



# A traffic management system based on Graphhopper and OpenStreetMap

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- Funded by the Federal Ministry for Economic Affairs and Energy and the German Aerospace Center (DLR)
- Goal: Mobility service platform
  - Based on Open Data / Crowdsourcing
  - Open web service APIs
  - Apps / Products
- Target groups:
  - SMEs
  - Start ups / Developers



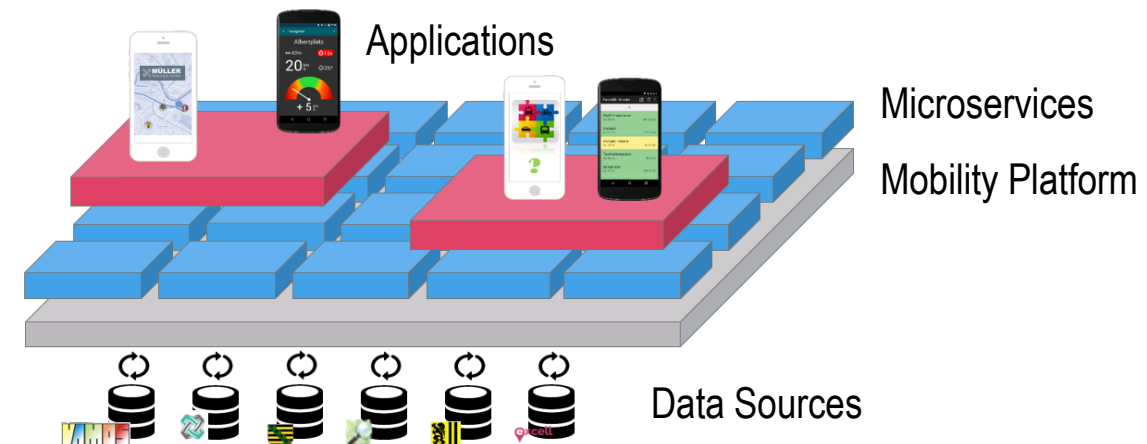
Supported by:



on the basis of a decision by the German Bundestag



Smart Data





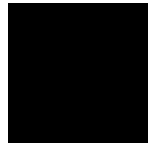


# Technology choices



openroute  
service

Graphhopper

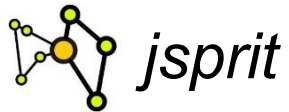


Itinero

OptaPlanner



OpenTripPlanner  
Multimodal Trip Planning



Road Network

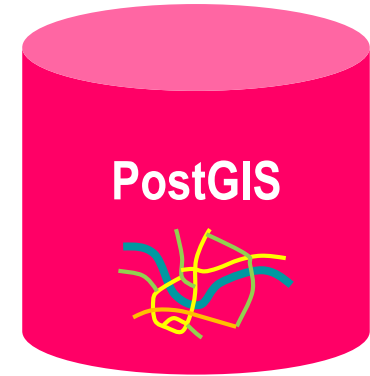
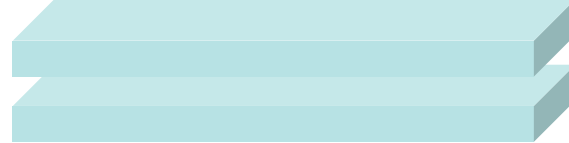
Routing

Map Matching

Travelling Salesman

Geocoding

Prediction



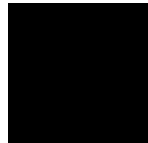


# Technology choices



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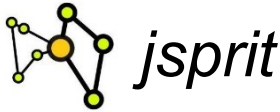


