

MetaGer Maps

<https://maps.metager.de>

Abstract

There are lots of services online that use the great data of OpenStreetmap to provide a navigation, or to provide a tool for planning routes and gps tracks.

The only problem is that none of them provides a universal tool that combines all the possibilities of the Geo Data into one service that is handy, easy to use and available/optimized for every display size and mobiles.

If you want to use such a service you probably only have one opportunity. You would have to use the service of the global player Google Maps. There really isn't any viable option for you having the possibility to search the geo data for places, opening-times, addresses, routes and navigation and be able to have your privacy by not selling out your private data at the same time.

That's the point where we started to plan and develop our own service that should provide all of these features in the end. A service that at the same time respects the privacy of each individual user.

The search engine MetaGer.de evolved from the University of Hannover and has now been on the German Internet market since more than 20 years (<https://metager.de>). In 2012 MetaGer was outsourced from Hannover University and is since then run by the non-profit NGO „SUMA-EV -Association for Free Access to Knowledge" (<http://suma-ev.de>).

One of our main objectives is to provide privacy to the users; the details are given at <http://metager.de/en/datenschutz>. Besides search the other most important use of Internet services is route planning, i.e. geographical information services. These services of the global players do even more invade into privacy, because they store the locations of their users.

Therefore we decided some months ago to offer a route planning map system which does not store user data and which saves the privacy of our users in this field too. It is based on Openstreetmap, Nominatim and OSRM. Because of our limited resources we started with maps for Germany only. We want to expand this worldwide. And we will integrate completely new features within it. All our software of search and maps is open source under GNU AGPL v3 (<https://gitlab.metager3.de/open-source/>) and meets the objectives of the Mozilla mission.

For this ambitious project we need your support.

In the following the current state of the project is outlined in more detail. The website of our maps-service is located at <https://maps.metager.de>. It can be used much more efficiently via an Android app too, which can be downloaded at <https://metager.de/app>. Using maps.metager.de will not create or store any user data; privacy is fully provided.

Maps.metager.de does provide a unique service which - to the best of our knowledge - has been implemented for the first time within a maps system:

Objects shown in the maps can interact with our search engine metager.de directly. So the user can extract deep information about objects and locations shown on the maps from our search engine. And using our search engine offers the other way: jumping directly into the maps.

This combination of a geo information system with an Internet search engine will probably offer even much stronger interactions. It will be another goal of research within this project to explore which interactions will benefit the users most.

What have we got already?

To start off with, we needed to setup and configure three different online services that would be essential for our goals.

1. A Tileserver that renders and serves the tiles from the OpenStreetmap data. (<https://wiki.debian.org/OSM/tileserver/jessie>)
2. A service that is able to process search queries and serves relevant results of the Geo Data. (<http://wiki.openstreetmap.org/wiki/Nominatim/Installation>)
3. A service that is able to calculate Routes between given geo coordinates. (<http://project-osrm.org/>)

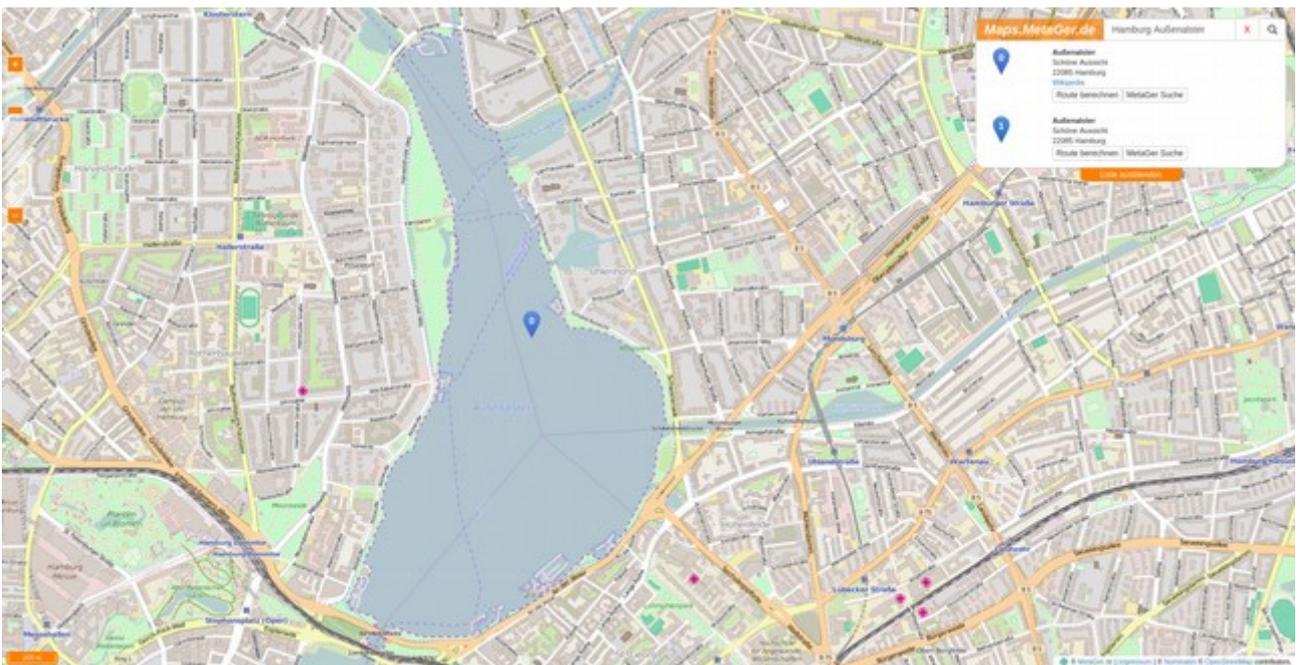
Each of the services needs another specially formatted and configured SQLite Database to make it possible to process those giant chunks of data (currently around 800GB for the whole world) in a reasonable amount of time.

