

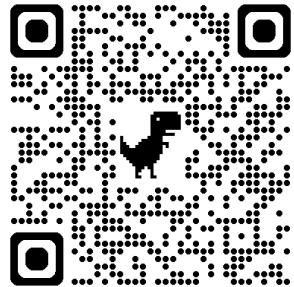
A Developer's Guide to Open Source Web Mapping Libraries



Courtney Yatteau

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v-audience-map.netlify.app



Courtney Yatteau

Developer Advocate, Esri



c_yatteau



c_yatteau

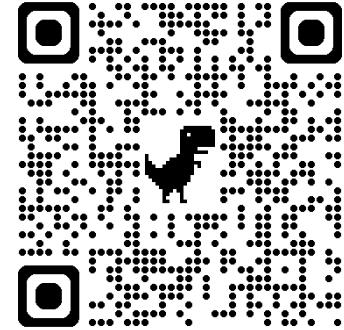


cyatteau



courtneyyatteau

Agenda



[github.com/cyatteau/oredev25-
open-source-mapping](https://github.com/cyatteau/oredev25-open-source-mapping)

01

Intro to Mapping

Vocab, concepts, etc.

02

Web Mapping Libraries

Two different open source options

03

Other Library Integrations

Using third-party plugins

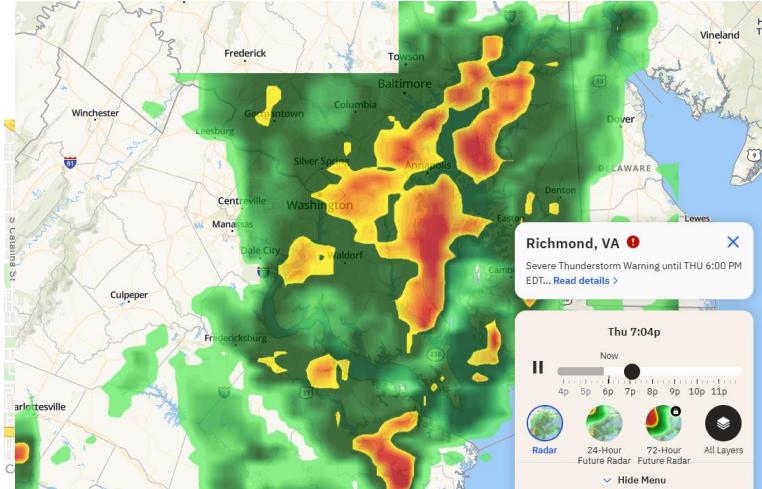
04

Conclusions

Real-world examples and summaries

Role of Mapping

01 Visualization 



02 Navigation 



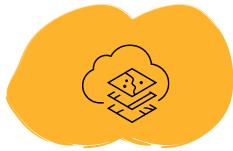
03 Communication 

04 Prediction 

Key Web Mapping Concepts



Basemaps

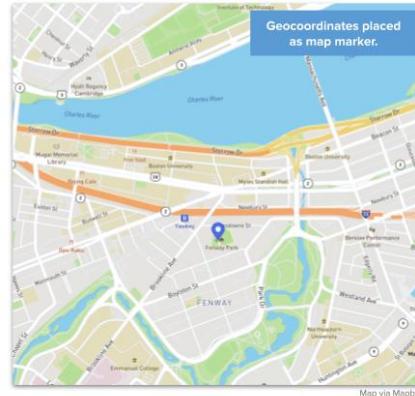


Data Layers



Geocoding

Geocoding



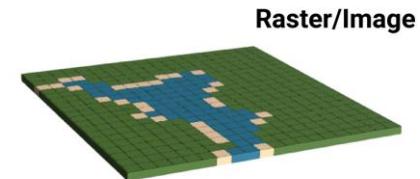
Basemap Formats

Raster Tiles

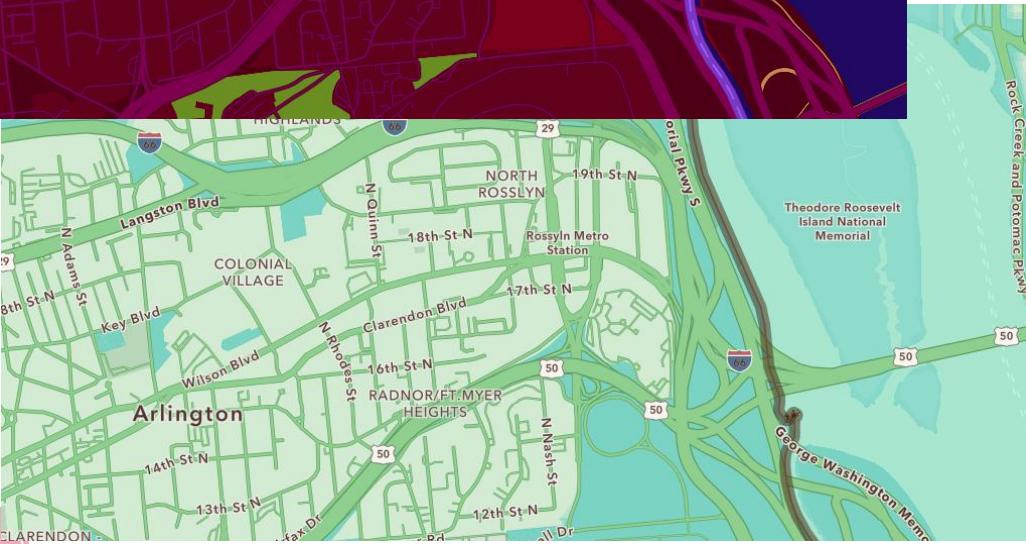
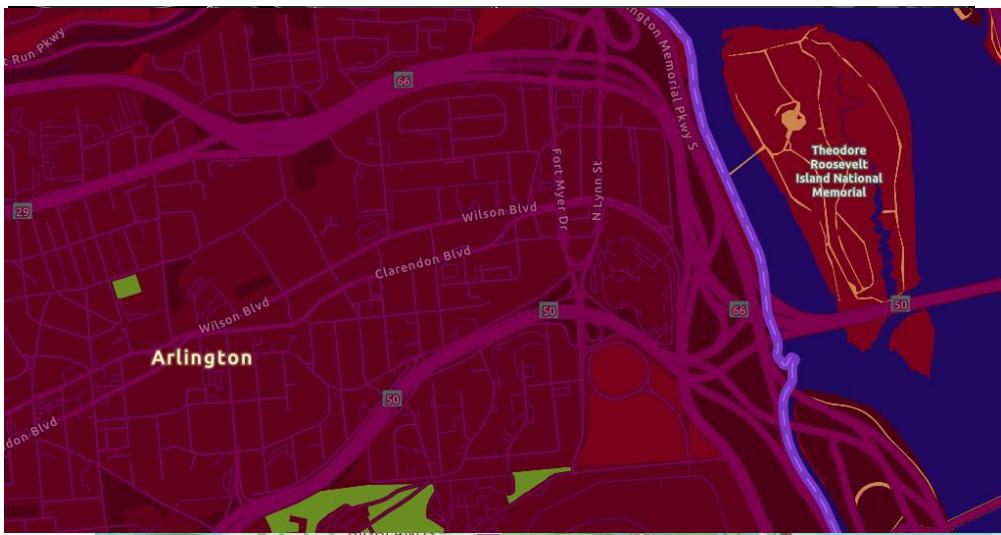
- Fixed look
- Quick and easy
- Reliable in low bandwidth

Vector Tiles

- Customizable
- Smooth and interactive
- Efficient on various devices



Basemap Styles



Streets



Satellite
Imagery



