

Google Maps alternatives

Leaflet, OpenStreetMap and more

About me

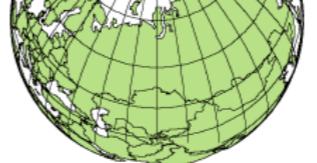
- Cartography and geomatics
- working at [geOps](#)
- playing at [climbingguide.rocks](#)

Structure

- Demo examples
- Concepts and technologies
- Map service provider
- Map libraries
- Code examples

Map Projections

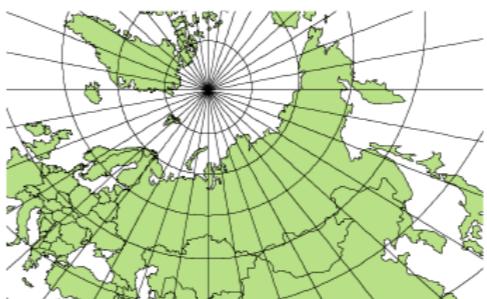
• epsg.io



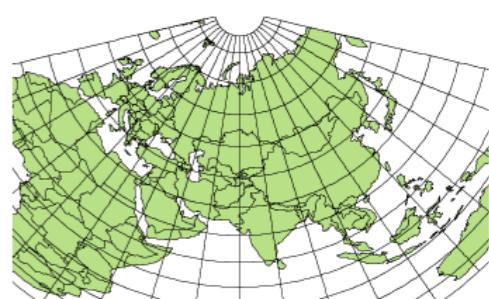
Senkrechte Umgebungsperspektive



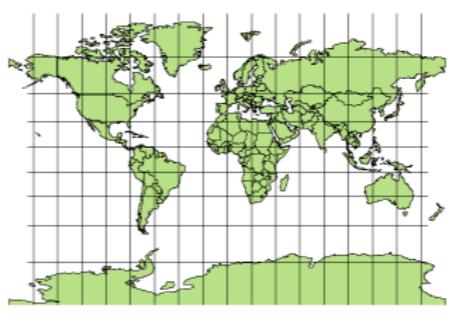
Robinson-Projektion



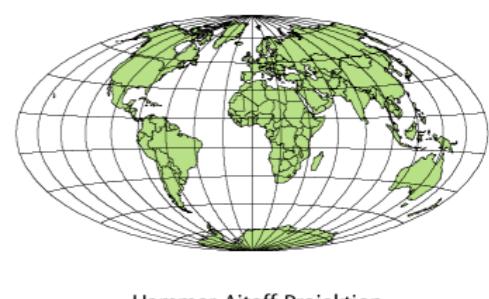
Gnomonische Projektion



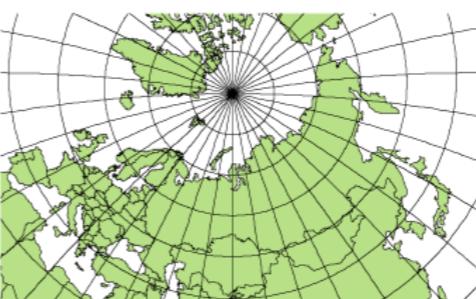
Flächentreue Kegelprojektion



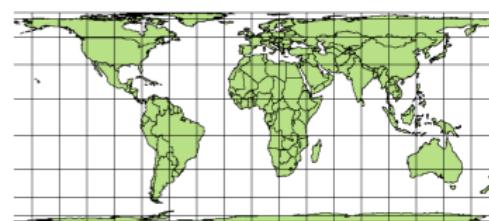
Zylinderprojektion nach Miller



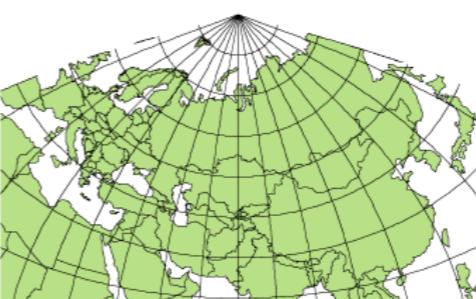
Hammer-Aitoff-Projektion



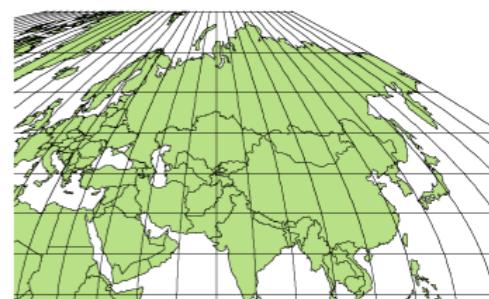
Stereographische Projektion



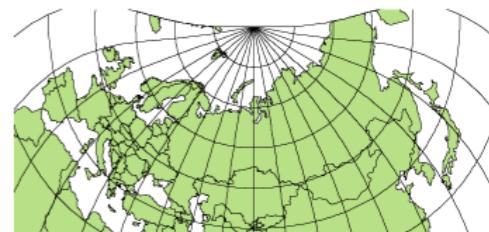
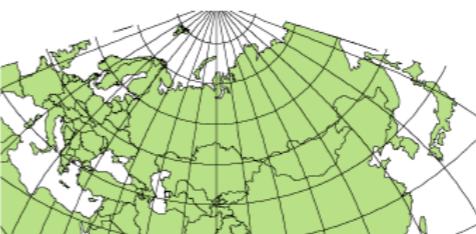
Behrmann-Projektion



