

# Enriching OSM road networks with TMC LCL information

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**RICH-VGI Workshop: enRICHment of volunteered  
geographic information (VGI)**

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# Motivation/Background



- Number of journeys are steadily increasing  
→ One consequence are highly frequented roads
  - Economy loses about 97 billions each year through traffic jams<sup>1</sup>
  - Europe 2015: average travel time increases by 15 min. per Trip<sup>1</sup>
  - Main Goal: Spatial, temporal, modal shift of traffic flows
- up to date traffic information
- up to date routing services

<sup>1</sup>Source: Mobility in Germany, Statistical Report 2008



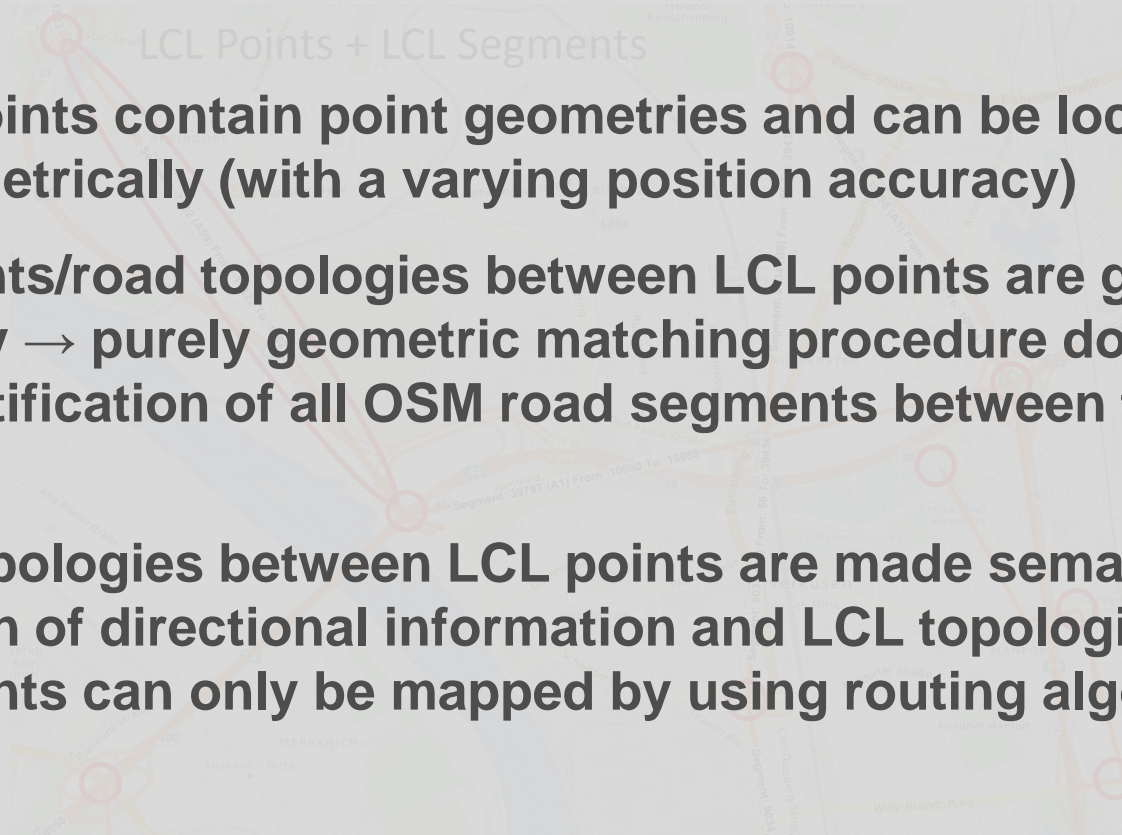
# Overview

1. State of the Art
2. TMC information in OSM
3. Matching concept and architecture
4. Matching results and validation
5. Problems
6. Services