To make things easier while in development we did not use all of the OSM Data because we would otherwise need a lot more powerful servers. Instead we limited the map data to germany for the moment.

Around this basis we could then start to develop our service. To connect the tiles from our tileserver to an interactive map, we used another free software (<http://openlayers.org/>).

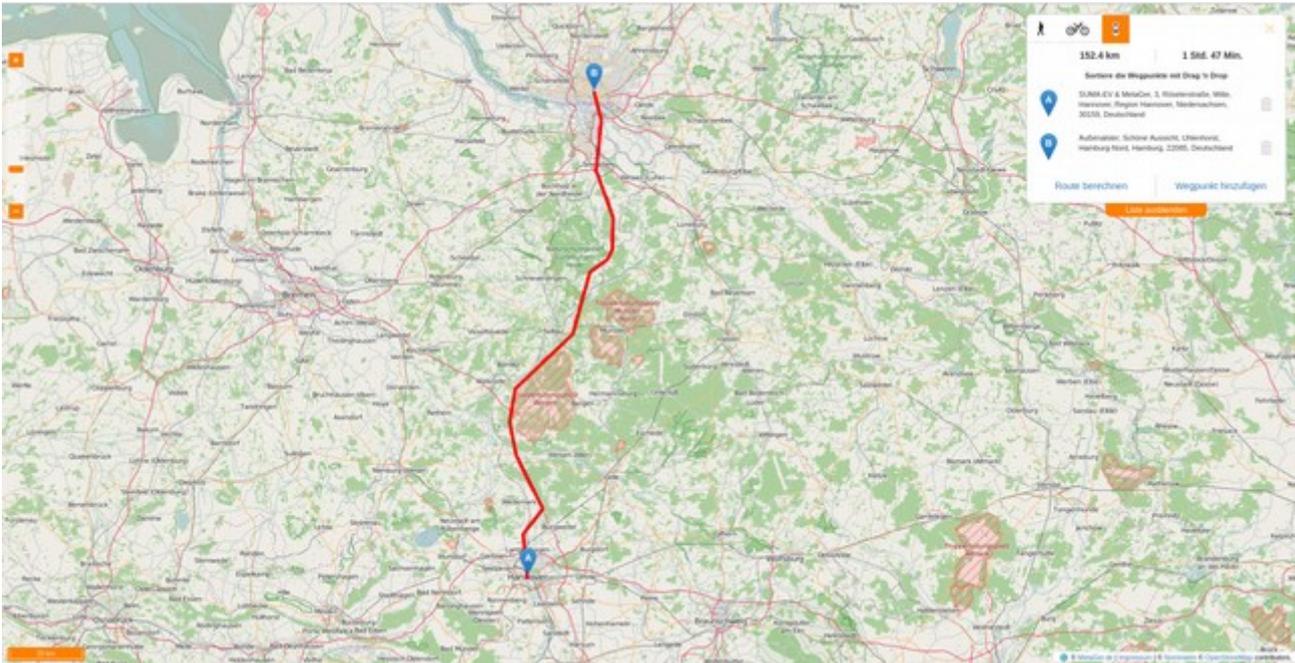


We then integrated the abilities to send search queries to our nominatim instance and integrated a dynamic reaction to show the search results.