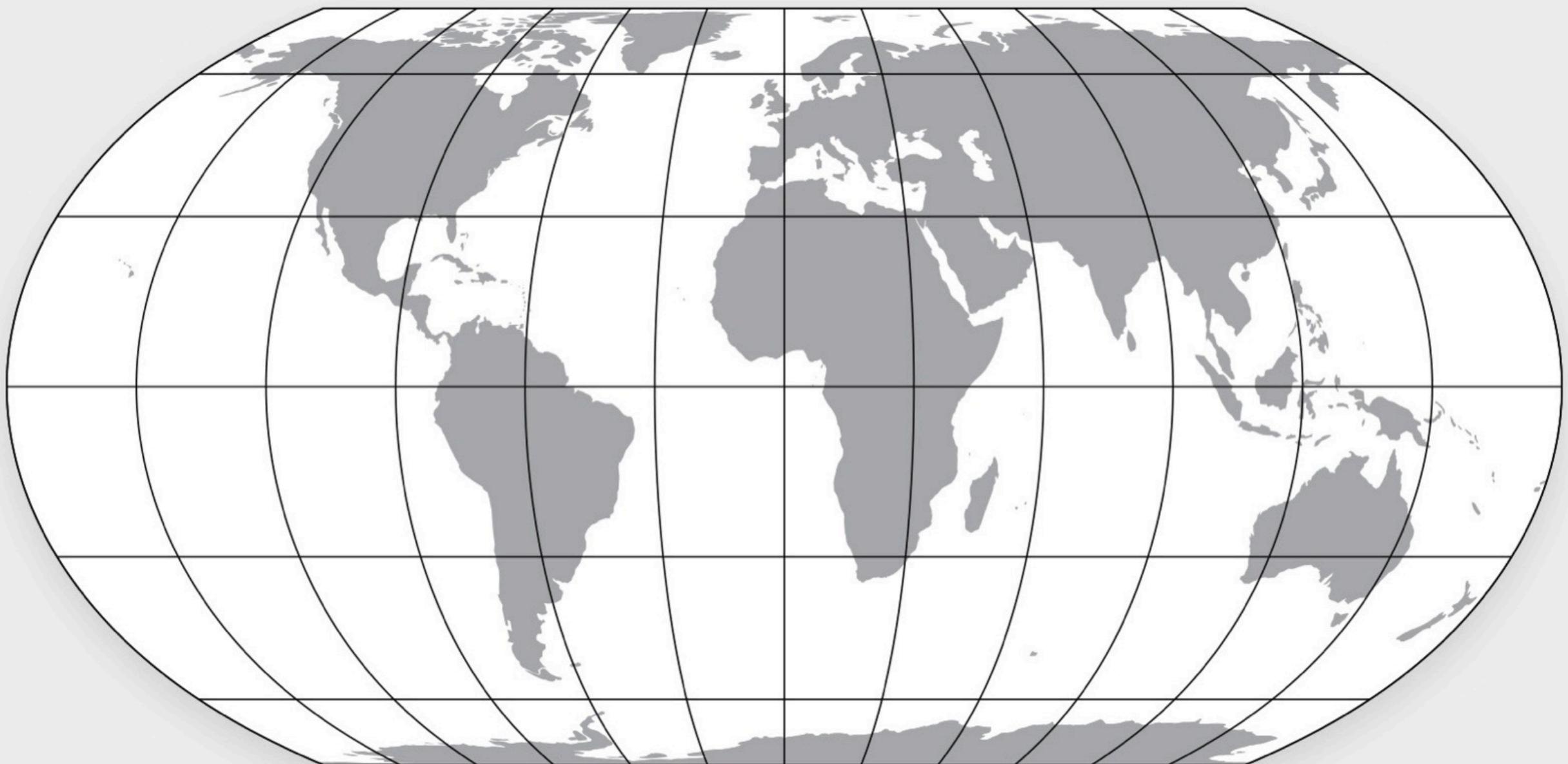
Hotine Oblique Mercator-Projektion



Sinusoidale Projektion



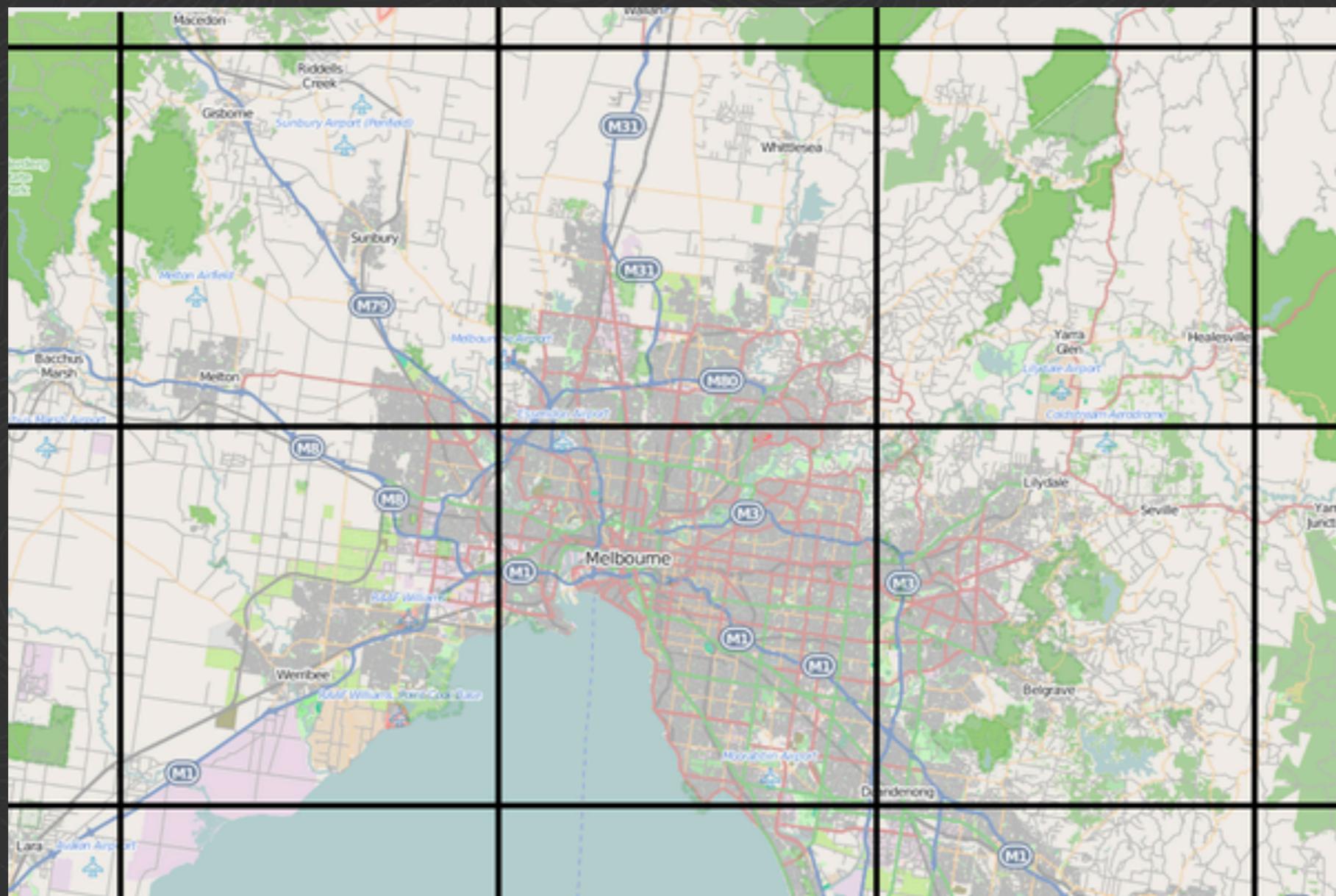
Equal Earth projection



Web Mercator projection



Raster Tiles



Example 1

Georeferencing and Tiling

- Using GDAL command line tools
 - GUI alternative: [MapTiler Desktop](#)
1. Georeferencing
 2. Reprojecting
 3. Tiling
 4. Map display

