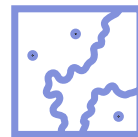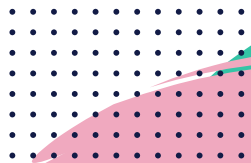# A Developer's Guide to Open Source Web Mapping Libraries

Courtney Yatteau

← Add to our audience map!

Add your name, choose pin and map style, then search for a location

Courtney Yatteau
Developer Advocate, Esri
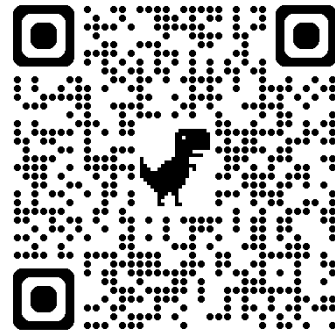
X c_yatteau

▶ c_yatteau

🦋 cyatteau

in courtneyyatteau

Agenda

github.com/cyatteau/oredev25-open-source-mapping

01

Intro to Mapping

Vocab, concepts, etc.

02

Web Mapping Libraries

Two different open source options

03
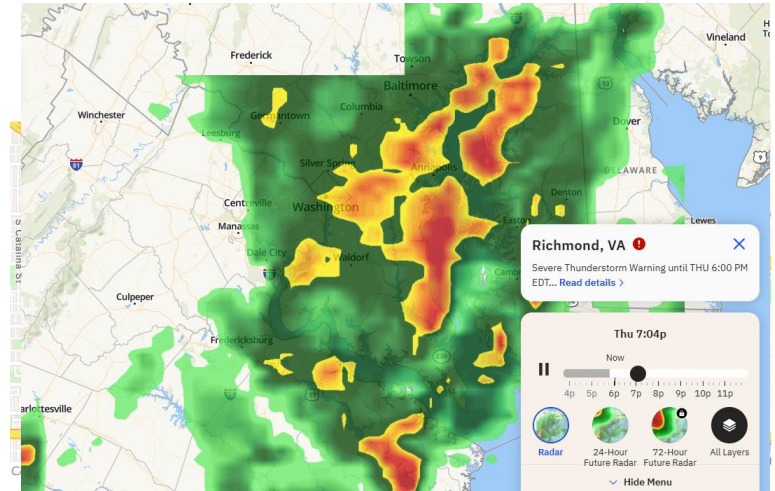
Other Library Integrations

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

"fenway park" | User inputs query

Fenway Park
4 Jersey St
Boston, MA
02215 | Address match

42.346454, -71.097347 | Address converted to geocoordinates

Geocoordinates placed as map marker.