# 1. State of the Art

– LCL 12.0/13.0 comparison OSM – LCL Graph

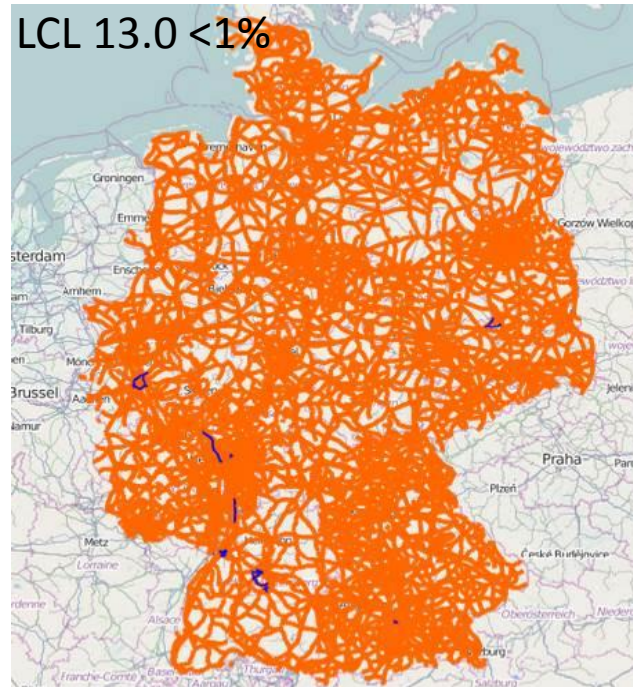
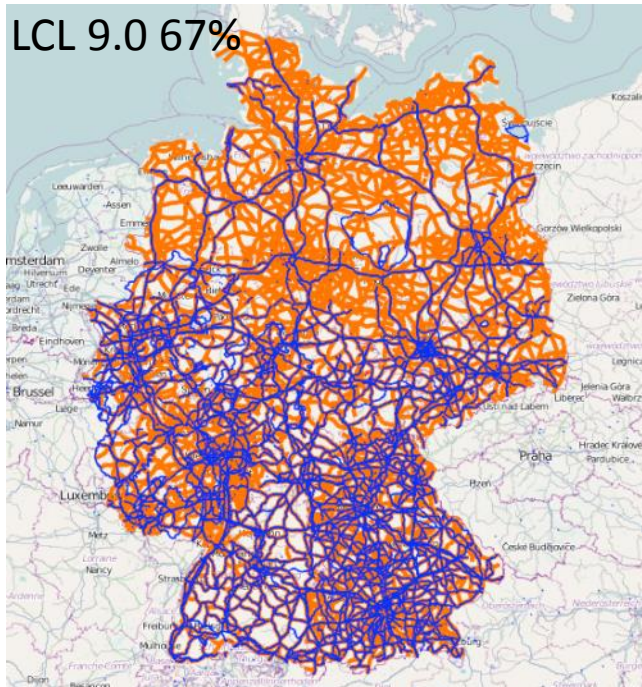


- Only LCL points contain point geometries and can be located at OSM nodes geometrically (with a varying position accuracy)
- LCL segments/road topologies between LCL points are generated only semantically → purely geometric matching procedure does not allow a unique identification of all OSM road segments between two LCL points
- Direction topologies between LCL points are made semantically → Identification of directional information and LCL topologies of OSM road segments can only be mapped by using routing algorithms



## 2. TMC Information in OSM

- OSM TMC import project 2011 with LCL 9.0
- OSM tagging scheme
- Comparison of TMC completeness of OSM road network



# 3. Matching concept

Creating a graph LCL (topologies and attributes) from the Location Code List

Transfer of the selected LCL Points and Coordinates using OpenRouteService routing algorithm  
(OSM Roadnetwork als Routinggraph)

Calculation of the route between two points LCL (depending on the segment and the direction)