Spatial Data Formats

- GeoJSON
- GeoRSS
- GML
- KML
- GPX
- Shapefile
- (E)WKT



GeoJSON

- Point
- LineString
- Polygon
- Feature
- Multi, Collection



```
{  
  "type": "Feature",  
  "geometry": {  
    "type": "Point",  
    "coordinates": [7.84, 47.9]  
  },  
  "properties": {  
    "name": "Freiburg"  
  }  
}
```

<http://geojson.org>

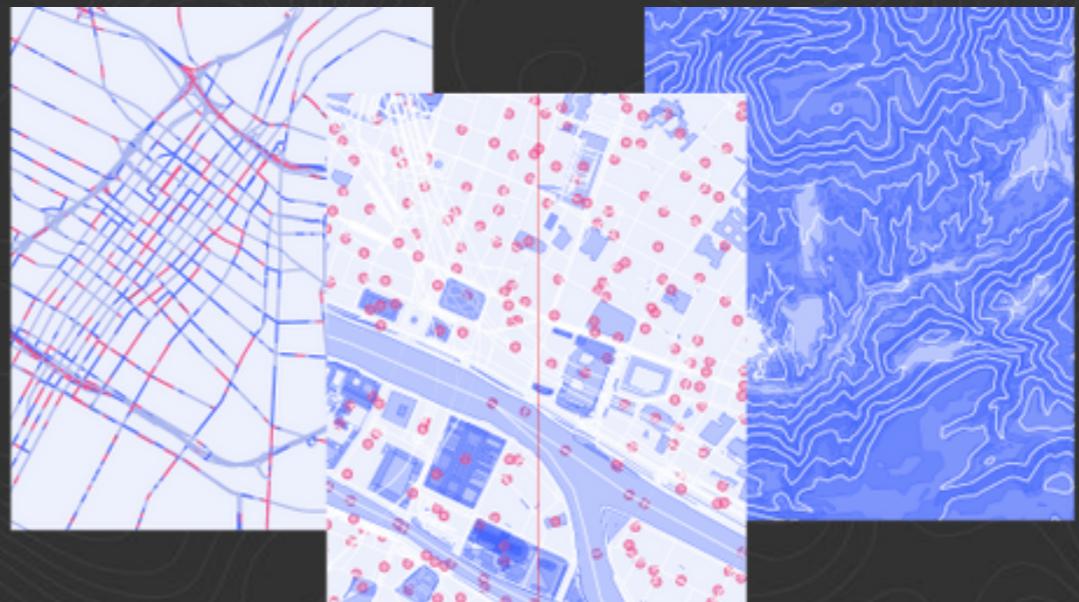
Map Service Specifications

- **Web Feature Service (WFS)**
Vector
- **Web Map Service (WMS)**
Raster
- **Web Map Tile Service (WMTS)**
Tiles



Vector Tiles

- Efficient encoding format
- Client-side rendering
- Dynamic styling
- Mapbox Specification



Spatial Data Sources

- Cultural, Physical and Raster: [Natural Earth](#)
- Countries and sub-divisions: [GADM](#)
- OSM Vector Tiles: [OpenMapTiles](#)
- Satellite images: [Remote Pixel](#)
- Open addresses
- Registry of Open Data on AWS
- Wikidata

Geoportals

- Europe: [INSPIRE](#)
- Germany: [Geoportal.de](#)
- Baden-Württemberg: [Geoportal BW](#)
- Freiburg: [FreiGIS](#)
- United States: [data.gov](#)

Map Service Providers

- Google Maps
- MapTiler Cloud
- Thunderforest
- Mapbox
- Here
- Azure Maps
- TomTom

Map Service Providers



Costs



Styles



Features

„there ain't no such thing as a free lunch“

-Robert A. Heinlein

Map Service



Google Maps

28 000 requests free

\$7 for each 1000 map requests (or high volume)

