

# MetaGer Maps

<https://maps.metager.de>

## Introduction

Currently the most used maps and routing systems worldwide are those of the big global players, like Google and Bing. The price users pay for it, is loosing their privacy. These services are tracking the locations of their users. That can in most cases even be referred to the individual person.

On the other hand 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 and optimized for every display size and mobiles.

At that point we started to plan and develop our own service that should provide all of these features in the end. **AND** that respects the privacy of each individual user at the same time.

These developments grew around our hybrid search engine MetaGer.de, which evolved from the University of Hannover and which has now been on the German Internet market since more than 20 years (<http://de.wikipedia.org/wiki/MetaGer>). In 2012 MetaGer was outsourced from Hannover University and is since then run by our non-profit NGO „SUMA-EV - Association for Free Access to Knowledge" (<http://suma-ev.de>). Since 2013 our English version metager.net is online too (<http://en.wikipedia.org/wiki/MetaGer>). In 2016 a Spanish interface has been added and currently a French version is under development.

One of our main objectives is to give privacy back to the users; the details are given at <http://metager.de/en/datenschutz>. Besides search the othermost important use of Internet services is route planning, i.e. geographical information services. These services of the big 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 with 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 efficient 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 may 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/>)

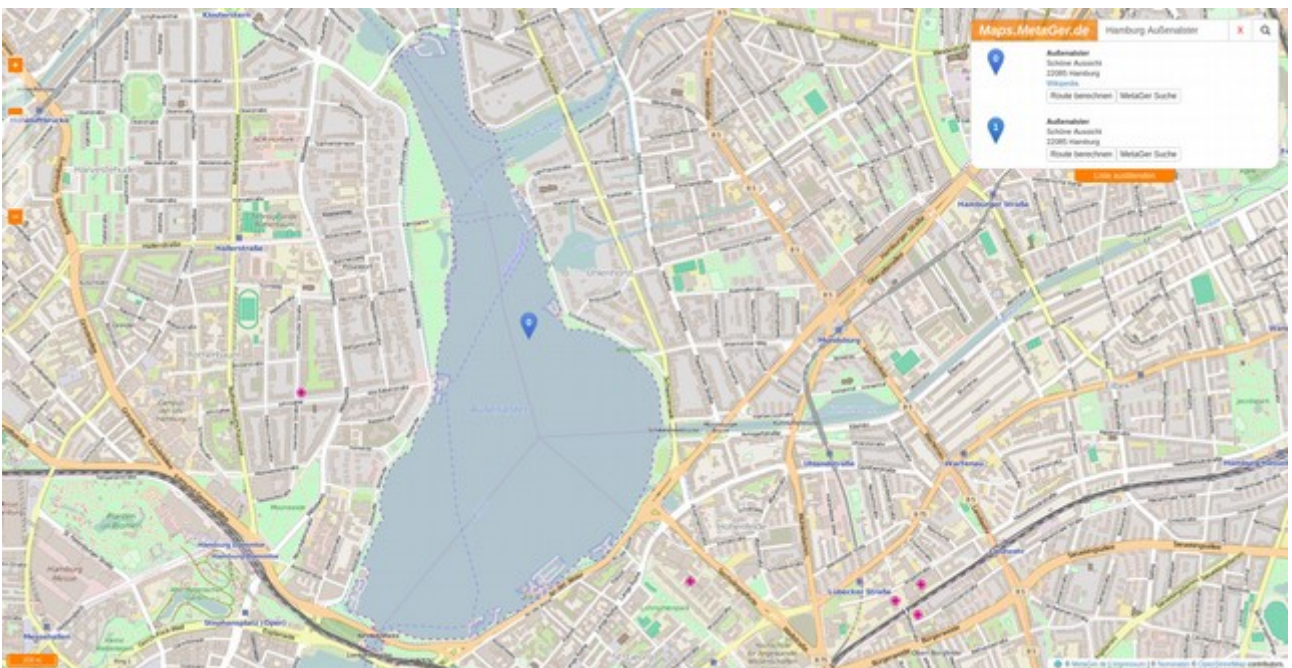
Each of the services needs another specially formatted and configured SQLite database to make it possible to process those giant chunks of data (currently around 800GB for the whole world) in a reasonable amount of time.

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 beginning.