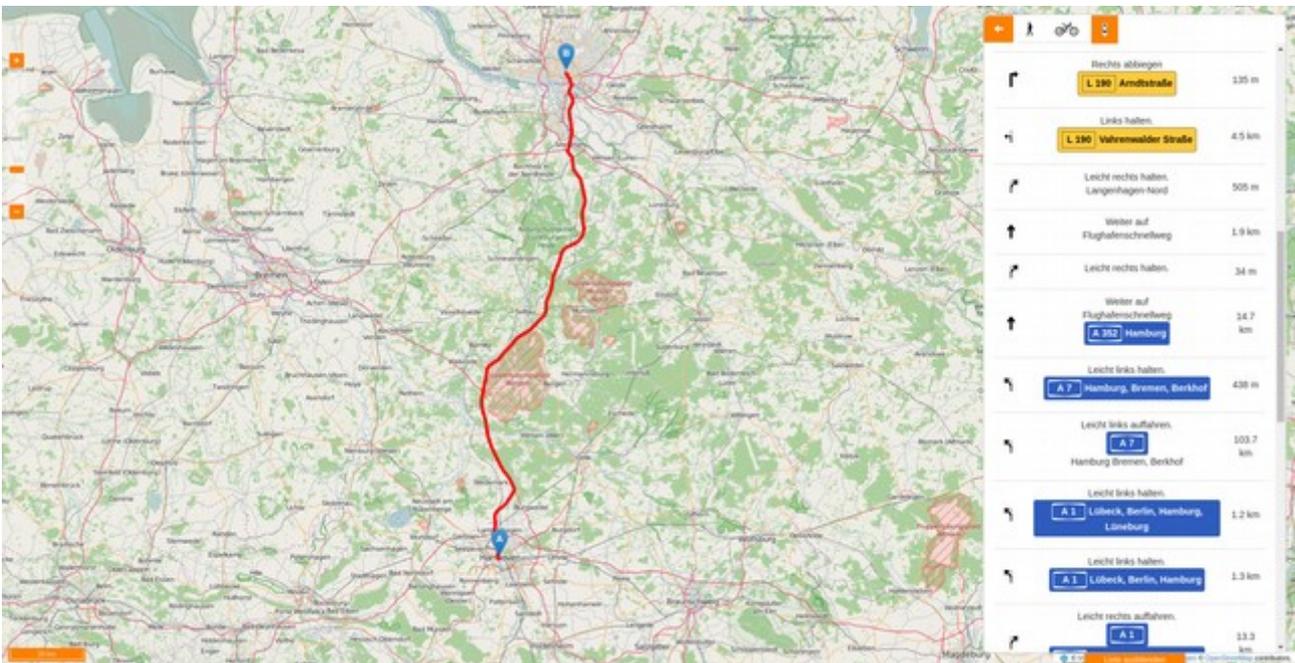


Of course you can start planning your route from this point. You have the possibility to chose between a route by foot, by bike or by car.

You can add unlimited additional waypoints and sort them easily via Drag'n'Drop.



You can also get directions and instructions for the give route. This includes visualizations of how the corresponding traffic signs should look like (Blue signs for highways in germany etc.) including the directions where the highways lead to.



We integrated GPS Support for easier Route planning. You can simply add your GPS position as a waypoint or per default (if gps is active) as a starting point.

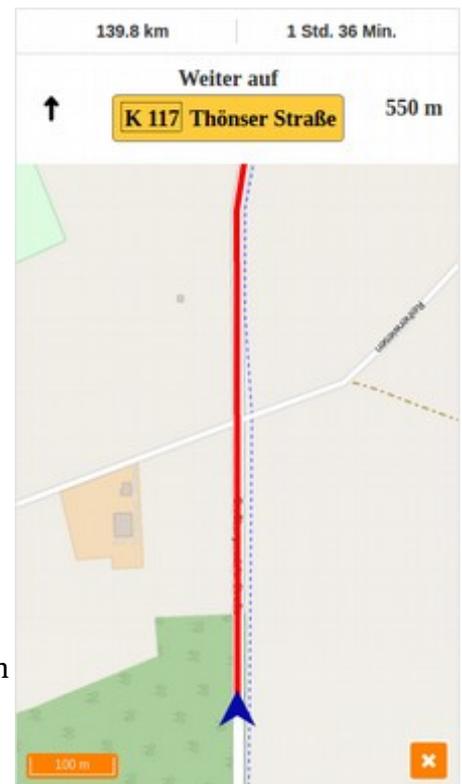
If the gps position is the starting point you have the possibility to start the turn-by-turn navigation module.

The Javascript will (locally) follow your location and continuously calculate (without internet connection) at which point of the route you are at this moment. It will automatically decide which part of the route will be relevant for you at this moment and zoom into that.