Terrain/
Topographic



Dark/Light
Modes



Custom
Themes

Data Layer Types

01

GeoJSON Layer

02

Esri Feature Layer

03

Vector Tile Layer

```
{
    "currentVersion": 11.2,
    "name": "Educational_Institutions_of_Colombia",
    "capabilities": "TilesOnly,Tilemap",
    "type": "indexedVector",
    "serviceItemId": "89a416863d324250b84e4bf95a4a76fe",
    "publishJobId": "90bc7681-d478-49a9-93db-5012ea095490",
    "jobServiceId": "453a16cb-0963-40e4-b863-07d0c8745a0b",
    "ownerUserName": "",
    "serviceDescription": "",
    "description": "",
    "isEnabled": true,
    "id": 3219,
    "sourceServiceName": "Educational_Institutions_of_Colombia",
    "sourceServiceType": "FeatureServer",
    "tileContainerName": "fabd007f6da142d99b9a8bed9a0272f9",
    "creationDate": 1731431561310,
    "datasource": "db",
    "exportTilesAllowed": false,
    "maxExportTilesCount": 100000,
    "tileMap": "tilemap",
    "defaultStyles": "resources/styles",
    "tiles": [ ... ], // 1 item
    "initialExtent": { ... }, // 5 items
    "fullExtent": { ... }, // 5 items
    "minScale": 295828763.795777,
    "maxScale": 35.265536760789715,
    "maxZoom": 23,
    "tileInfo": { ... }, // 8 items
    "resourceInfo": {
        "styleVersion": 8,
        "tileCompression": "gzip",
        "cacheInfo": { ... } // 1 item
    }
}
```

