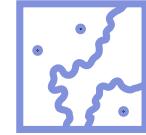


# A Developer's Guide to Open Source Web Mapping Libraries



Courtney Yatteau



# Courtney Yatteau

*Developer Advocate, Esri*



c\_yatteau



c\_yatteau

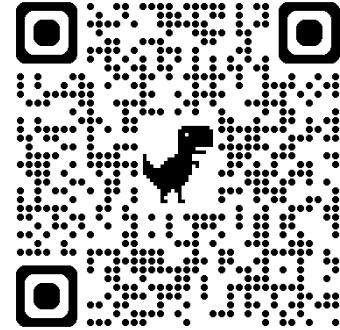


cyatteau



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*

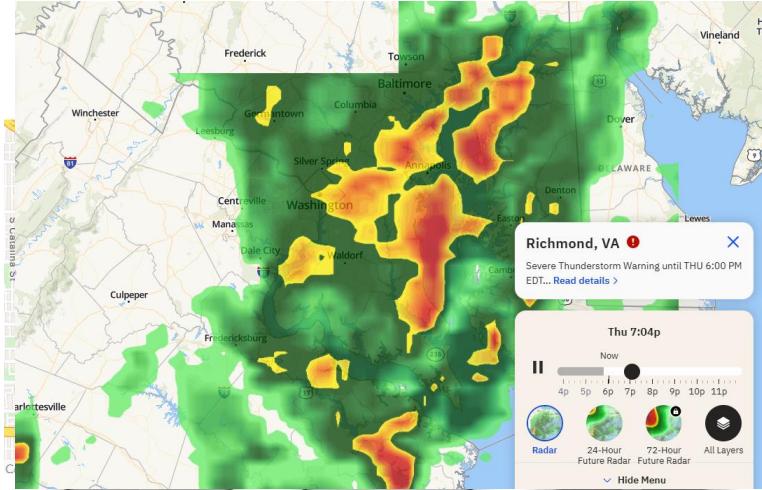
04

## Conclusions

*Real-world examples and summaries*

# Role of Mapping

01 Visualization 



02 Navigation 



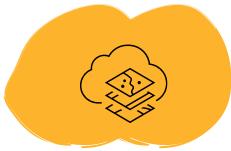
03 Communication 

04 Prediction 

# Key Web Mapping Concepts



**Basemaps**

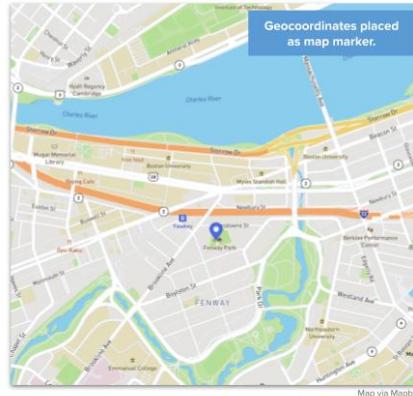