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/>).

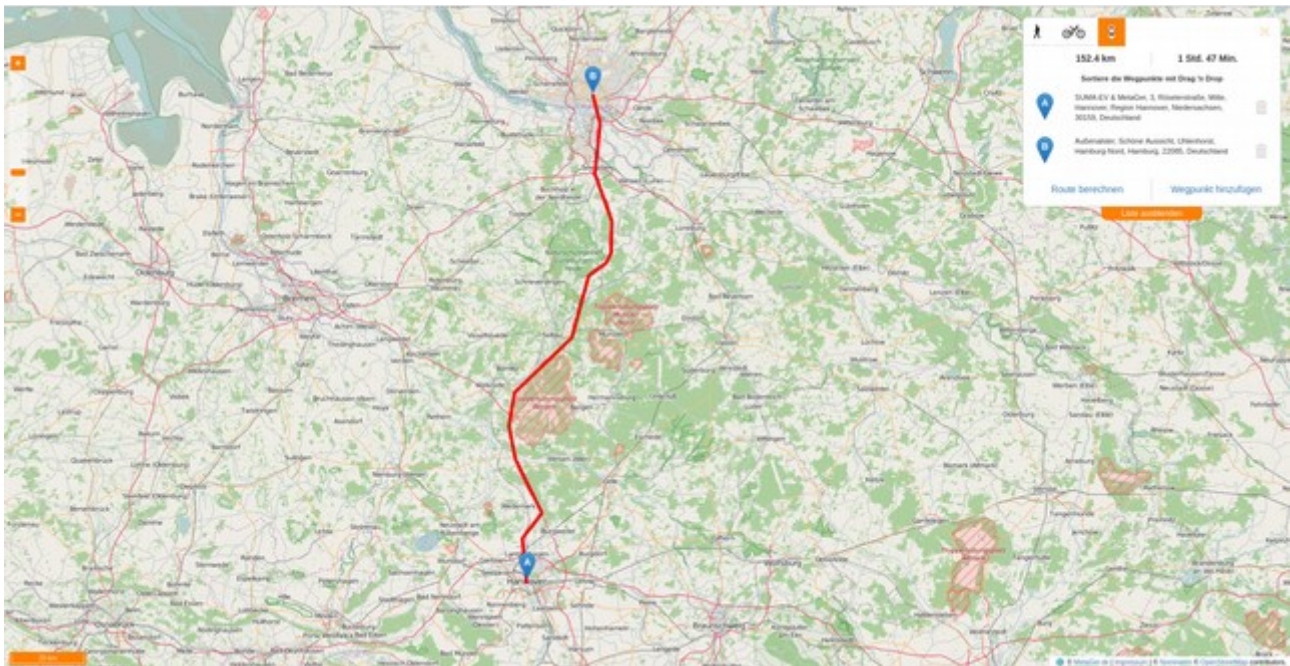


We then integrated the abilities to send search queries to our nominatim instance and integrated a dynamic reaction to show the search results.