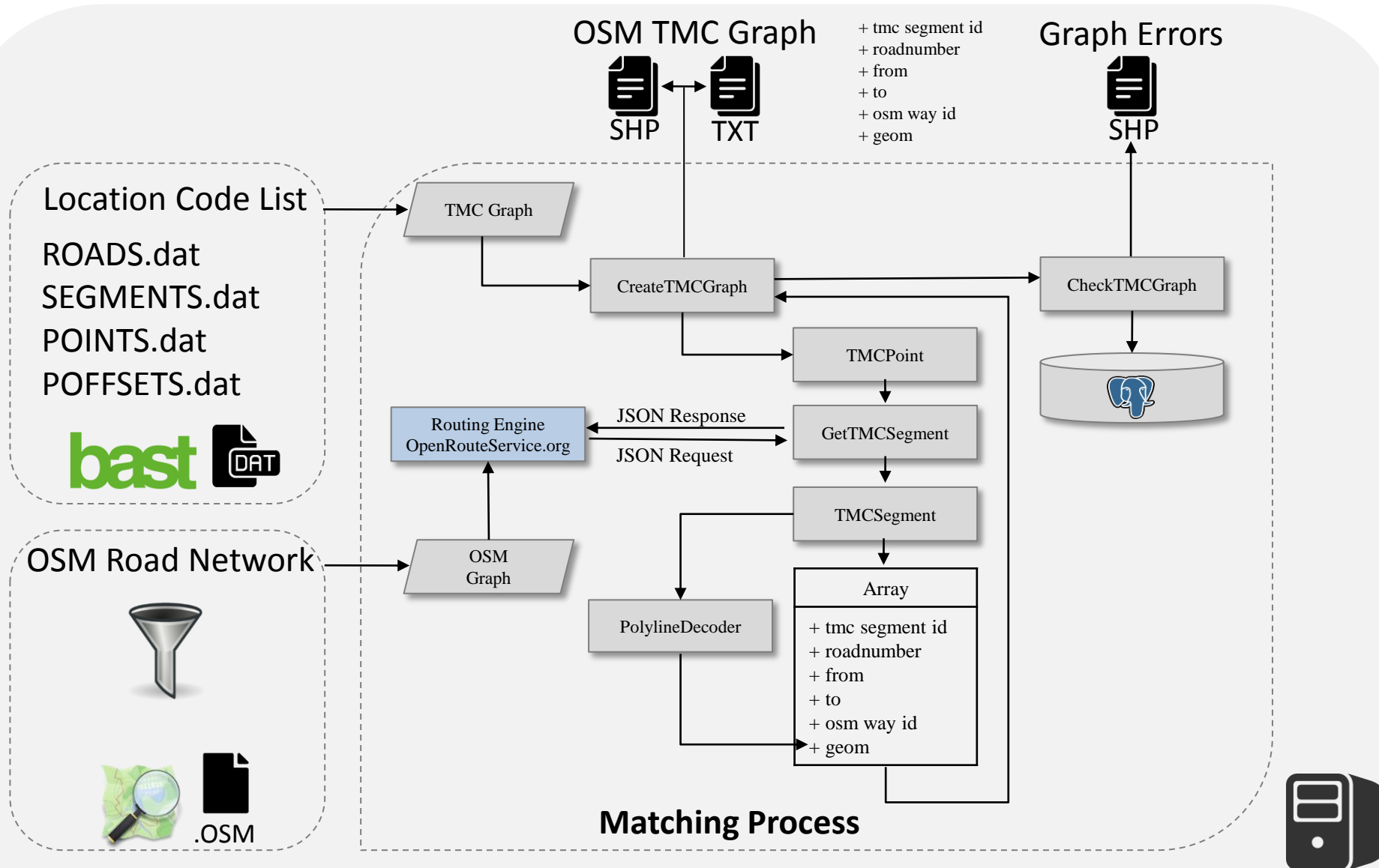
Semantic validation between LCL segment and the calculated route (OSM Ways)