MapTiler

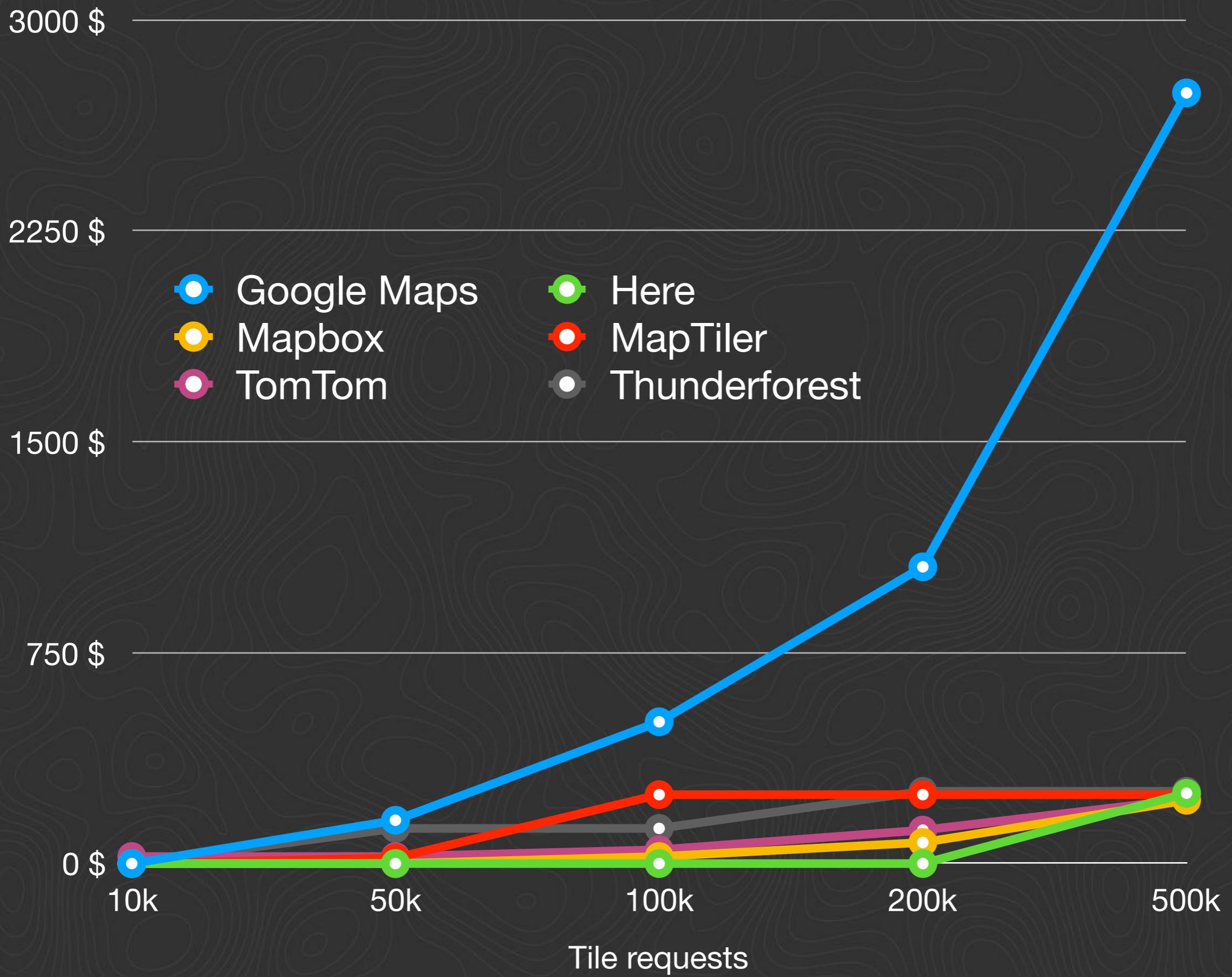
100 000 free, 500 000 for \$100, 1 million for \$245