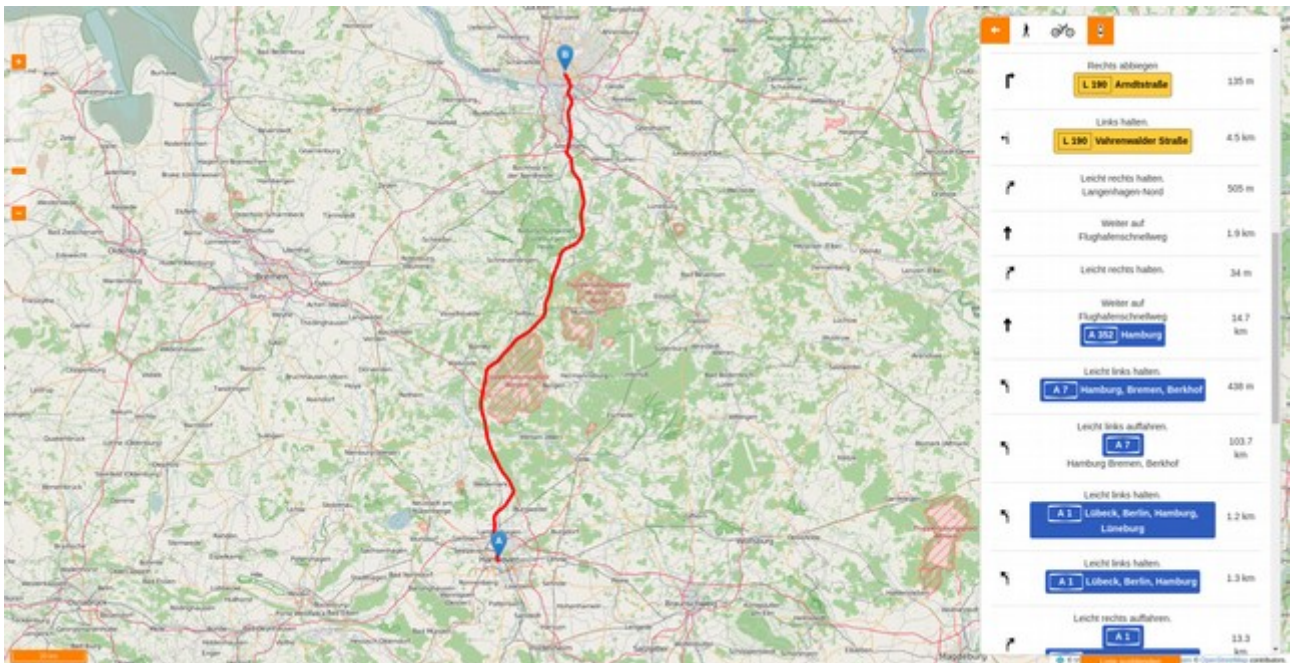


Of course you can start planning your route from this point. You have the possibility to chose between a route by foot, by bike or by car.



You can add unlimited additional waypoints and sort them easily via drag'n'drop.

You can also get directions and instructions for the given 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.

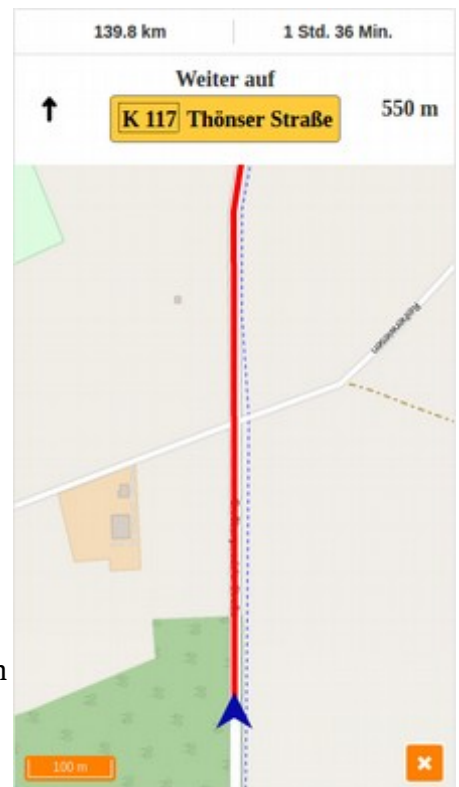
The Javascript will (locally) follow your location and continuously calculate (without internet connection) at which point of the route you are at this moment. It will automatically decide which part of the route will be relevant for you at this moment and zoom into that.

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.

Additionally we have implemented some options to save electricity which is quite important on mobile devices. To do so we added an algorithm which dynamically decides which update rate the app should use at any given moment. This leads to a battery consumption which is a lot better than the one of Google Maps. So the user can navigate for a much longer period of time without recharging. This is especially useful if there is no power supply available, like during bicycling or hiking.



## What we need

### Hardware

As mentioned above, we will 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).

We 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 up to 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 utopic.

We found a server that would generally fit our needs at the hosting service of Hetzner Online GmbH:

[https://www.hetzner.de/de/hosting/produkte\\_rootserver/px121ssd](https://www.hetzner.de/de/hosting/produkte_rootserver/px121ssd)

We need to add an additional HDD, so that the total cost per server will be at 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) What we will need

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.