## **MATCHING**

**Matching of segment-based LCL attribute information to the extracted OSM Ways**



# 3. Matching architecture

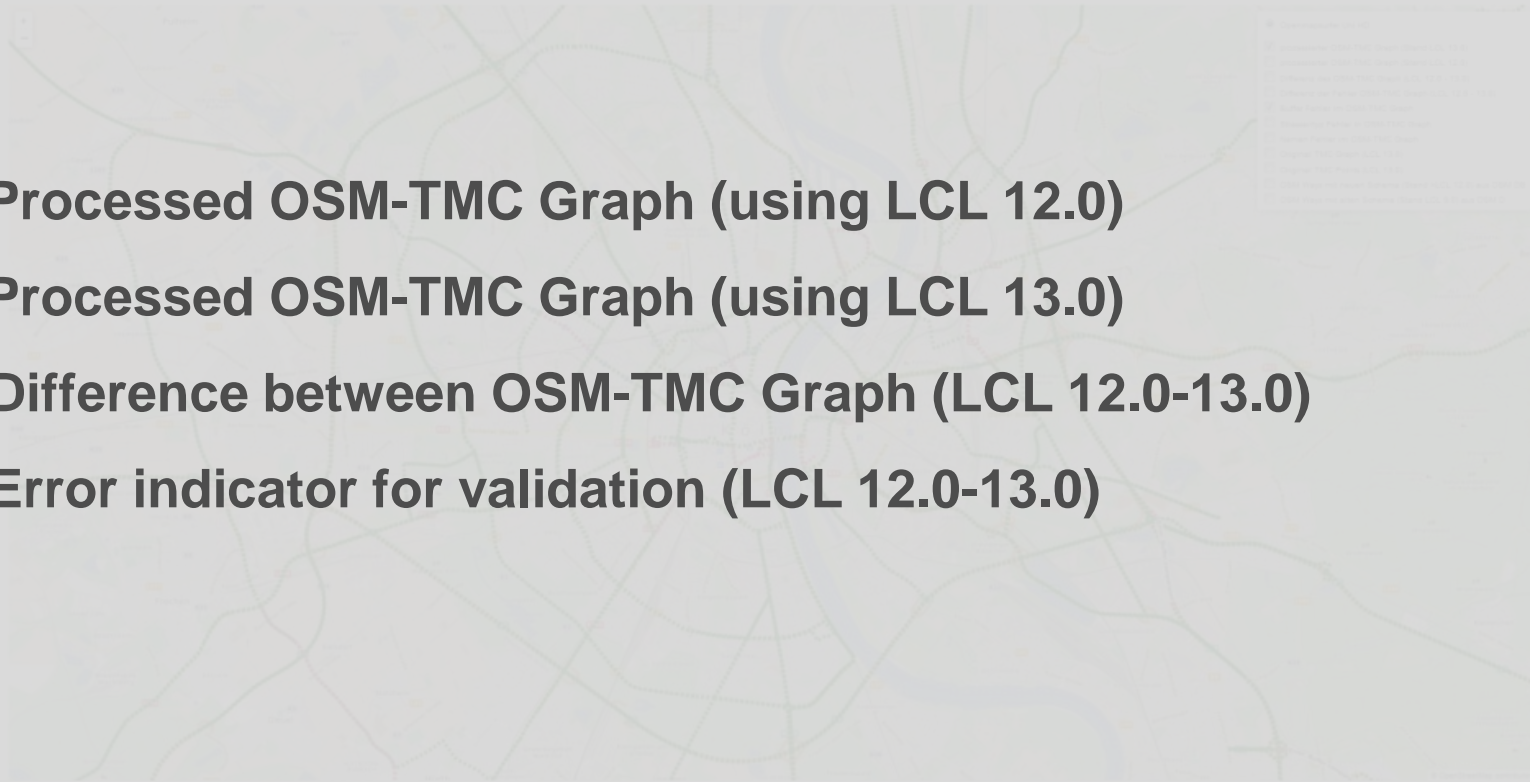




# 4. Matching results

<http://129.206.228.92/osm-tmc/>

OSM TMC  
Matching



- **Processed OSM-TMC Graph (using LCL 12.0)**
- **Processed OSM-TMC Graph (using LCL 13.0)**
- **Difference between OSM-TMC Graph (LCL 12.0-13.0)**
- **Error indicator for validation (LCL 12.0-13.0)**