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jsprit

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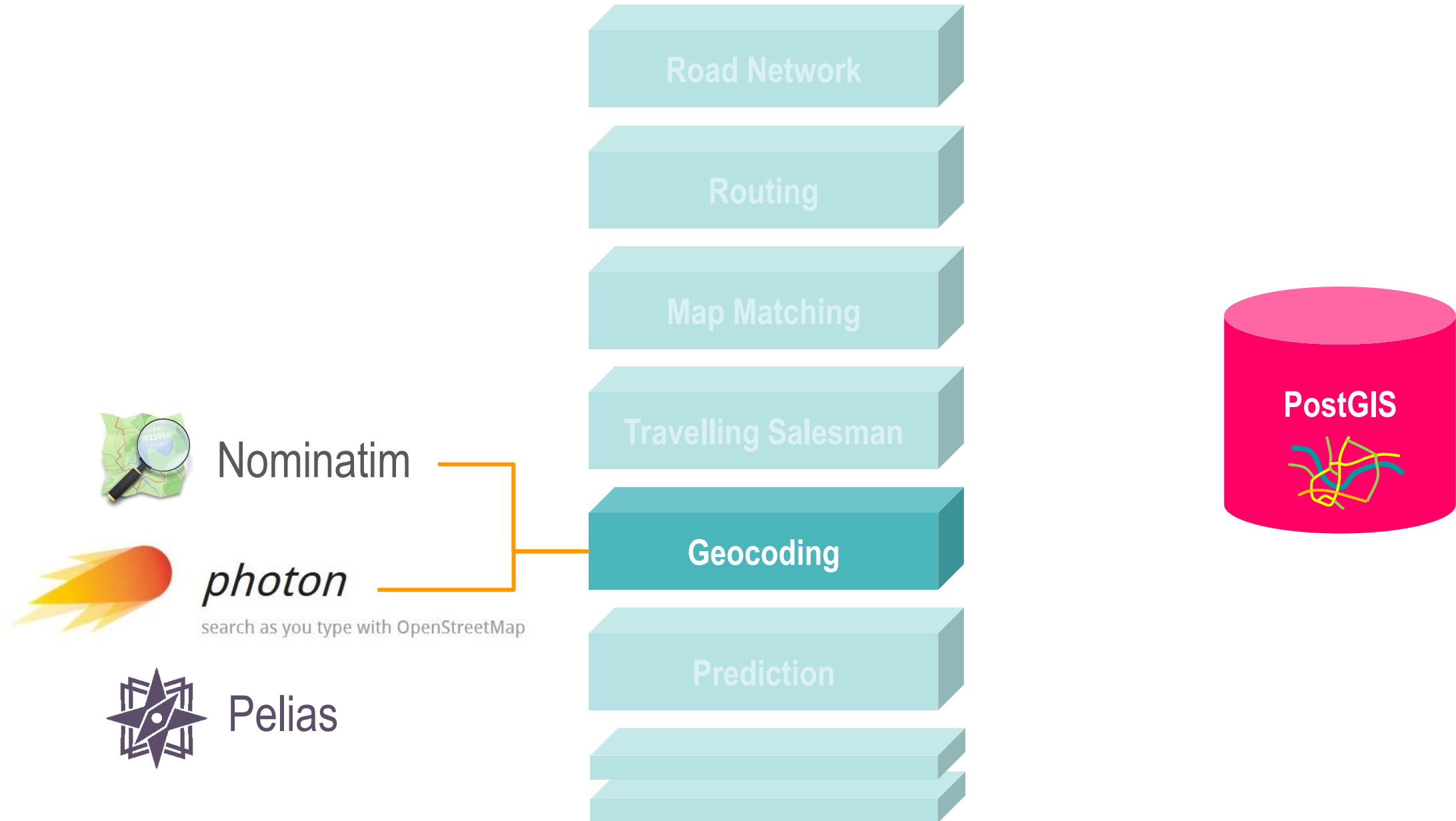
Graphhopper