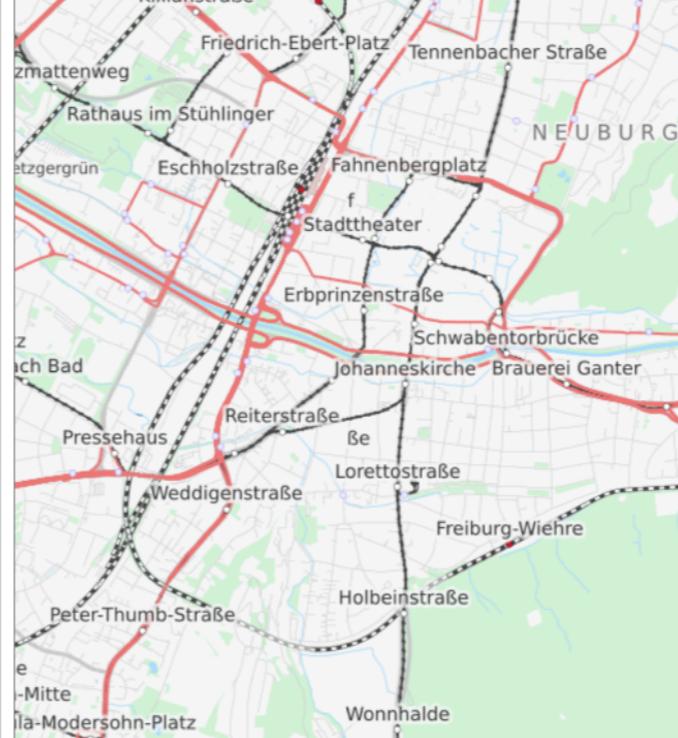
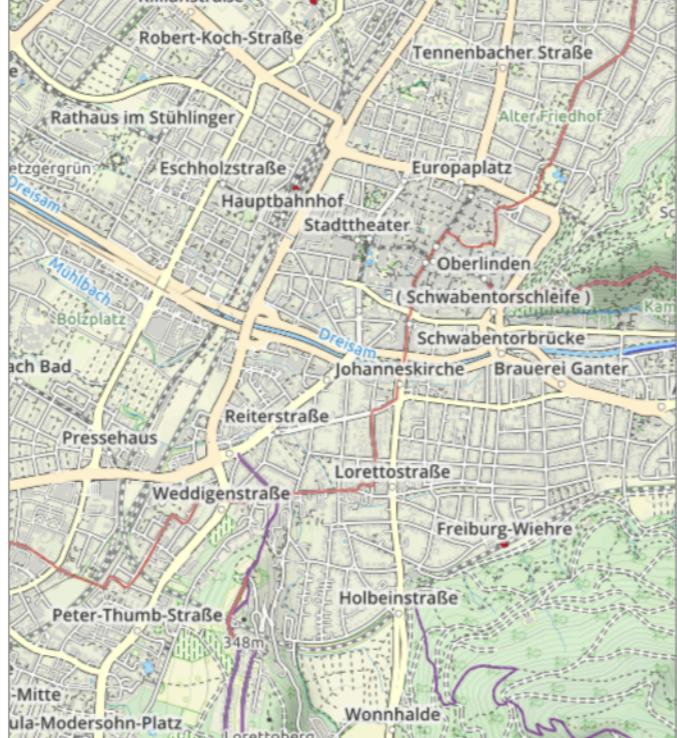
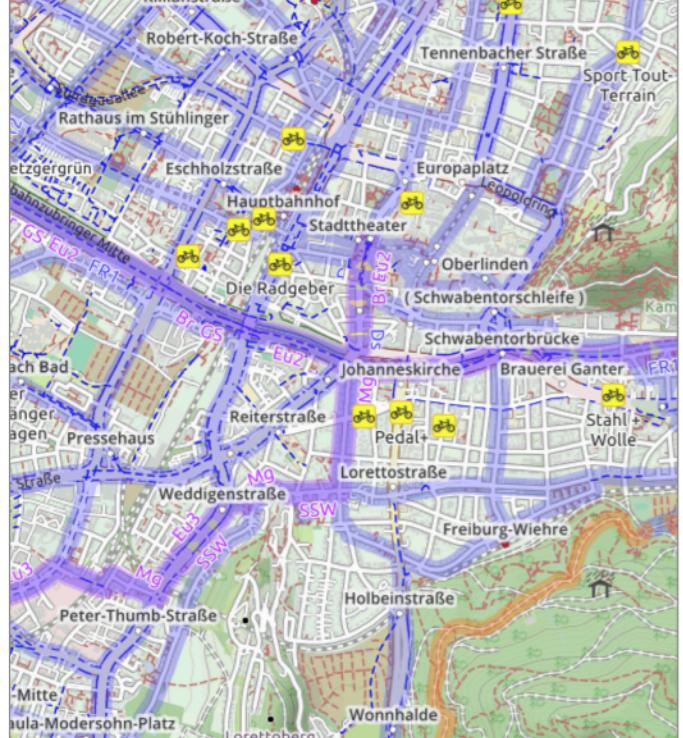
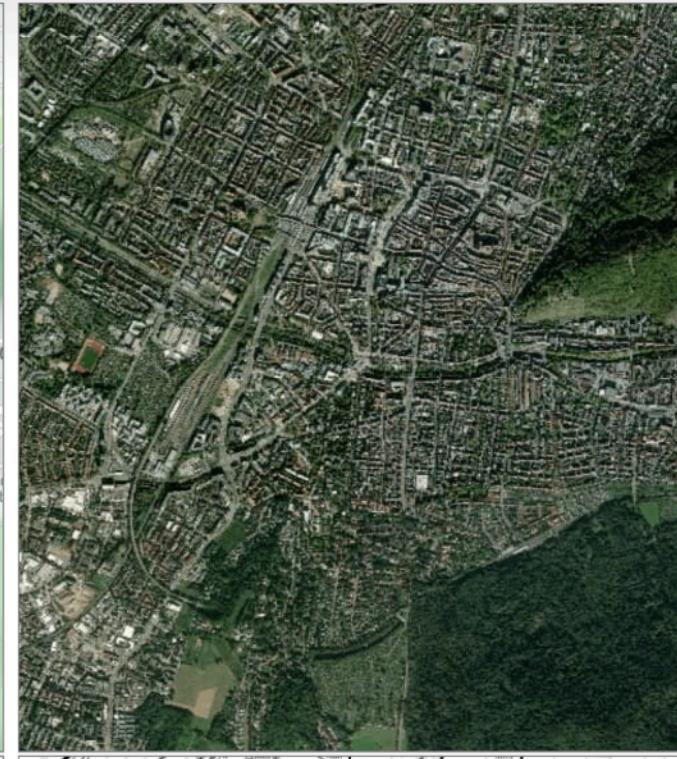
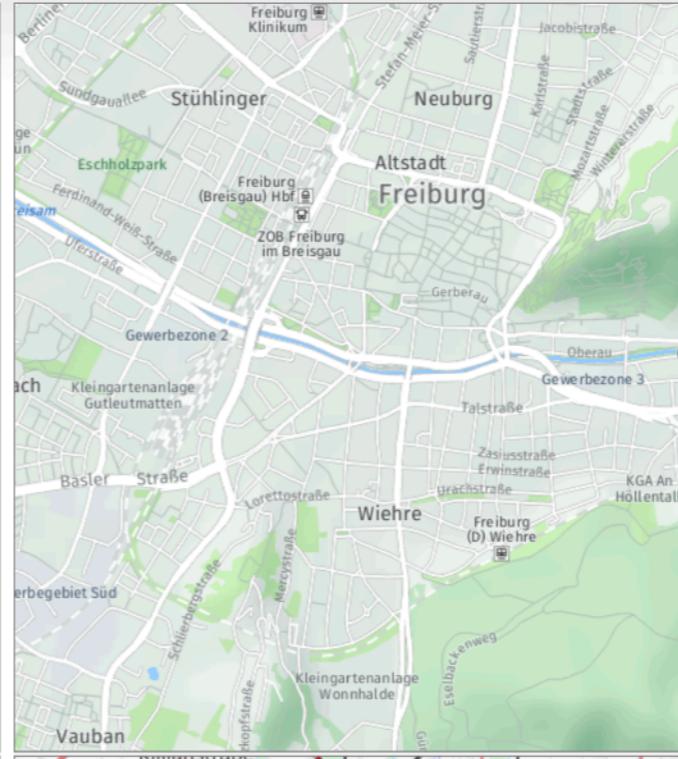
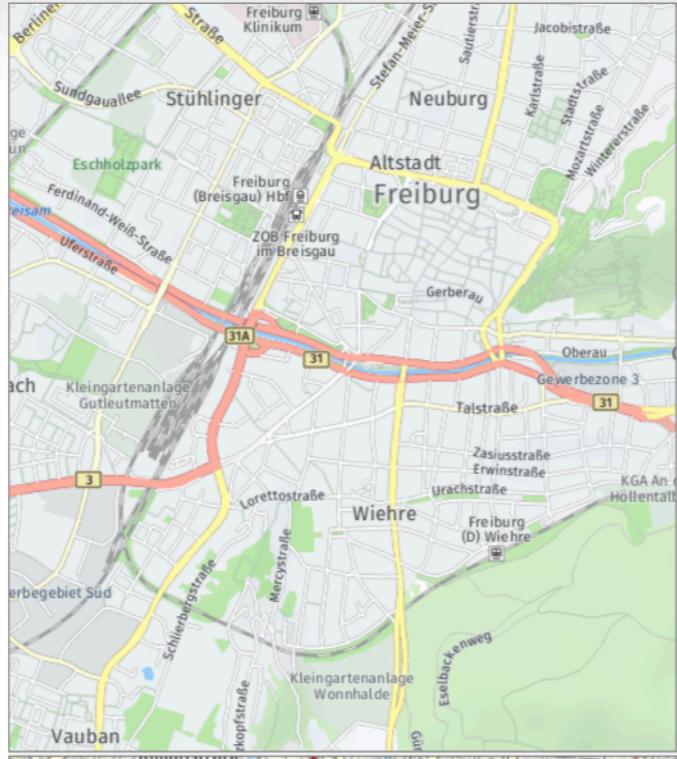
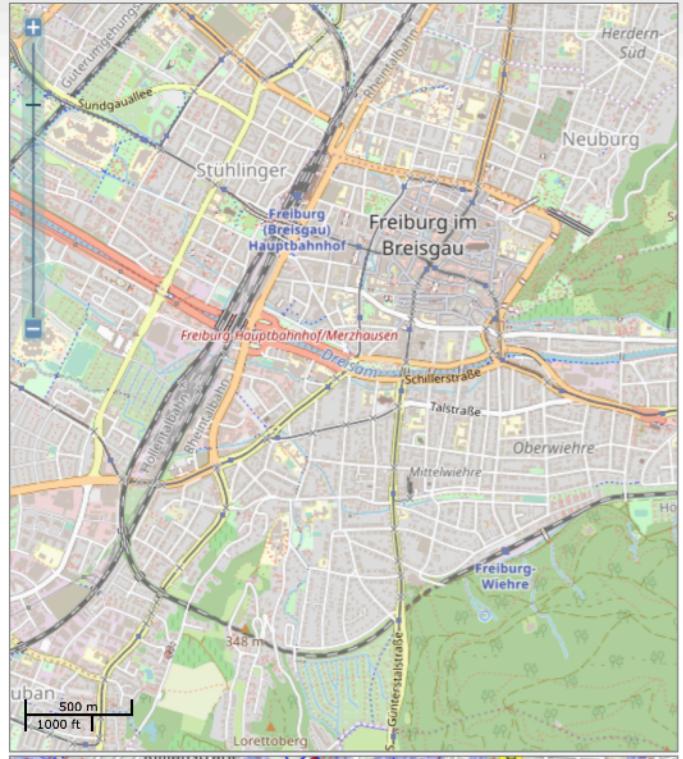
\$0.05 for each additional 1000 requests