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# 4. Matching results

- 4620 LCL Segments assigned to 55627 OSM road segments
- 963 Streettype error, 1303 buffer error detected with OSM-TMC Graph
- Matching performance around 85%
- Adjustments and adaption process to prioritize main arterial roads while considering the given road hierarchy
- Minor service and residential roads are removed
- certain LCL points which are matched on different OSM road categories (e.g. first highway, than primary road and then again highway), a new route calculation is performed by higher weighting the road category where most of the segments have been assigned to



# 4. Matching validation

- Error indicators – localization of potential matching problems

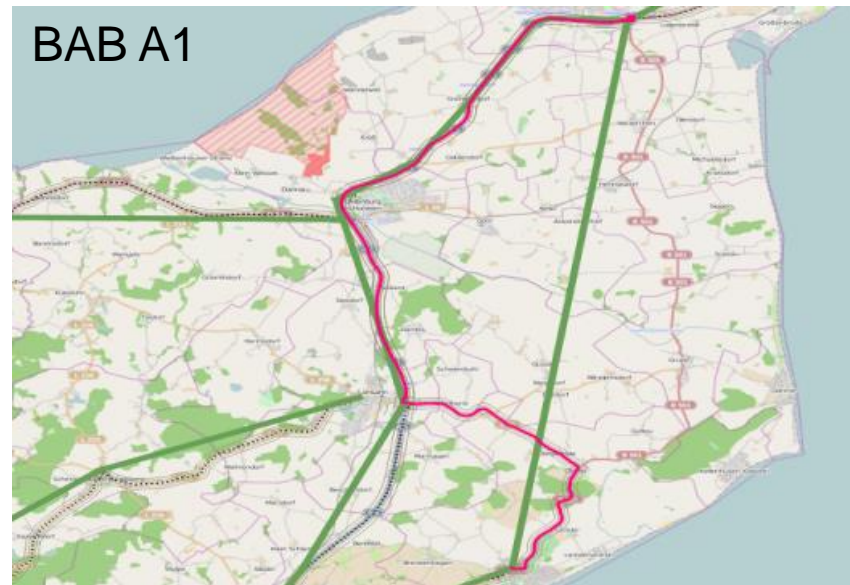


- **Buffer errors in OSM-TMC Graph**

Comparison and visualization of matched LCL codes with the OSM graph (buffer) whose route does not correspond to 75% of the total route length from the routing algorithm