Library Commonalities

Core Tech

- Built on JavaScript
- Compatible with HTML & CSS
- Works across modern browsers

Open Source

- Cost-Effectiveness
- Community-driven
- Modifiable
- Interoperable

Easy to Learn

- Simple APIs
- Extensive documentation
- Abundance of Resources

Key Features

- Interactive & mobile friendly
- Customizable
- Web Mercator projection

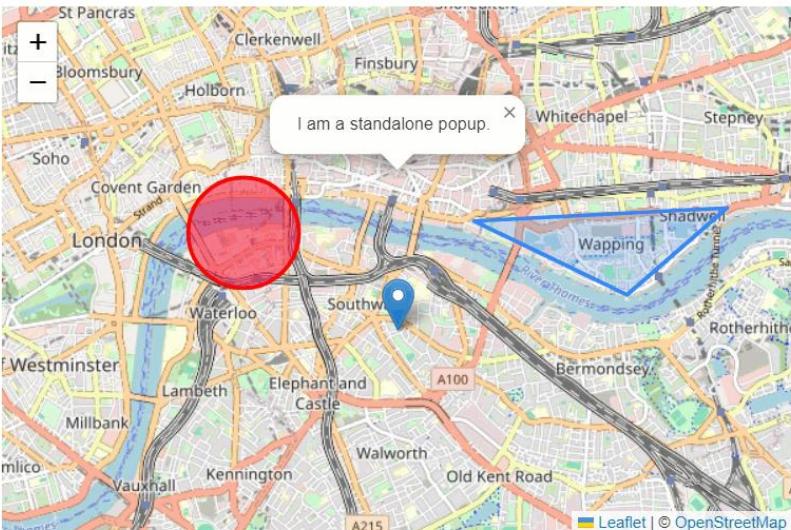
Leaflet



leafletjs.com



github.com/Leaflet



- Lightweight (~42 KB JS)
- Tons of [plugins](#)
- Focuses on simplicity and performance

Esri Leaflet



developers.arcgis.com/esri-leaflet



github.com/Esri/esri-leaflet

Esri/esri-leaflet

A lightweight set of tools for working with ArcGIS services in Leaflet.



89
Contributors

5k
Used by

2k
Stars

795
Forks



- Seamless ArcGIS integration
- Developer-friendly
- Extensive Documentation

Nominatim



nominatim.openstreetmap.org

nominatim.org/release-docs/latest/api/Search

The screenshot shows the Nominatim search interface. At the top, there are tabs for 'Simple' and 'Structured', and buttons for 'Search', 'Reverse', and 'Search By ID'. Below the tabs is a search bar with a placeholder 'Search' and a 'Search' button. A link '► Advanced options' is also present. On the left, a sidebar titled 'Welcome to Nominatim' provides information about the interface and links to 'More information'. The main area features a world map with country boundaries. A blue circle marks a specific location, and a smaller red circle is visible near the bottom right. A scale bar indicates distances of 3000 km and 2000 mi. The text 'Data last updated: 1 minute ago (Details)' is displayed above the map. At the bottom, a note states: 'Addresses and postcodes are approximate. Blue circle is the result. In case of reverse geocoding the smaller red circle is at the search position.' and a copyright notice: '© OpenStreetMap contributors'.

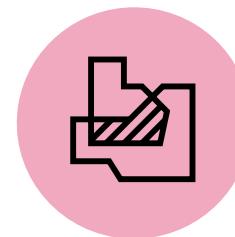
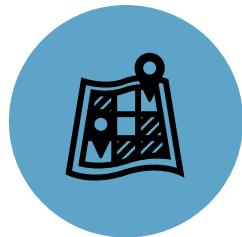
- Converts place names to coordinates
- Returns GeoJSON and metadata
- Used by many Leaflet plugins
- Free to use

Leaflet Demos

- 1) Simple map
- 2) GeoJSON layer
- 3) Feature layer
- 4) Feature layer
Geosearch
- 5) Nominatim
highlighting