Thunderforest

150 000 tile requests for free

1.5 million for £95, 15 million for £195, 150 million for £395





All maps except Bing/Google/HERE based on OSM data © OpenStreetMap (License: ODbL 1.0), OSM Tiles licensed CC-BY-SA 2.0 - [help](#) - [legal notice/privacy](#) - [fullscreen](#)

Map Services Styles

Static map style comparison

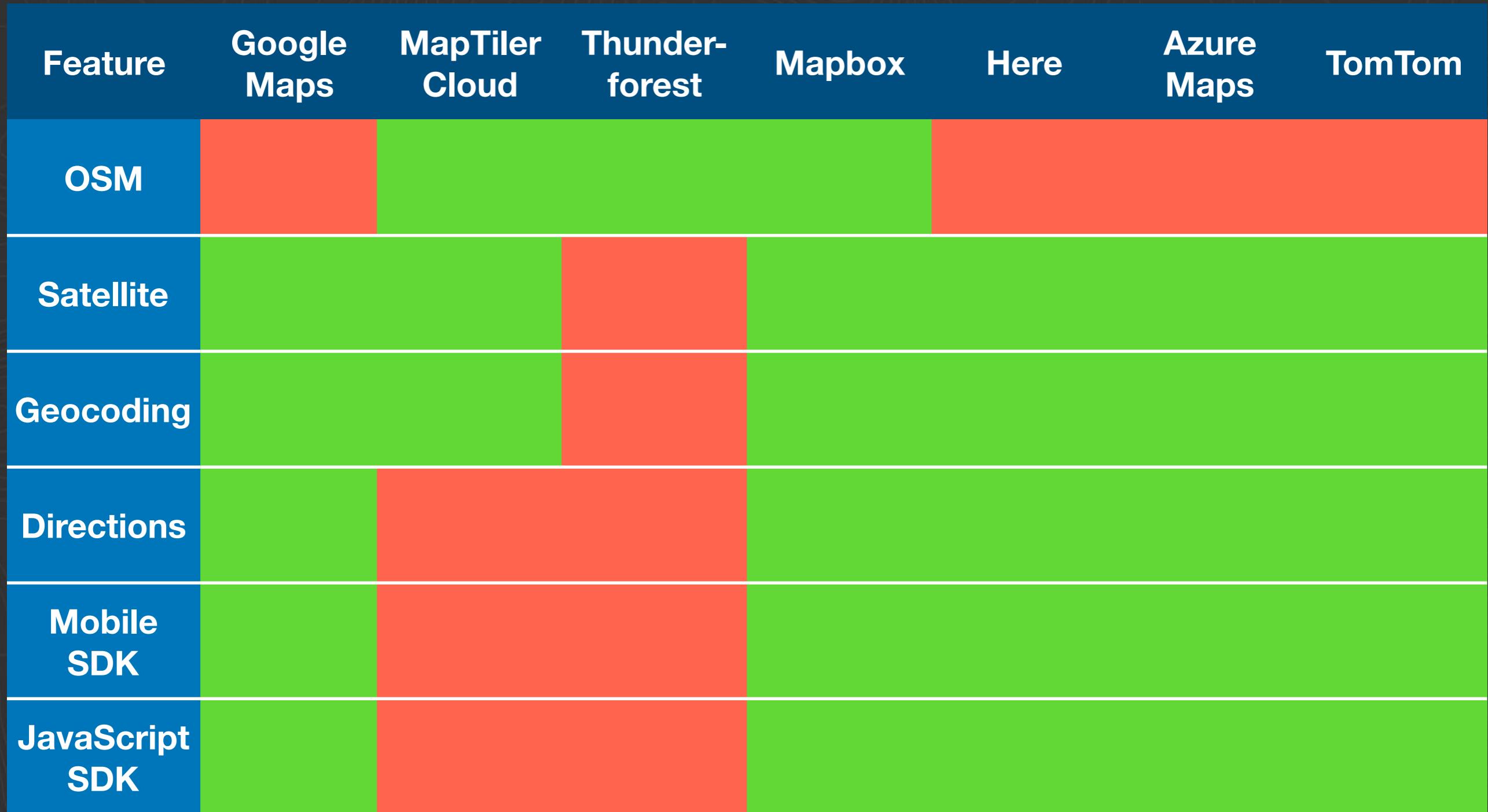
Interactive map style comparison

OpenStreetMap tiles

Map Services Features

Feature	Google Maps	MapTiler Cloud	Thunder-forest	Mapbox	Here	Azure Maps	TomTom
Self-Hosting							
Custom Styles							
Vector Tiles		MVT	MVT	MVT			
Advanced Services							
Static Maps							