**Data Layers**



**Geocoding**

## Geocoding



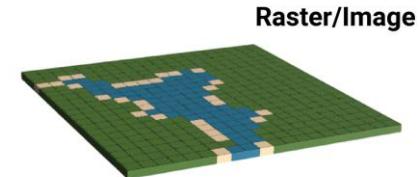
# Basemap Formats

## Raster Tiles

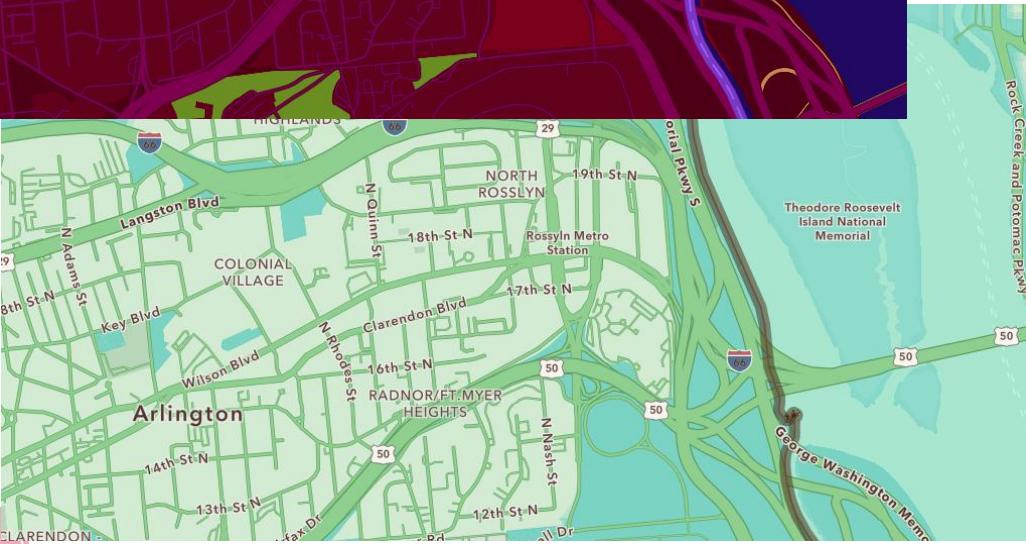
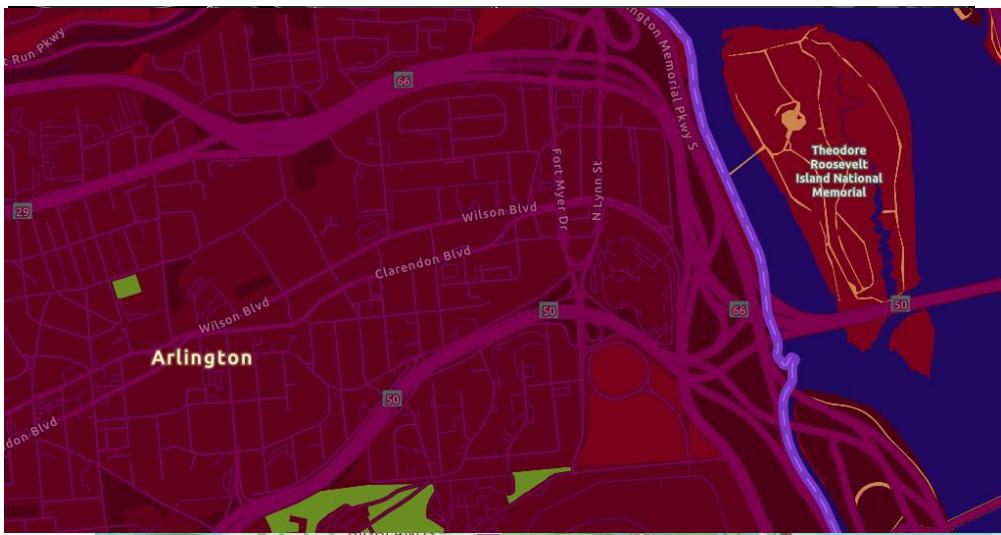
- Fixed look
- Quick and easy
- Reliable in low bandwidth

## Vector Tiles

- Customizable
- Smooth and interactive
- Efficient on various devices



# Basemap Styles



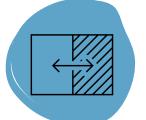
Streets



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

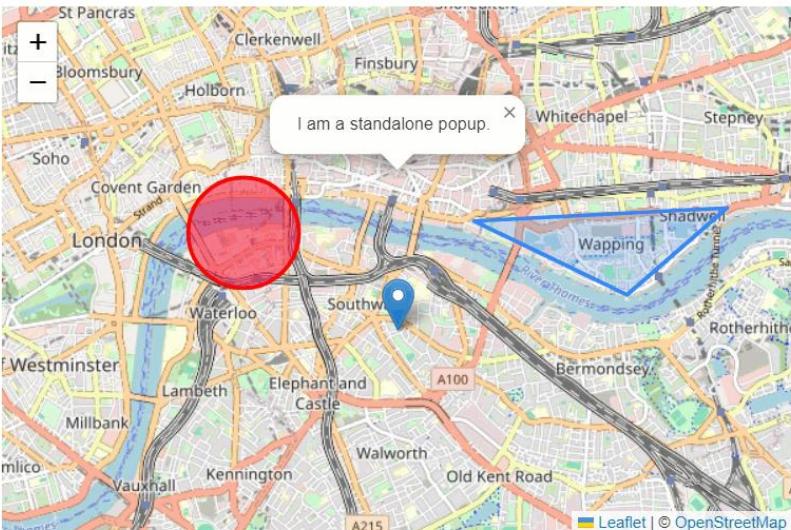
# Leaflet



[leafletjs.com](http://leafletjs.com)