Leaflet Demos Takeaways



Demo 1: Simple Map

- Basemap - image tiles
- Small geoJSON layer

Demo 2: Large Data Sets

- Feature Layers – load to extent
- Clustering features

Demo 3: Geosearch

- Search with providers and set parameters

Demo 4: Nominatim highlighting

- Plugin that pairs with Nominatim

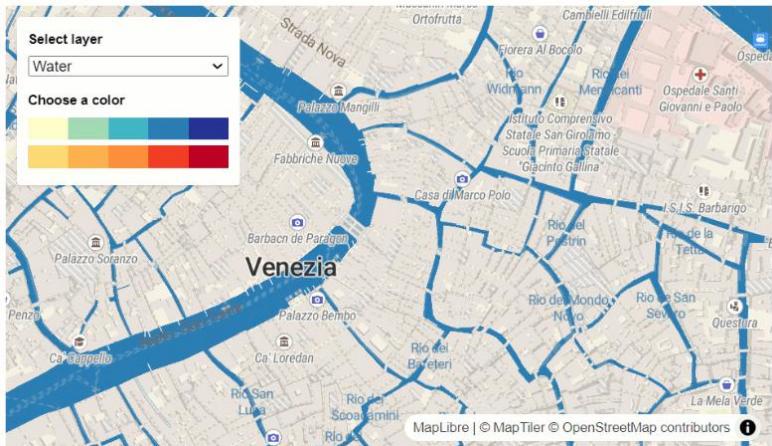
MapLibre GL JS



maplibre.org



github.com/maplibre/maplibre-gl-js



- Fork of Mapbox GL JS 1.x
- WebGL rendering
- Dynamic data integration
- Customizable styling options

MapLibre ArcGIS Plugin



developers.arcgis.com/maplibre-gl-js



github.com/Esri/maplibre-arcgis

MapLibre GL JS and ArcGIS

This guide covers how to build mapping applications with MapLibre GL JS and ArcGIS. It shows you how to use the [MapLibre ArcGIS plugin](#) and [ArcGIS REST JS](#) to access location services, data services, and the spatial analysis service.

What's in this guide

Learn how to

- Display basemap styles
- Create custom styles
- Migrate Mapbox apps and data
- Display feature, vector tile, and map tile data
- Geocode, route, and find places
- Perform mapping and analysis operations

- Easy access to ArcGIS:
 - Basemap Styles service
 - feature services
 - vector tile services

ArcGIS REST JS



developers.arcgis.com/arcgis-rest-js



github.com/Esri/arcgis-rest-js

Esri/arcgis-rest-js

compact, modular JavaScript wrappers for the
ArcGIS REST API



71
Contributors

386
Used by

3
Discussions

359
Stars

123
Forks

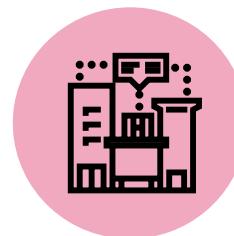
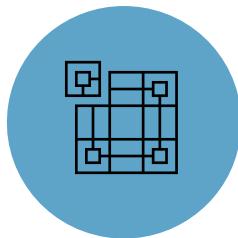
- Wrapper for ArcGIS REST APIs
- Module & promise-based
- No map component



MapLibre GL JS Demos

- 1) Simple map + styles
- 2) Feature layer
 - Querying
- 3) Vector tile layer
- 4) Data Enrichment

MapLibre GL JS Demos Takeaways



Demo 1: Simple Map + Styles

- Basemap - vector tiles
- Various styles

Demo 2: Feature Layer

- Querying

Demo 3: Vector Tile Layer

- Handle large datasets

Demo 4: Data Enrichment

- Gain location-based insights



Real-World Examples



Conclusions

Leaflet

Pros

- Lightweight, easy
- Many plugins

Cons

- Limited for large datasets
- Simple visualizations

MapLibre GL JS

Pros

- Large dataset handling
- vector basemaps

Cons

- Resource-intensive

Additional Resources

- Leaflet basemap styles providers
- Malmo's open data portal
- ArcGIS Hub (open data)
- Analysis Variable Finder
- Nominatim highlight plugin

Thank you, Øredev!

Courtney Yatteau

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 courtneyyatteau

 cyatteau



Please leave your feedback!



[github.com/cyattein/oredev25
-open-source-mapping](https://github.com/cyattein/oredev25-open-source-mapping)