PostGIS

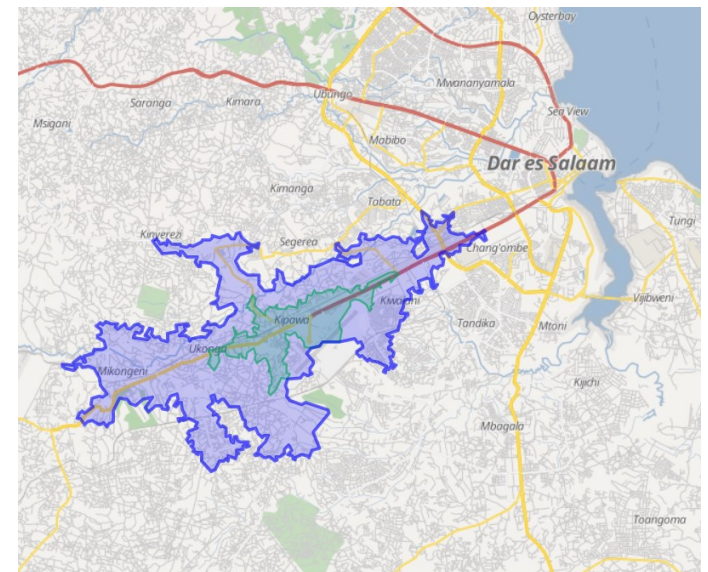
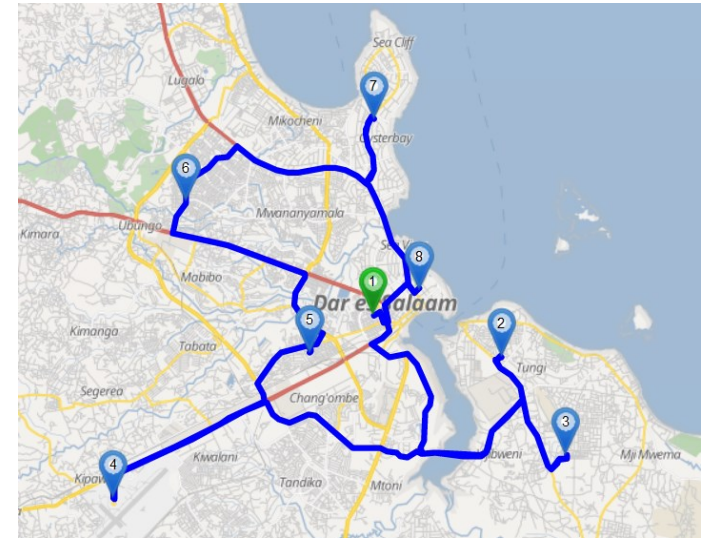


# Technology choices





- OS release 2014. Company founded in 2016.
- Written in Java. Apache 2 License
- Use as library, server or SaaS (Unix, Win, Mac)
- Offline routing via Android and iOS
- Routing:
  - Contraction Hierarchies, Dijkstra / A\* / hybrid
  - Turn costs, alternative routes, instructions, height data
  - Profiles for car, truck, bus, moto, bike profiles
  - Other data sources possible (e.g. TomTom)
- More sub projects:
  - Isochrones, Map Matching, Geocoding, jsprit (TSP)
  - Matrix Optimization (closed)







- Easy to setup on your own machine
- Very fast and reliable
- APIs are well documented (see <https://graphhopper.com/api/1/examples/>)
- Active discussion board: <https://discuss.graphhopper.com/>
- Company has a sane business plan: <https://graphhopper.com/public/slides/2018-ppu.pdf>
- OS Spirit: Gh teams attends FOSS conferences and OSM meetings