[github.com/Leaflet](https://github.com/Leaflet)



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

# Esri Leaflet



[developers.arcgis.com/esri-leaflet](https://developers.arcgis.com/esri-leaflet)



[github.com/Esri/esri-leaflet](https://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](https://nominatim.openstreetmap.org)

[nominatim.org/release-docs/latest/api/Search](https://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, there's a sidebar with the heading 'Welcome to Nominatim' and a note about it being a debugging interface for the OpenStreetMap search engine. It includes links for 'More information' and 'OpenStreetMap website'. The main area features a world map with country boundaries. A blue circle highlights a specific location in North America. A small inset map in the bottom right corner shows the same location. A scale bar at the bottom left indicates distances of 3000 km and 2000 mi. The Leaflet and OpenStreetMap contributors logos are at the bottom right. A note at the bottom 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.' A copyright notice for OpenStreetMap contributors is at the very bottom.

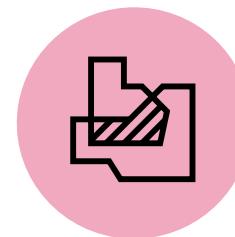
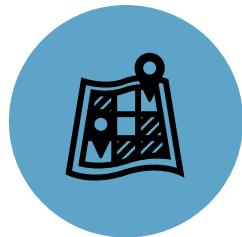
- Converts place names to coordinates
- Returns GeoJSON and metadata
- Used by many Leaflet plugins
- Free to use

# 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

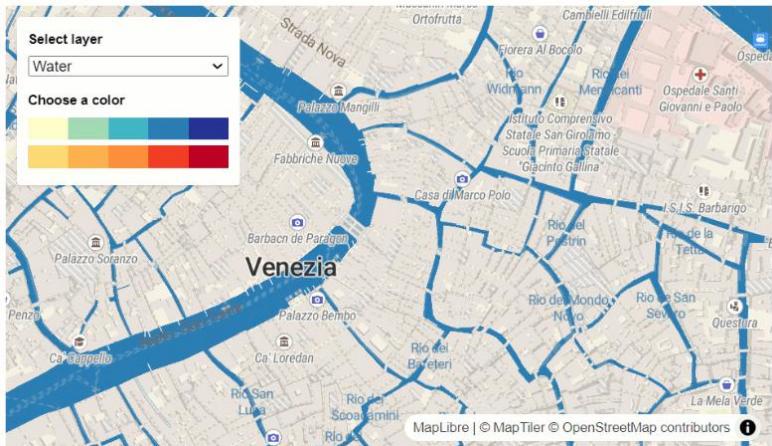
# MapLibre GL JS



[maplibre.org](https://maplibre.org)



[github.com/maplibre/maplibre-gl-js](https://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](https://developers.arcgis.com/maplibre-gl-js)



[github.com/Esri/maplibre-arcgis](https://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](https://developers.arcgis.com/arcgis-rest-js)



[github.com/Esri/arcgis-rest-js](https://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

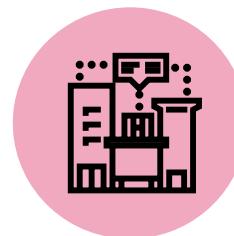
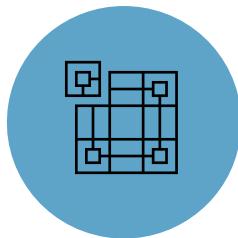
- Wrapper for ArcGIS REST APIs
- Module & promise-based
- No map component



# 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)