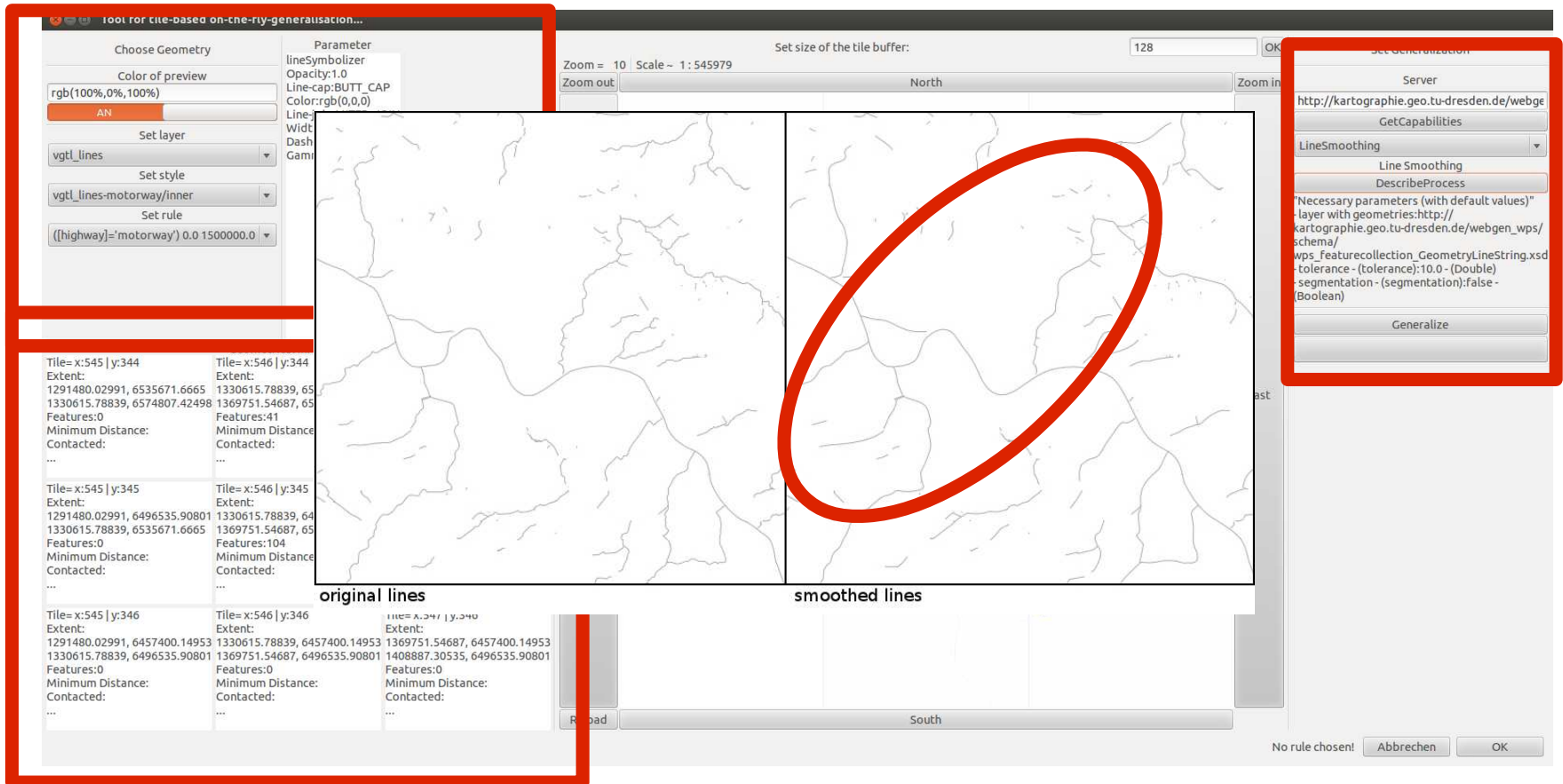
4. Exemplary implementation



Process flow of exemplary implementation



5. Results



Tool for tile-based on-the-fly-generalisation...

