

ESRI and Open Source

A Love Story

Presented by Bates Rambow



Open Source Software: What and Why?

What

- Software that has its source code published for anyone to inspect the source code.
- Generally released under a license that allows anyone to inspect, modify, and distribute the software.
- FOSS: Free Open Source Software. *Free as in speech, not as in beer.*

Why

- Lower cost
- Friendly licensing terms
- Control
- Crowdsourced development/bug fixes
- Innovation
- Sustainability

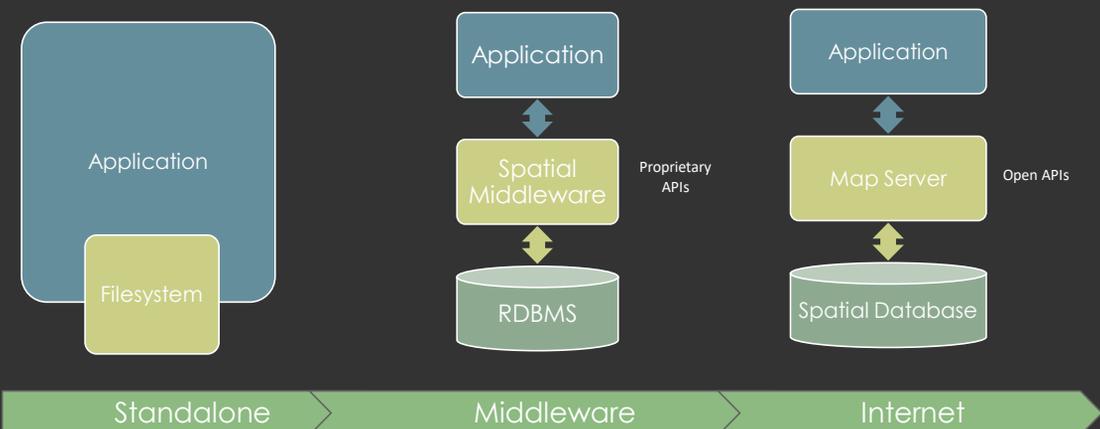
What is Open Source GIS?

There are a wide variety of free open source software for GIS (FOSS4G). Some popular ones include:

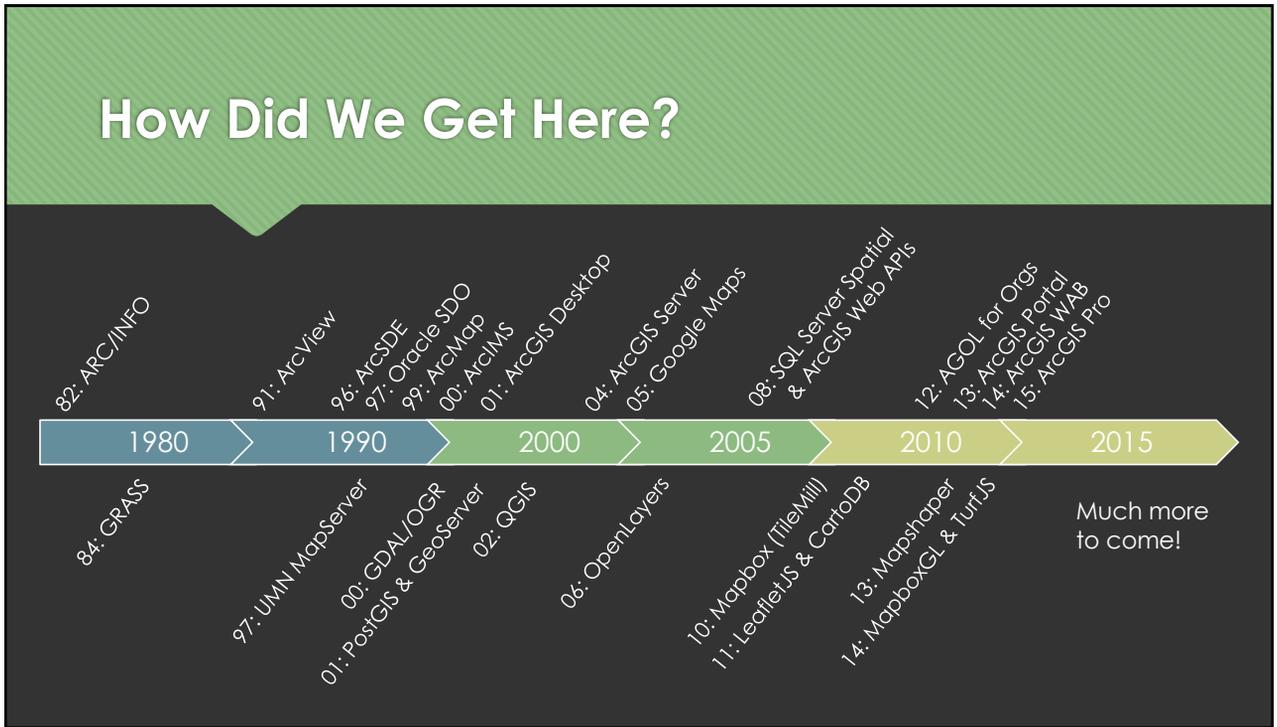
- **QGIS**: Cross Platform (!) Desktop GIS software
- **GDAL & OGR**: library with large selection of geospatial algorithms. Command line/programmatic execution.
- **Proj4**: projections library
- **PostGIS**: geospatial extension for PostgreSQL - an open source relational database management system similar to SQL Server.
- **Geoserver**: geospatial data server
- **OpenLayers** and **Leaflet**: web mapping JavaScript libraries
- Many more!



How Did We Get Here?