# 4. Matching validation

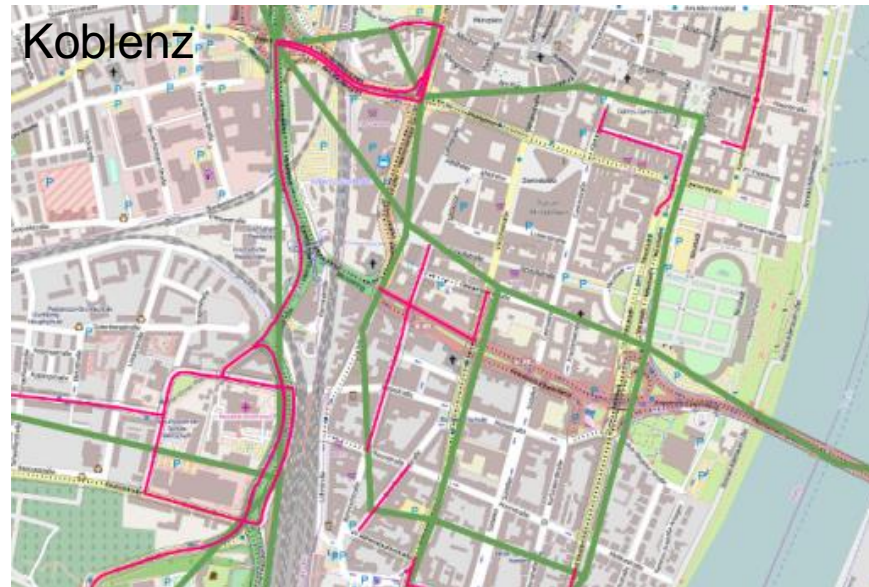


- **Name errors in OSM-TMC Graph**

Name comparison of the calculated OSM ways with the provided LCL roads names



# 4. Matching validation



- **Road type errors in OSM-TMC Graph**

Comparison and visualization of OSM segments which have been partially (more than 20%) matched to lower road categories (e.g. residential roads, service ways etc.) where usually no LCL information should be available



# 5. Problems

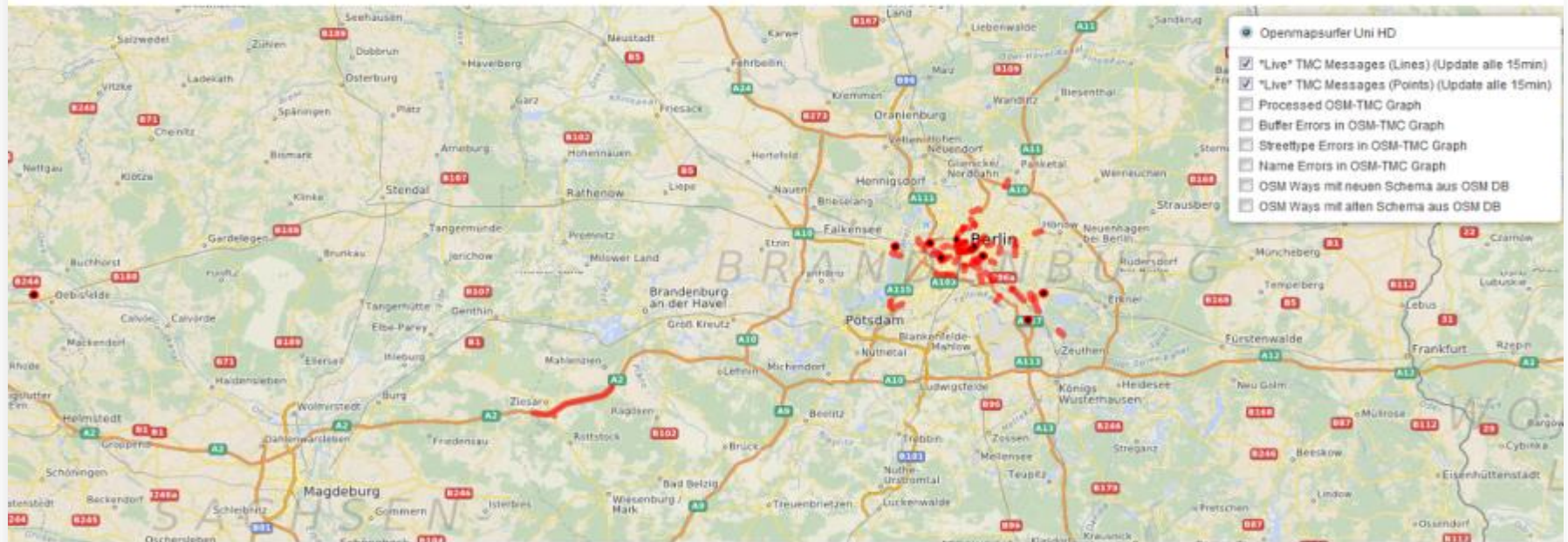
- complex intersections (e.g. motorway junctions)
- decreasing matching rate in secondary/tertiary road network
- inaccuracy/inconsistency of osm roads(e.g. street names)
- dense urban areas with a complex road network
- Location Code List direction topologies (only semantical)
- quality of Location Code List
  - geometrical inaccuracy of LCL points (distance/offset to referenced road objects)
  - 50 LCL segments had internal problems e.g. no available Location Codes
- error indicators only show potential problems