Choose Geometry

Color of preview

rgb(100%,0%,100%)

AN

Set layer

vgtl_lines

Set style

vgtl_lines-motorway/inner

Set rule

(([highway]='motorway') 0.0 1500000.0)

Parameter

lineSymbolizer

Opacity:1.0

Line-cap: BUTT_CAP

Color:rgb(0,0,0)

Line-Width

Dash

Game

Zoom = 10 Scale = 1 : 545979

Set size of the tile buffer: 128

Zoom out North Zoom in

original lines smoothed lines

Tile= x:545 | y:344

Extent:

1291480.02991, 6535671.6665

1330615.78839, 6574807.42498

Features:0

Minimum Distance:

Contacted:

...

Tile= x:545 | y:345

Extent:

1291480.02991, 6496535.90801

1330615.78839, 6535671.6665

Features:0

Minimum Distance:

Contacted:

...

Tile= x:545 | y:346

Extent:

1291480.02991, 6457400.14953

1330615.78839, 6496535.90801

Features:0

Minimum Distance:

Contacted:

...

Tile= x:546 | y:344

Extent:

1330615.78839, 6574807.42498

1369751.54687, 6574807.42498

Features:41

Minimum Distance:

Contacted:

...

Tile= x:546 | y:345

Extent:

1330615.78839, 6496535.90801

1369751.54687, 6574807.42498

Features:104

Minimum Distance:

Contacted:

...

Tile= x:546 | y:346

Extent:

1330615.78839, 6457400.14953

1369751.54687, 6496535.90801

Features:0

Minimum Distance:

Contacted:

...

Tile= x:547 | y:344

Extent:

1369751.54687, 6457400.14953

1408887.30535, 6496535.90801

Features:0

Minimum Distance:

Contacted:

...

Set Generalization

Server

http://kartographie.geo.tu-dresden.de/webge

GetCapabilities

LineSmoothing

Line Smoothing

DescribeProcess

"Necessary parameters (with default values)"

- layer with geometries: http://

kartographie.geo.tu-dresden.de/webgen_wps/

schema/

wps_Featurecollection_GeometryLineString.xsd

- tolerance - (tolerance): 10.0 - (Double)

- segmentation - (segmentation): false - (Boolean)

Generalize

No rule chosen! Abbrechen OK

5. Results

- general feasibility of proposed architectures demonstrated
- tool needs currently
user interaction ↔ development stage
- applicability of WebGen-WPS proved

Processing time at WebGen-WPS

Tile coordinates	Zoom	Number of geometries	Geometry type	Processing time (in seconds)
X: 546 Y: 344	10	6	LINESTRING	69.292
X: 547 Y: 344	10	8	LINESTRING	68.261
X: 546 Y: 345	10	126	LINESTRING	70.218
X: 547 Y: 345	10	851	LINESTRING	74.145
X: 546 Y: 346	10	7	LINESTRING	67.262
X: 547 Y: 346	10	19	LINESTRING	68.266

Future work – Tile-based mapping

- generalize context dependent features
- limits of on-the-fly generalisation
- optimize process flow for better performance
- implement „real“ on-the-fly-generalisation

Future work - WebGen-WPS

- investigations on processing time
- develop & publish more functionalities
- use potential of community activities

Future work – User-generated geodata

- analyse special properties
- usability for context-dependent functionalities
- amount of meta-data → advantage ???
- irregular datadensity → disadvantage ???

*“Whether for good or bad,
online mapping is currently in a tile-based era
and will likely be so for the foreseeable future”*

Michael P. Peterson (2012)

The Tile-Based Mapping Transition in Cartography.
In: L. Zentai, J. R. Nunez (eds.): *Maps for the Future,
Children, Education and Internet*. Lecture Notes in
Geoinformation and Cartography, 5:151-163.

Thank you for your attention!
Questions!?!?