Map Services Features



Map Libraries



OpenLayers



mapbox

Map Libraries



Size

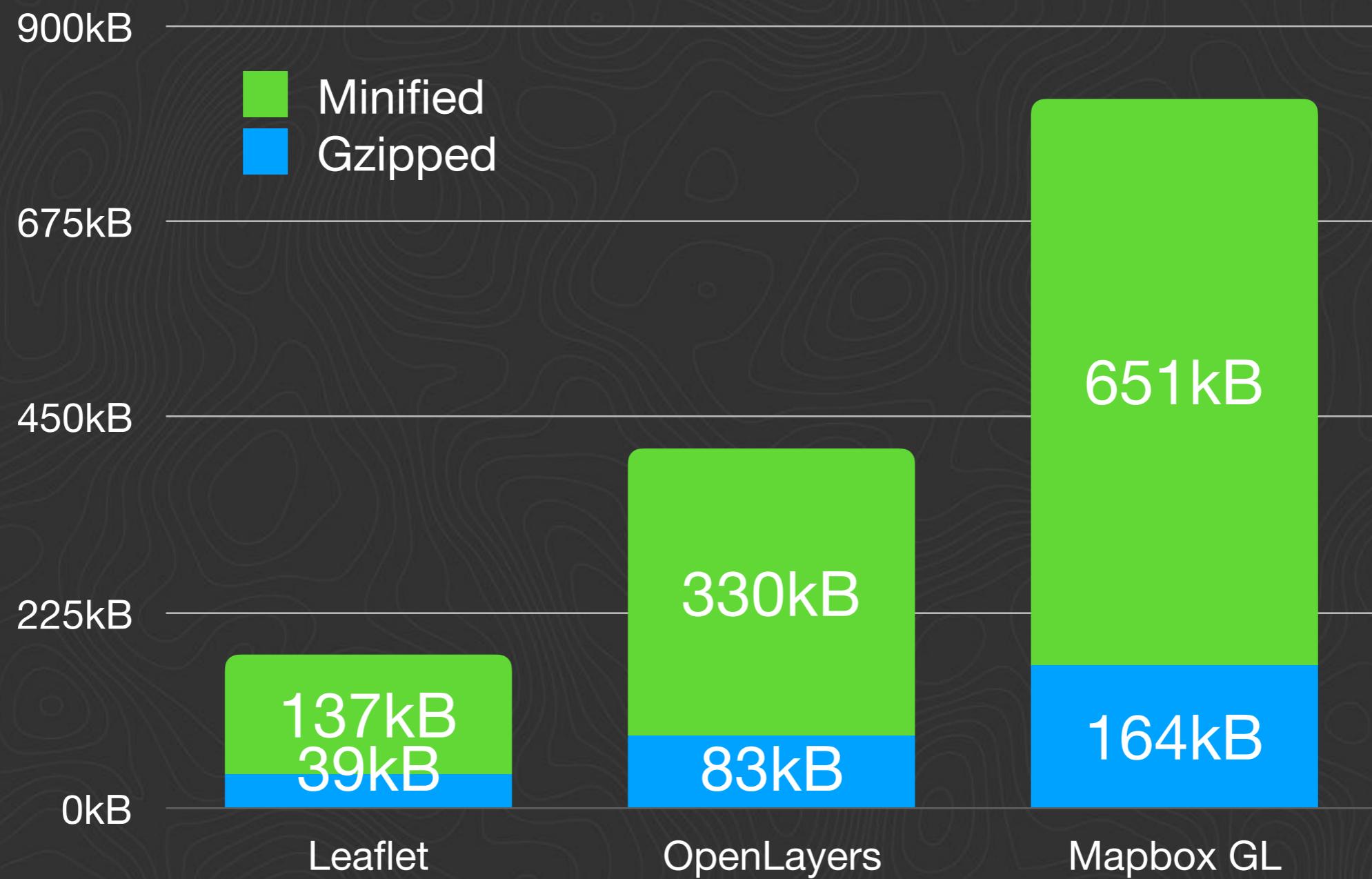


Trend

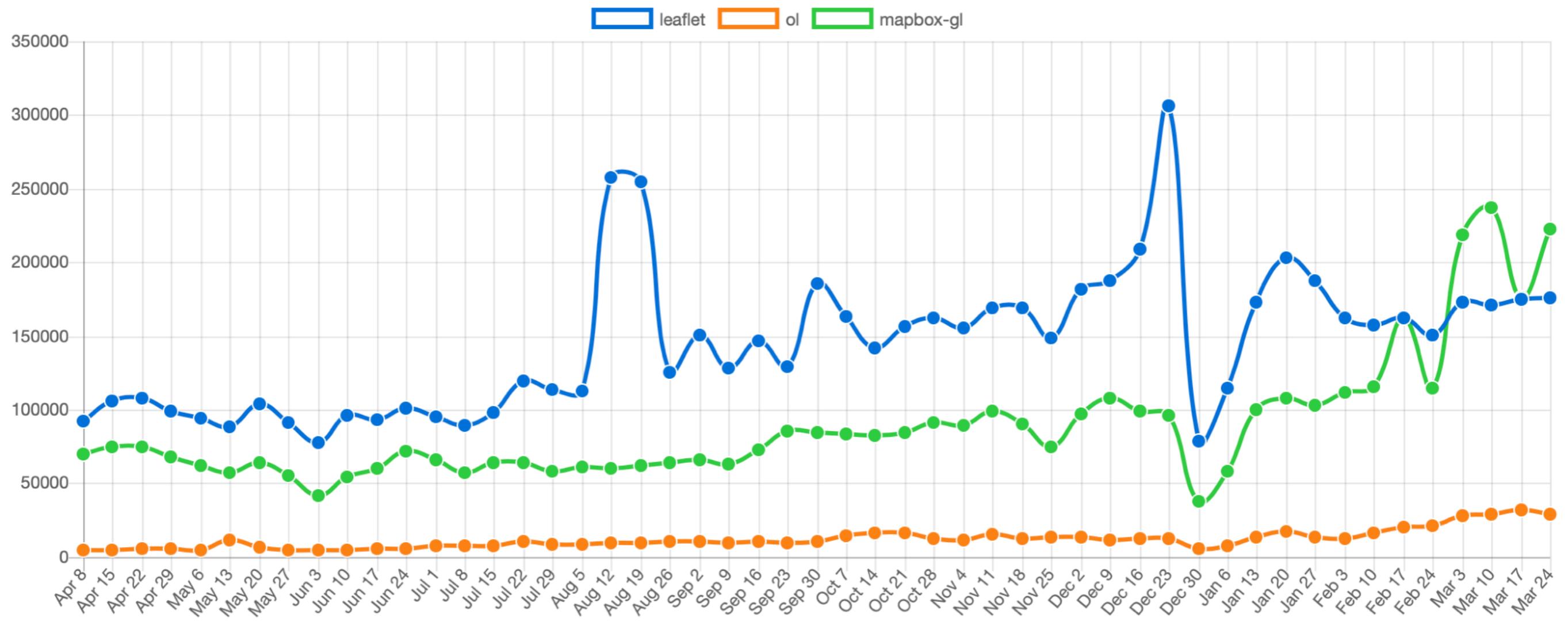


Features

Map Libraries Size



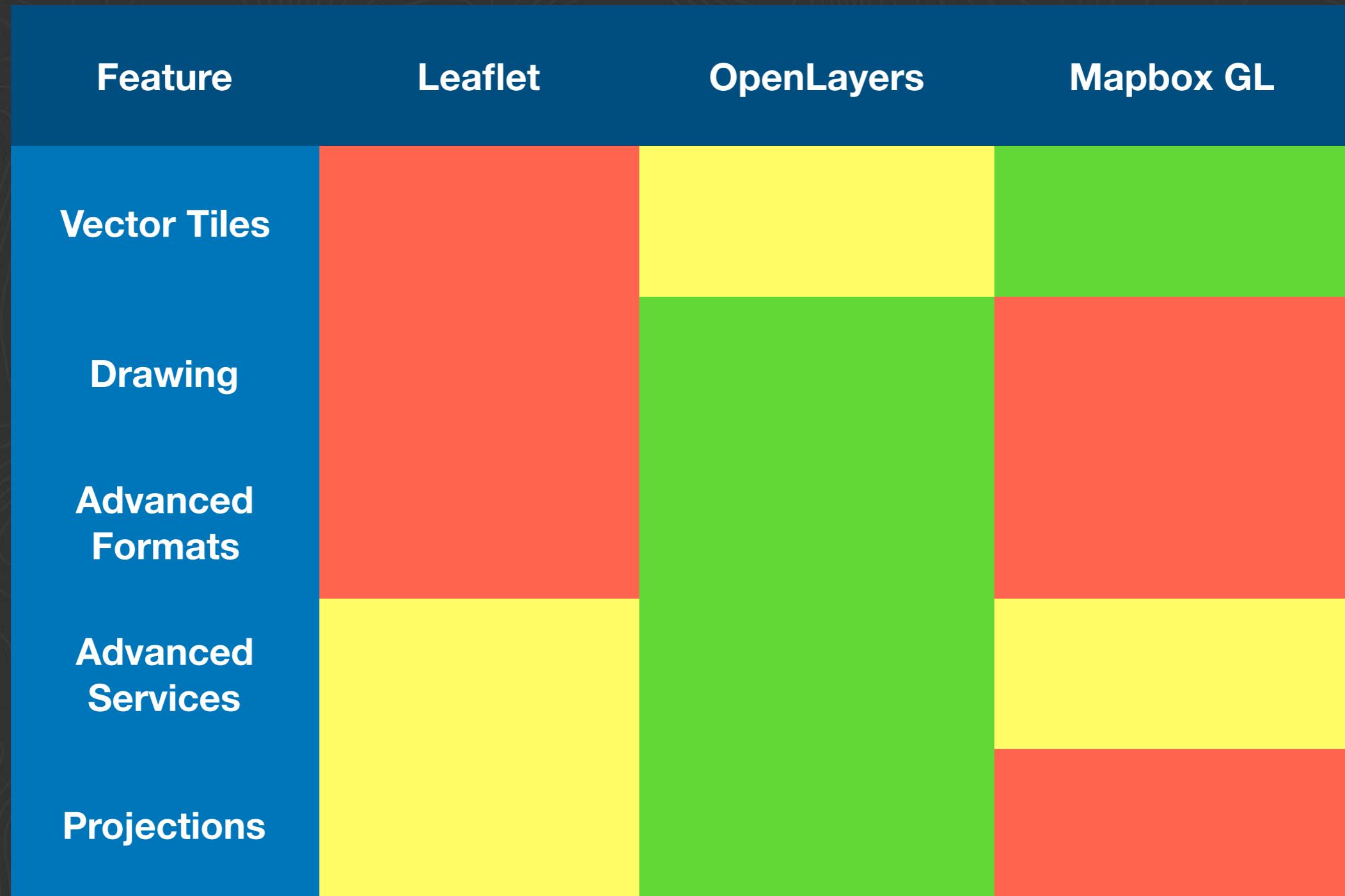
Downloads in past 1 Year



Stats

	stars 🌟	forks 🍽️	issues ⚠️	updated 🛠️	created 🐵	size 🎪
leaflet	24365	4001	411	Mar 27, 2019	Sep 22, 2010	minified size 137.7 KB
ol	4712	1850	650	Mar 26, 2019	Jun 20, 2012	minified size 330.1 KB
mapbox-gl	4122	1004	605	Mar 27, 2019	Mar 7, 2013	minified size 651.4 KB

Map Libraries Features



Examples

1. Georeferencing and Tiling
2. (Reverse) Geocoding
3. GeoJSON and Styling
4. Custom Vector Tiles

Example 2 (Reverse) Geocoding

- Using the [Nominatim](#) geocoder
 - [Help! I need a geocoder.](#)
1. Geocoding: get **coordinates** for address
 2. Reverse geocoding: get **address** for coordinates

Example 3

GeoJSON and Styling

1. Generate GeoJSON using the [Overpass API](#)
2. Display GeoJSON using [Leaflet](#)
3. Display big GeoJSON using a [cluster plugin](#)

Example 4

Custom Vector Tiles

1. Generate vector tiles using [tippecanoe](#)
2. Serve vector tiles using [mbview](#)
3. Display vector tiles using [OpenLayers](#)