<http://roadstorome.moovellab.com/>



<https://twitter.com/tjukanov/status/871329474125672448>



# WHAT KIND OF DATA IS NEEDED TO CREATE A TRAFFIC MANAGEMENT SYSTEM?

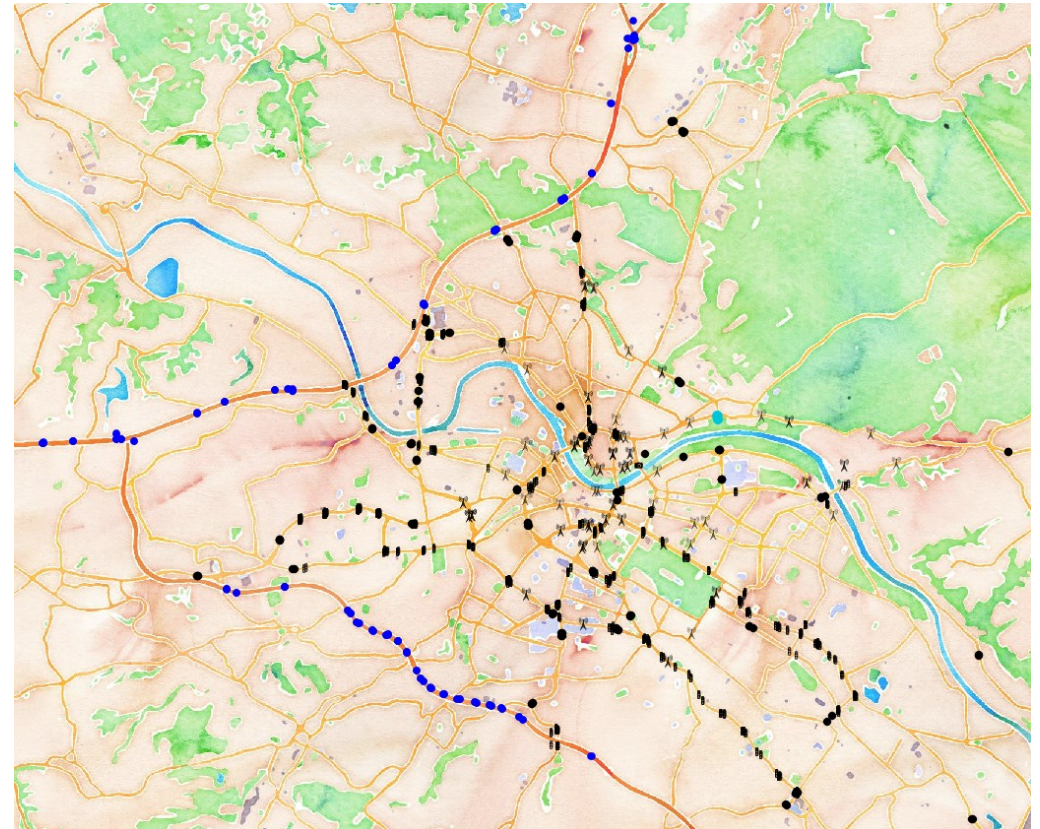
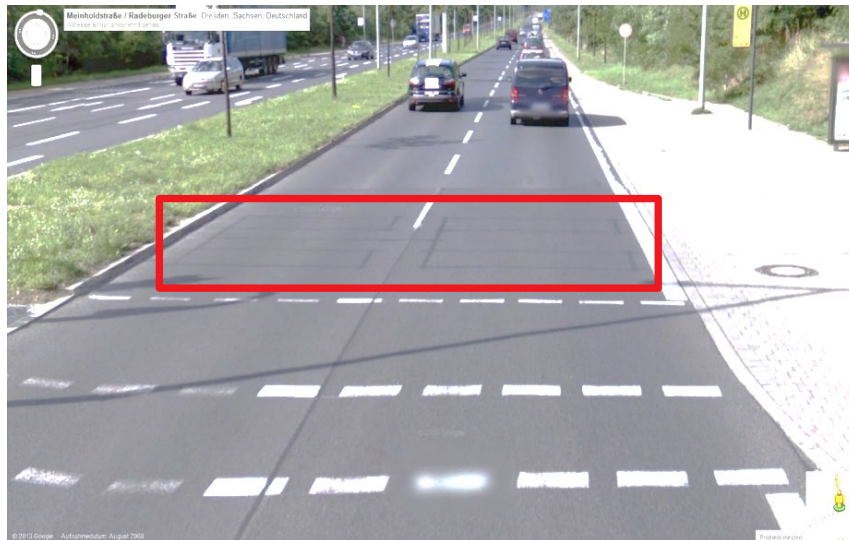
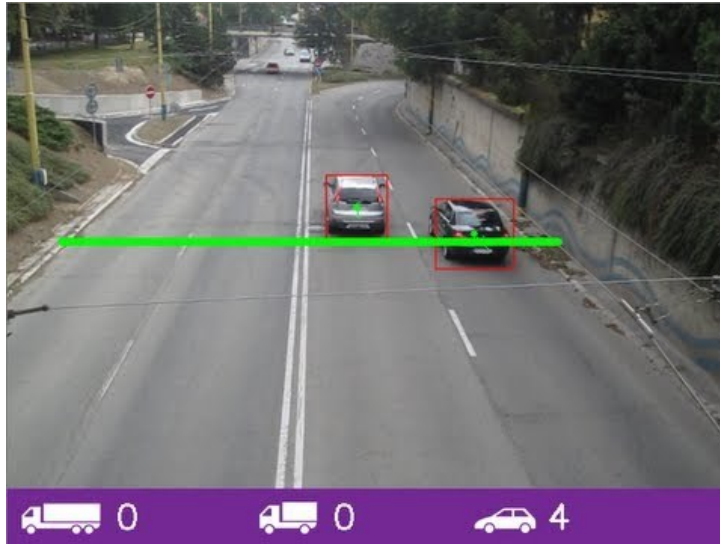