It will also automatically rotate the map so you are always driving upwards and show your current position.

The next step you have to take is always displayed at the top together with the distance to it and a visualization of the instruction (arrow to the left).

In addition it will continuously update the remaining total distance for the route (top left: distance and top right: time) and recalculate a new route automatically if you have left the current one.



What will we need?

Hardware needs

As mentioned above, we are gonna need Servers that are strong enough to handle tile rendering, search requests and route calculation (by foot, by bike and by car) for the data of the whole world (currently around 800GB).

I would put those services on an individual server each because otherwise they would have to share the same CPU. That makes 5 Servers in total.

Each of the five servers should match the following requirements:

- At least 1TB of SSD storage
- At least 128 GB RAM

The CPU power is not the most important thing. The bottleneck of each service is the SQLite Database which will have a size upto 800GB.

Processing this Data is mostly a thing of the harddrive speed (that's why we need SSD's) and how much of the database can be held in the RAM.

Ideally the whole Database would lie in the RAM of the server but that sounds a little utopistic.

You can find a server that would generally fit our needs at hetzner:

https://www.hetzner.de/de/hosting/produkte_rootserver/px121ssd

We would need to add a additional HDD, so that the total cost per server lies at round about 200€ monthly. This given server has the SSDs setup for RAID-1. We would need to change it to RAID-0.

In total: 1000€ per month (server rent for 5 servers)

This hardware will be able to provide Map Data for the whole world. The Rent for those servers should be included in the funding for the first 5 years. After this SUMA-EV would be further responsible for providing the needed Hardware.

1.000€ montly * 12 months * 5 years = 60.000 €

Software needs

We have already created a good basis to start off for creating a viable alternative to Google Maps. But some essential Features are missing from the current map that would make it a real option. We will estimate the effort in working hours (h) and list the essential problems that need to be solved for being competitive to Google Maps.

Map Rendering

We need to develop a rendering style that is optimized to serve well looking tiles in all situations.

This means the creation of our own „style.xml“ for the render engine:

1. Develop a new general style layout. (~ 80h)
2. Develop a new style which serves tiles that are specialized for bikes. (~ 80h)
=> Biking Layer for our map.
3. Develop a new style which serves tiles that are specialized for hiking. (~ 80h)
=> Hiking Layer for our map.

All of these layers will get a nightmode Option, where the colors on the tiles will be optimized for use in the dark. We should consider that when creating the styles because the probably easiest way to achieve that is gonna be a CSS3 Filter that changes the colors. (~ 16h)

Total: ~ 256h

Search Engine

The Nominatim search provides pretty good search results for any kind of search term. Nevertheless we have to tune the search to always provide the best results for the current position. We already have included a pretty simple Algorithm which decides for which geographical area the search should be executed primarily. It already works quite well but there will be more problems with it

when we are querying the data of the whole world so it have to get extended more which will be quite some effort. ~160h

In addition we already have included Links to Wikipedia for search results where it has been included. We want to extent that to already show the most important informations of wikipedia directly within the search results so the user won't have to leave the page to retrieve further informations. ~ 80h

Total: ~240h

Route Services

Most of the effort will be spent in the route services because here lies the most value of a online map. Since we already have route finding and navigation included, this services just need to get extended.

Access to multiple routes

The user should have the possibility to decide which route he wants to take if we can suggest multiple ones. Since this is already a feature of OSRM the implementation within the user interface should be quite easy. ~24h

Additionally we could evalate what it takes for being able to provide more route options (no highways, pretty route, short route, fast route, etc).

Include traffic data into route generation

This is a feature that has probably the most value for a user because we would then be able to provide routes that take current traffic jams etc. into account.

At the same time it will be a feature that is gonna take the most time to achieve. I thought of 2 steps:

1. Collect anonymous traffic data from our users

We can identify traffic jams by taking a look at the average speed for a road and compare it to the actually driven speed of the user. There are different problems to take into account (i.e. when the user stops on his way) and we have to make sure that there are no personally identifiing user data saved at any point but its doable.

~ 200h

2. Collect different sources which provide traffic data, convert this data into a format that OSRM can read and directly feed it into the route generation.

Collection of traffic data sources for the whole world can mean pretty much effort. But if you want to have most current traffic data there is no way around. We could start with traffic data for the biggest countries and extend that afterwards. Integration would be easy when you have access to the sources.

We would need to evaluate possible sources. There might be extra costs for being granted access to this data.

~ 1000h

Total: ~ 1200h

Total

Hardware needs: 60.000€

Software needs:

$256h + 240h + 24h + 1200h = \sim 1720h$ at $36\text{€}/h = \sim 62.000\text{€}$

122.000€