$1.000\text{€} \text{ monthly} * 12 \text{ months} * 5 \text{ years} = 60.000 \text{ €}$

## 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 night mode 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 will 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 information 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 evaluate 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 will take the most time to achieve. We 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 identifying 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 we 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 = ~1720h at 36€/h = ~62.000€

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122.000€ ( = **\$130,747** conversion calculated on 19th of April 2017)

## Publication, Propagation and Announcement of maps.metager.de

A new worldwide maps und routing service needs to be announced to the users to become truly useful. We are in a very good position for such announcement: Since 1996 we are running the German hybrid search engine metager.de (<https://de.wikipedia.org/wiki/MetaGer>). Since 2013 our English version metager.net is online (<https://en.wikipedia.org/wiki/MetaGer>) and in 2016 a Spanish version has been implemented. On all of these we have in average a total of more than 100.000 queries per day. So we have an estimated usership of round about 400.000 people. This is our basis to announce new services. We already did that with the current „German-only“ version of maps.metager.de and we had an enormous media echo after our according press release (see list below). We will use these instruments too to publish maps.metager.de. If this process, which usually needs some time to propagate, seems to slow, we might additionally use the advertisement within Facebook.

Media echo on the German version of maps.metager.de (as far as known to us):

<https://pod.dapor.net/posts/6dd354b0ead50134b64a525400699018>

[https://www.nwzonline.de/digitale-welt/kartendienst-ohne-standortaufzeichnung\\_a\\_31,2,2788330355.html](https://www.nwzonline.de/digitale-welt/kartendienst-ohne-standortaufzeichnung_a_31,2,2788330355.html)

<https://forum.openstreetmap.org/viewtopic.php?id=57685>

<https://diasporazone.wordpress.com/2017/03/14/maps-konkurrenz-metasuchmaschine-metager-startet-eigenen-kartendienst/>

<http://www.saarbruecker-zeitung.de/sz-spezial/internet/art371089,6402843>

[http://Totalwiki.openstreetmap.org/wiki/OpenStreetMap\\_in\\_the\\_media](http://Totalwiki.openstreetmap.org/wiki/OpenStreetMap_in_the_media)

<https://justmac.info/archive/2017/03/13/>

<http://blog.openstreetmap.de/>

<http://www.pc-newsticker.de/newslinks/?id=2415823>

<https://newstral.com/de/article/de/1059071559/metager-bietet-kartendienst>



<https://tsecurity.de/de/134608/NachrPublication, Propagation and Announcement of maps.metager.deichten/MetaGer-bietet-Kartendienst/>

<http://www.ad-hocTotal-news.de/wissenschaft/die-metasuchmaschine-bezieht-die-karten-vom-freien-projekt-openstreetmap/53310>

<http://www.multimedia.de/>

<http://newsempire.net/>

<http://www.aktronixs.de/index.php> Publication, Propagation and Announcement of maps.metager.de

<http://www.zdnet.de/88289770/metager-bietet-kartendienst/>

<http://www.zdnet.de/88289770/metager-bietet-kartendienst/>

<http://t3n.de/news/metager-startet-kartendienst-804596/>

<http://fixmibug.com/metager-offers-the-metasearch-engine-map-service.html>

<http://www.silicon.de/41641995/metager-erweitert-angebot-um-tracking-freien-kartendienst/>

<https://libranet.de/display/1d6c3610ead601343e3756645923f34a>

<http://www.pressreader.com/germany/saarbruecker-zeitung/20170315/282535838177846>

<http://news.feed-reader.net/130798-bild-nachrichten.html>

<https://www.perlentaucher.de/medienticker/2017-03-15.html>

<http://twimage.org/infosat-verlag-119114958>

<https://www.infosat.de/digitale-welt/metager-suchmaschine-startet-kartendienst-ohne-standortaufzeichnung>

## Abstract

The non-profit NGO SUMA-EV has in addition to its privacy protected search engines developed a maps and routing system: maps.metager.de. It is based on Openstreetmap, Nominatim and OSRM and it is strictly privacy protected. For the startup phase the underlying maps are implemented for Germany only. Establishing a worldwide system would currently exceed the resources of SUMA-EV. Therefore we apply for funding via the Mozilla Open Source Support (MOSS) "Mission Partners" Application to implement the privacy protected maps and routing system worldwide. The total cost of our project is \$130,747 (see calculation above: „What we will need“ and following paragraphs). For the later announcement, publication and advertisement of maps.metager.de we have the sound basis of the existing usership of our search engines and the media echos which follow press releases of SUMA-EV.