# Sensor Data



[https://youtu.be/z1Cvn3\\_4yGo](https://youtu.be/z1Cvn3_4yGo)

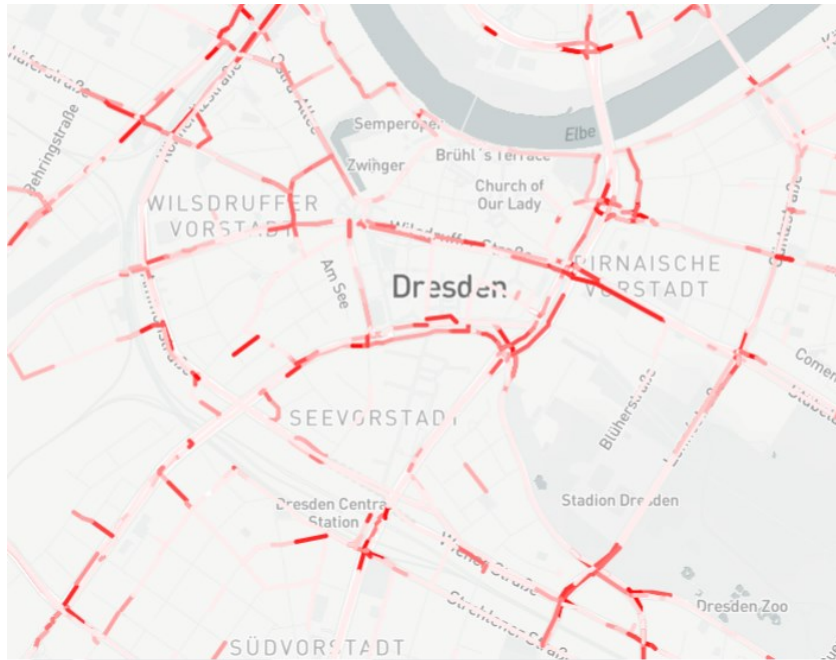




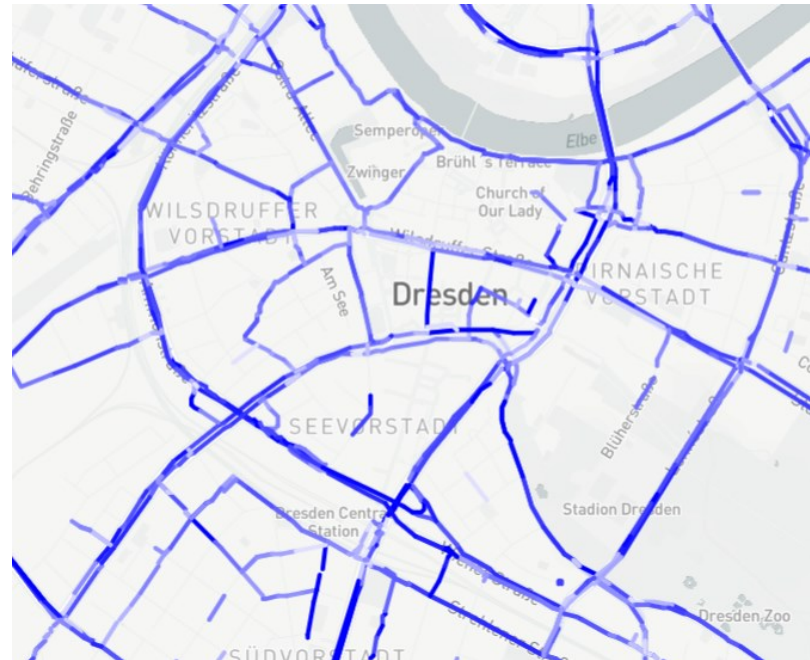
# Floating Car Data



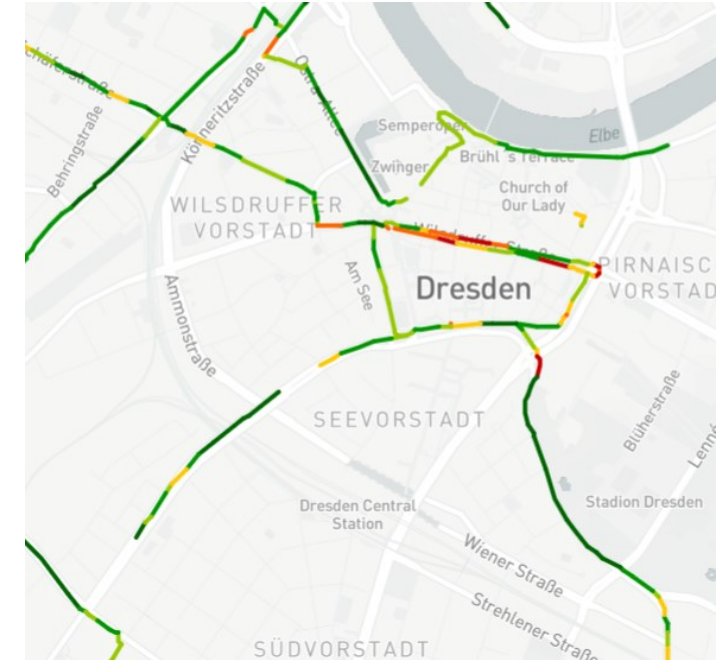
Travel Times (more red = higher)



Avg. speed (more blue = faster)



Level of Service (A-F)



URL: [excell-mobilty.de/developer](http://excell-mobilty.de/developer)

- 12 Web-Services with 46 Endpoints
- One central API Gateway
- 3 Client application
- > 20.000 Lines of Code
- Unique combination of free street data with real-time traffic data
- URL: [excell-mobilty.de/developer](https://excell-mobilty.de/developer)