Map via Mapbox

graphics
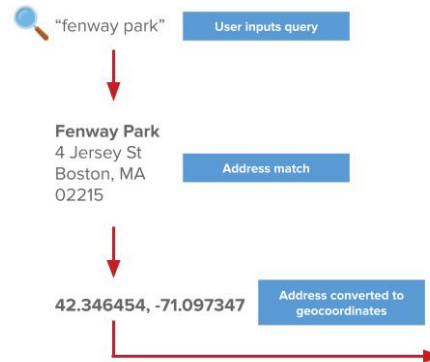
Basemap Formats

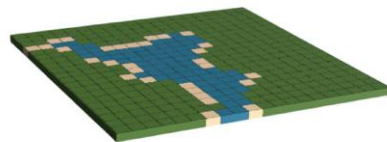Real World

Raster Tiles

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

Raster/Image

Vector Tiles

- Customizable
- Smooth and interactive
- Efficient on various devices
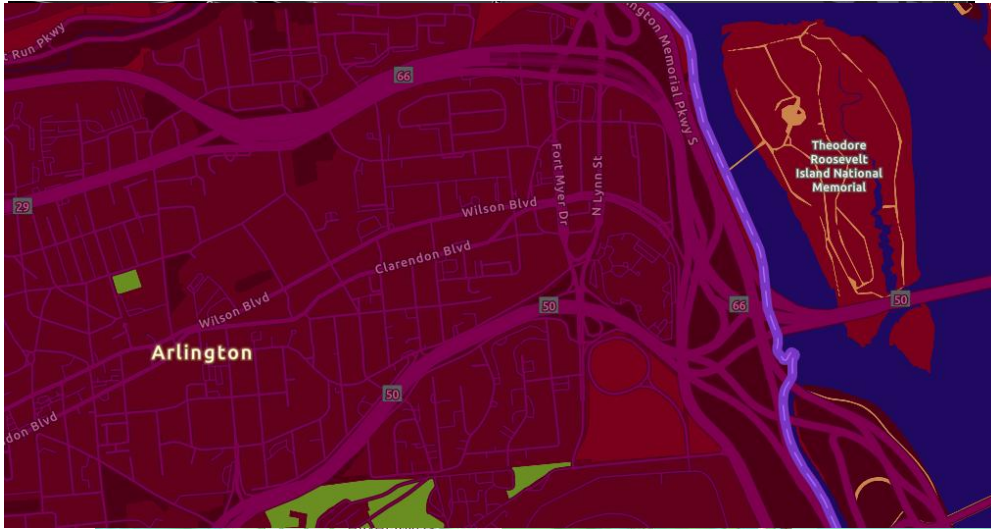