# 6. Services – real time traffic

<http://129.206.228.92/osm-tmc/traffic>



- Openmaphurfer Uni HD
- ☒ "Live" TMC Messages (Lines) (Update alle 15min)
- ☒ "Live" TMC Messages (Points) (Update alle 15min)
- ☐ Processed OSM-TMC Graph
- ☐ Buffer Errors in OSM-TMC Graph
- ☐ Streettype Errors in OSM-TMC Graph
- ☐ Name Errors in OSM-TMC Graph
- ☐ OSM Ways mit neuen Schema aus OSM DB
- ☐ OSM Ways mit alten Schema aus OSM DB

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# 6. Webservices

- WMS/WFS



## Example traffic messages linked to OSM node (Json Format)

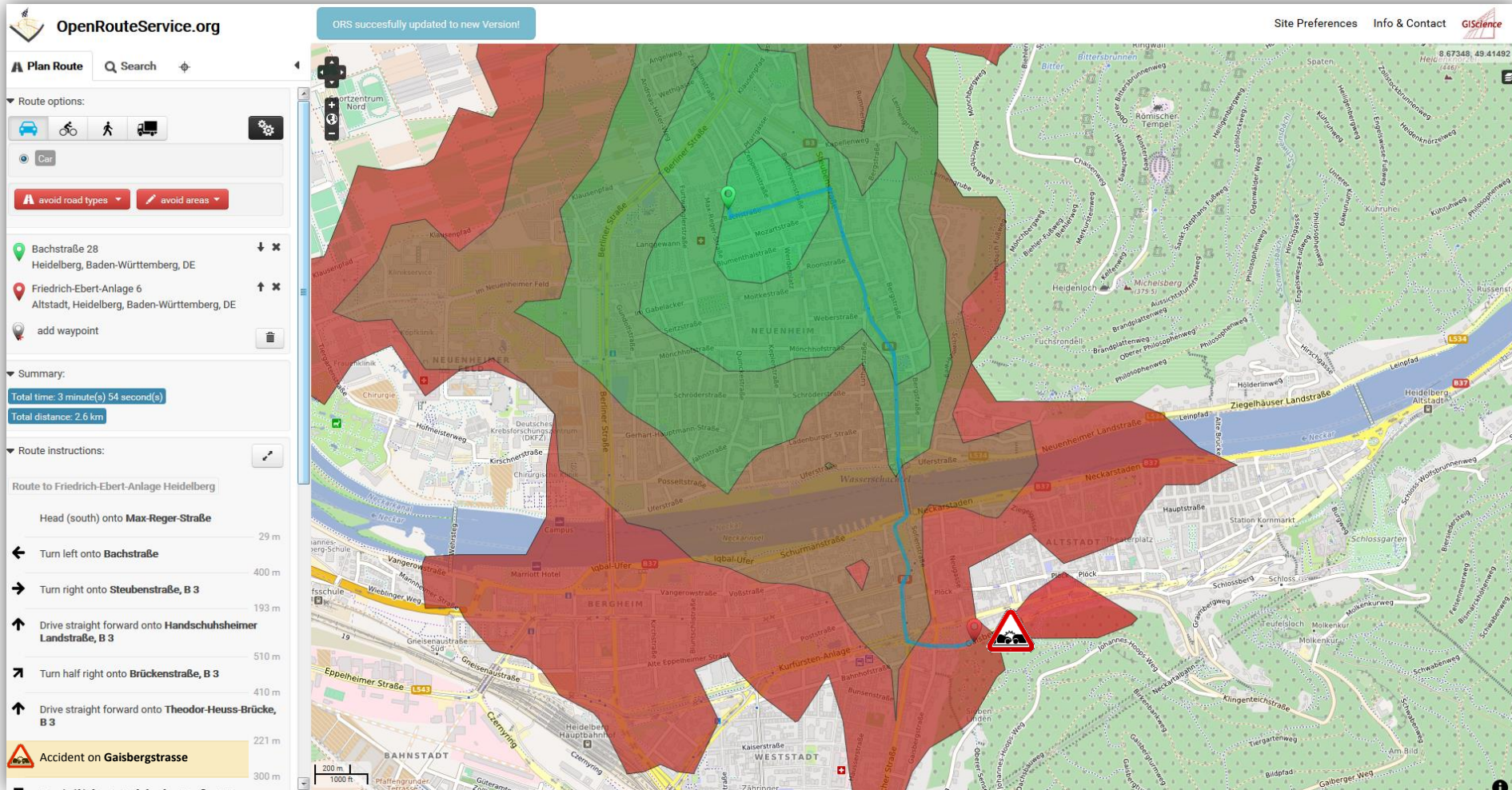
```
http://129.206.228.92:8080/geoserver/osm/ows?service=WFS&version=1.0.0&request=GetFeature&typeName=osm:latest-tmc-points&maxFeatures=50&outputFormat=json
```

```
{"type":"Feature","id":"latest-tmc-points.2","geometry":{"type":"Point","coordinates":[8.64505,50.10311]},"geometry_name":"the_geom","properties":{"event":"[701, 802]","message":"[K803, Stadtgebiet Frankfurt am Main, Mainzer Landstra  e, Ampelkreuzung Galluswarte Baustelle, Dauerbaustelle]"}}, {"crs":{"type":"EPSG","properties":{"code":"4326"}}
```