The screenshot shows the ExCELL developer portal. At the top, there is a navigation bar with 'DASHBOARD', 'EXCELL SERVICES', and 'EXCELL ANWENDUNGEN'. Below the navigation bar, a text block states: 'ExCELL ist eine offene Service- und Daten-Plattform, die es Entwicklern ermöglichen soll, Lösungen für komplexe Mobilitäts- und Logistikanwendungsfälle zu entwickeln.' Below this, there is a grid of 12 service cards. Each card has a title, an icon, a description, and a 'MEHR | DOKUMENTATION' link. The 'Routing Service' card is highlighted with a red background and contains the text: 'Software-Entwickler? Hacker? Jetzt mitmachen! Sie haben spannende Anwendungsfälle innerhalb von Mobilitätskontexten oder spannende Geschäftsmodelle für Apps?'. The other services include: Scheduling Service, Crowdsourcing Service, Monitoring Service, Tracking Service, Heatmap Service, Anonymization Service, Geocoding Service, Sensor Data Collector Service, Travel Time Service, and Prediction Service.



GitHub repository page for **ExCELL**. The repository description is "Echtzeitanalyse und Crowdsourcing für eine selbstorganisierte City-Logistik" with the website <https://www.excell-mobility.de/>. The repository has 20 sub-repositories, 11 people, 6 teams, and 0 projects.

Search repositories... Type: All Language: All Customize pinned repositories [New](#)

### Service-Documentations

Serves as a central hub to store swagger files for all the different services

- [api-gateway](#) [swagger](#) [api-rest](#)
- JavaScript Updated 2 days ago

### scheduling\_service

The Scheduling API is designed to optimize the route of a trip with multiple stops.

- [springfox](#) [springboot](#) [traveling-salesman](#) [graphhopper](#)
- Java Apache-2.0 Updated 14 days ago

### excellapis

Central library providing beans to other web services

- [java](#) [rest](#) [beans](#)
- Java Updated 15 days ago

### anonymization

This API takes individual GPS tracks and removes properties which are critical in terms of user privacy.

- [privacy](#) [springfox](#) [springboot](#) [gps-tracking](#) [floating-car-data](#)
- Java Apache-2.0 Updated on 14 May

**Top languages:** Java, JavaScript, PHP

**Most used topics:** [springboot](#) [springfox](#) [graphhopper](#) [php7](#) [java](#)

**People:** 11 > [Invite someone](#)

GitHub repository page for **excell-mobility / scheduling\_service**. The repository has 4 issues, 0 pull requests, 0 projects, 0 wiki pages, 0 insights, and 0 settings.

Unwatch 4 Star 0 Fork 0

Code Issues 4 Pull requests 0 Projects 0 Wiki Insights Settings

**Label issues and pull requests for new contributors** [Dismiss](#)

Now, GitHub will help potential first-time contributors discover issues labeled with [help wanted](#) or [good first issue](#)

Filters  Labels Milestones [New issue](#)

4 Open 2 Closed Author Labels Projects Milestones Assignee Sort

- [Cosider existing appointments into schedulingcare endpoint](#) [enhancement](#) #6 opened 2 days ago by FxKu 1 comment
- [Remove deprecated endpoint scheduling](#) [enhancement](#) #3 opened on 6 Mar by FxKu
- [Rename schedulingnew Endpoint and calendarID variable](#) [question](#) #2 opened on 6 Mar by FxKu
- [Provide JSON Model for Endpoints](#) [enhancement](#) #1 opened on 6 Mar by FxKu 4 comments





- Hosting continues also after project end
- Integration of more data sources (MDM, MCloud)
- Create partnerships with more cities (Wolfsburg, Darmstadt etc.)
- Dynamic referencing of travel times in a changing graph (e.g. OpenLR)



- Traffic management requires more area-wide open telemetry data from public sector
- Crowdsourced tracking data by companies
- Don't feed the dictator: <https://www.cbc.ca/news/technology/google-movements-tracking-1.4782895>



BEUTH HOCHSCHULE FÜR TECHNIK BERLIN  
University of Applied Sciences



Thank you for your attention!  
**Questions?**

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