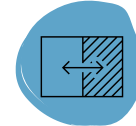Vector

Basemap Styles

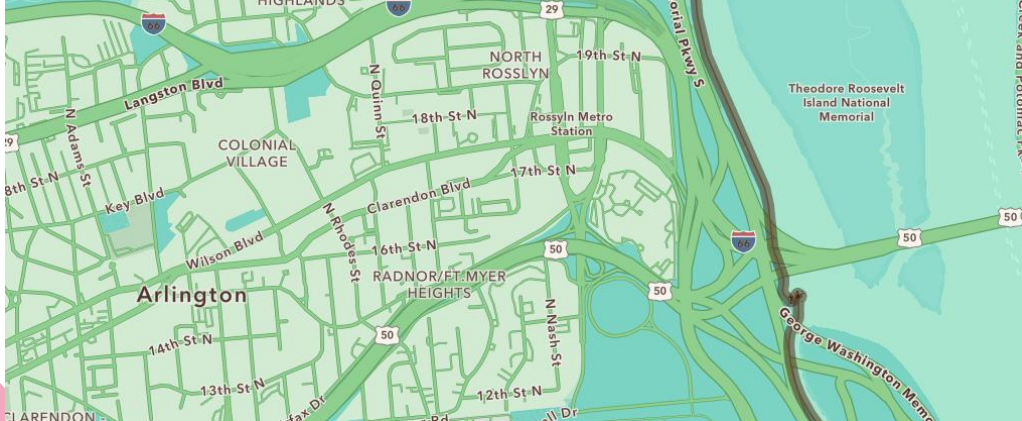**Streets**

Satellite Imagery

Terrain/ Topographic

Dark/Light Modes

Custom Themes

Data Layer Types

01 GeoJSON Layer

02 Esri Feature Layer

03 Vector Tile Layer

```json
{
  "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
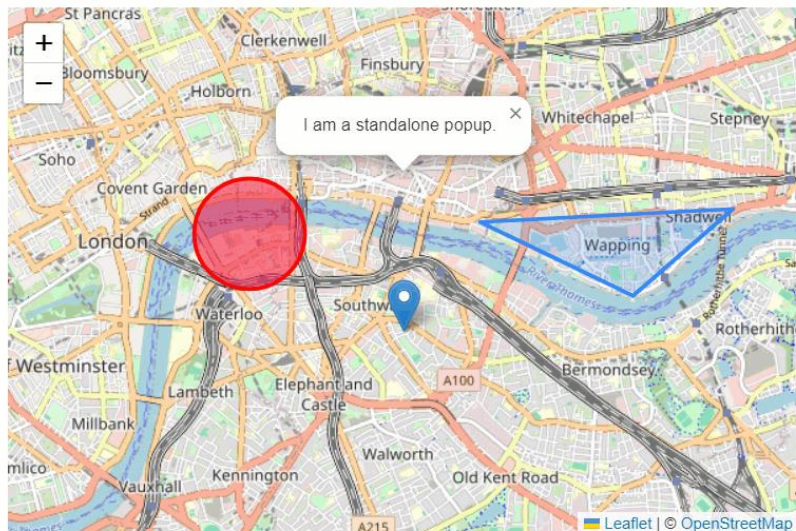- Customizable
- Web Mercator projection

Leaflet 🌿

- 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. 🚀

esri

👥 89
Contributors

📦 5k
Used by

⭐ 2k
Stars

🍴 795
Forks

- Seamless ArcGIS integration

- Developer-friendly

- Extensive Documentation

ArcGIS REST JS

💻 developers.arcgis.com/arcgis-rest-js   🧑‍💻 github.com/Esri/arcgis-rest-js

Esri/**arcgis-rest-js**

esri

compact, modular JavaScript wrappers for the
ArcGIS REST API

👥 71   ⬇ 386   💬 3   ⭐ 359   ⑂ 123
Contributors   Used by   Discussions   Stars   Forks

- Wrapper for ArcGIS REST APIs

- Module & promise-based

- No map component

Leaflet Demos

1) Simple map

2) GeoJSON layer

3) Feature layer

4) Feature layer Geosearch

5) Places Service

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
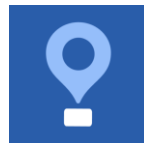
- Search with providers and set parameters

Demo 4: Places Service

- On-demand place search
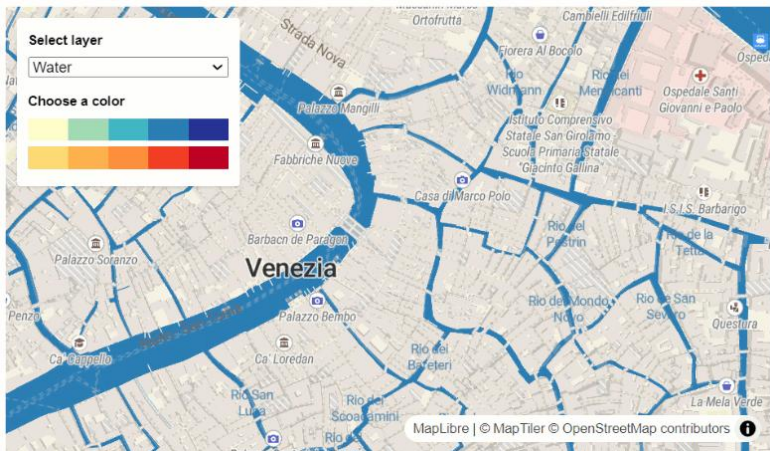- Near-point or extent

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
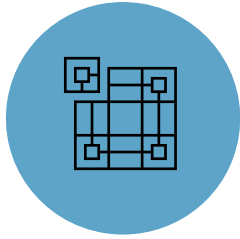- Perform mapping and analysis operations

- Easy access to ArcGIS:

  - Basemap Styles service

  - feature services

  - vector tile services

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

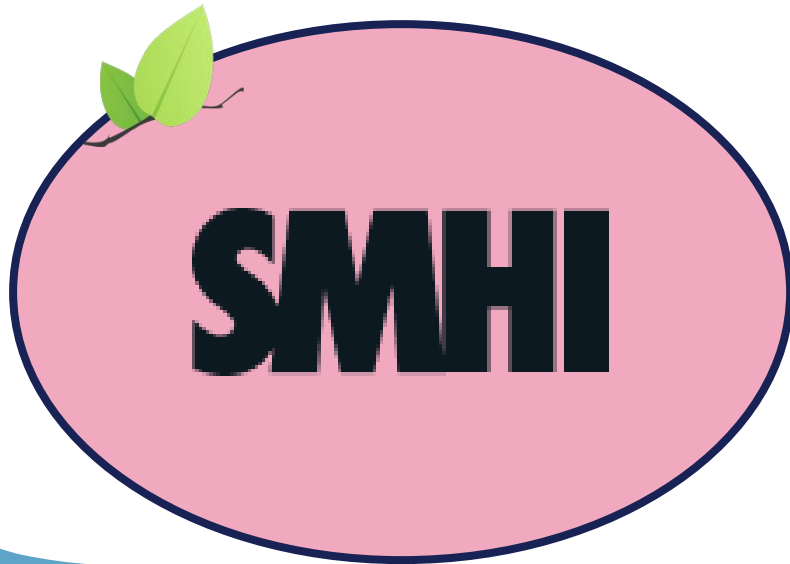**Demo 3: Vector Tile Layer**

- 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

Thank you, Øredev!

A Developer's Guide to Open Source Web Mapping Libraries

Please leave your feedback!

Courtney Yatteau

▶️ 𝕏 c_yatteau

in courtneyyatteau

🦋 cyatteau

github.com/cyatteau/oredev25 -open-source-mapping