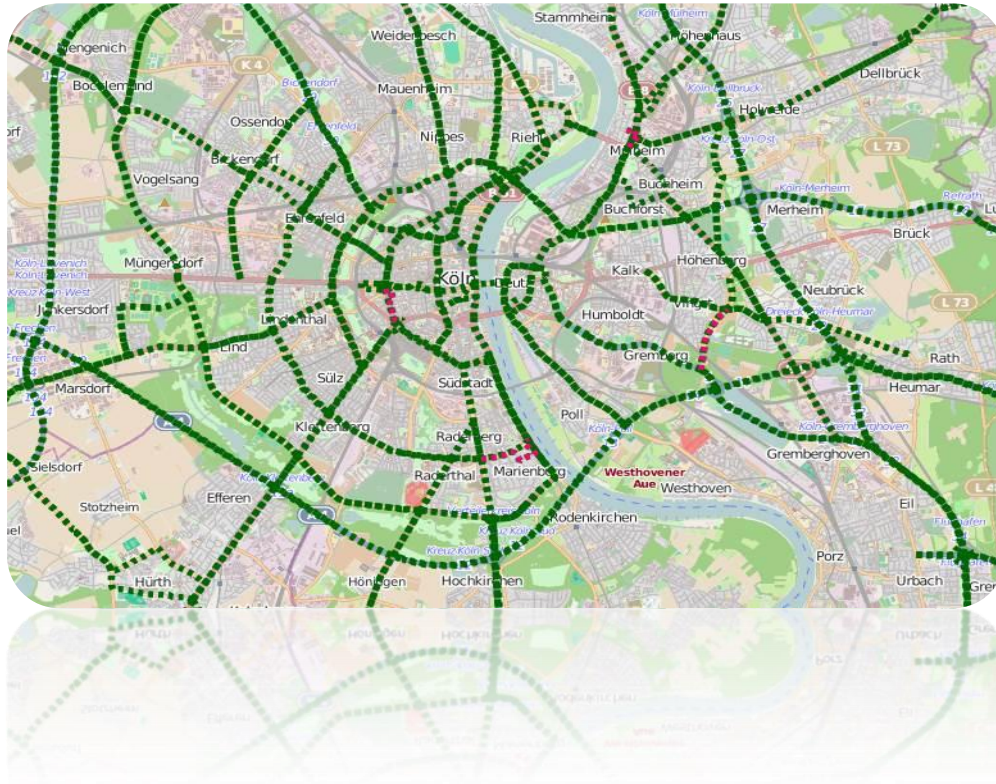
# Quo Vadis?



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# Questions?

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