How Did We Get Here?



Should I Use Open Source GIS?

- Yes! You probably already are, even if you don't know it.
 - Example 1: GDAL is used for some raster operations in ArcGIS
 - Example 2: Web AppBuilder Widgets are open source
- Broader Skillset – Do you know GIS or do you know ESRI software?
- Ability to fix bugs yourself or add functionality that you want

ERROR 999999: Error executing function.

Can Open Source GIS Replace ESRI?

- Yes and no. It depends on your goals.
- CartoLab uses both on a regular basis.
- If you have a highly specialized workflow that depends on integration with other systems (e.g. AutoCAD, hydrologic models like InfoSWMM, asset management software like CityWorks) then Esri is almost certainly a better choice for Desktop GIS.
- If you do not have highly specialized workflows that require 3rd party software, or you are competent at developing and extending software yourself, then you may find that you can do what you need with FOSS4G software.

Open Source or ESRI?

One area where open source GIS software really shines is **web application development**.

Reasons:

- **Easier APIs** (opinion). In my experience, OL, Leaflet, and Mapbox have easier APIs for developers to understand and work with than Google Maps and ArcGIS JS.
- **More mature**. OpenLayers, the first open source web mapping JS API, was released 2 years before the first ArcGIS JS API. At the same time, ESRI released two additional web mapping APIs - Flex and Silverlight, meaning development and support of web APIs were fragmented. ESRI ended the lifecycle of the Flex and Silverlight APIs in 2016.
- **Better licensing**. Almost all web mapping platforms offer some sort of free tier when creating maps and apps for public use. The catch almost always comes when you want to build an application that has restricted access. At that point, a lot of platforms start charging fees. Esri has one of the most cost-prohibitive fee structures for building commercial applications that restrict access to the maps and data servers. A stack like PostGIS, GeoServer, and OpenLayers is free, even for commercial use.

It's Not a Fight!

- ESRI and FOSS4G offerings all have their own strengths and weaknesses.
- It's not about which is better
- It's about what tools are right for the job
- More important: can you move data and content between systems. INTEROPERABILITY
- Things that ESRI offers:
 - Many of the ESRI APIs and SDKs are open source
 - Liberal licensing that allows use of ESRI service with open source mapping libraries like Openlayers and Leaflet

ESRI's Open Vision

Open Standards

- member of OGC
- Esri software supports open formats and protocols like WMS, WFS

Data Interoperability

- Maps for AutoCAD
- Maps for MS Office

Open Data

- ArcGIS Hub
- ArcGIS Data Editor for OSM

Open APIs and Specs

- ArcGIS REST API
- File Geodatabase API
- Shapefile

Open Source

- over 300 open source projects on Github
- <https://esri.github.io/>

<https://www.esri.com/en-us/arcgis/open-vision/overview>

ArcGIS Online Assistant

ArcGIS Online Assistant

Search My Content

I want to...

Bates Rambow (bates@cartolab)

CartoLab -
<https://uscartolab.maps.arcgis.com/>

Current User: Bates Rambow (bates@cartolab) Refresh

Root 24

KBCAdvisors 25

SPS 5

- Copy Content
- View an Item's JSON
- Update the URLs of Services in a Web Map
- Update the URLs of Registered Apps and Services
- View My Stats
- Start Over

<https://ago-assistant.esri.com/>

ESRI Loader

- A tiny library to help load modules from either the 4.x or 3.x versions of the ArcGIS API for JavaScript in non-Dojo applications.
- Build UI with modern frameworks like React, Vue, Angular, etc.
- Improve initial load performance, especially on mobile
- Use the ArcGIS API in isomorphic/universal (server-rendered) applications
- <https://github.com/Esi/esri-loader>



ESRI Leaflet

- Lightweight set of tools for using ArcGIS Services with LeafletJS
- LeafletJS very popular among web developers for simple, easy to use API
- Not as full featured as ArcGIS JS API
- <https://esri.github.io/esri-leaflet/>

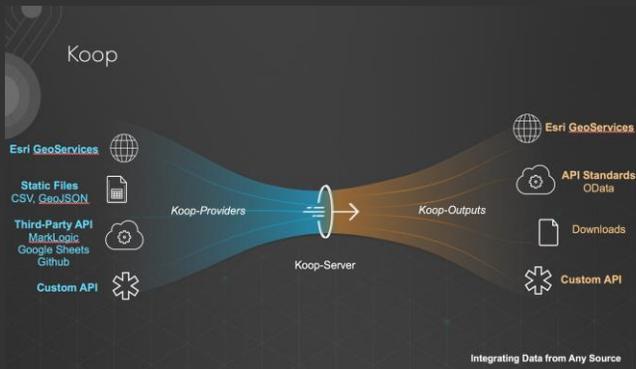


KoopJS

- Open Source Geospatial ETL (Extract Transform Load)
- Built with Javascript
- Converts variety of sources to GeoJSON, CSV, KML, Shapefile, & ArcGIS Feature Services
- Existing provider plugins for sources like Google Sheets, Github, ACS, Zillow, etc.
- <http://koop.dc.esri.com/>
- <https://koopjs.github.io/>



KoopJS

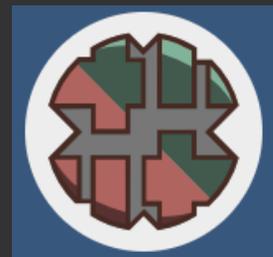


An experiment with Koop:

- An ArcGIS Feature Server backed by PostGIS, without ArcGIS Enterprise
- <https://github.com/brambow/koop-provider-postgis>

Terraformer

- Set of tools for working with geodata on the web
 - Core: Geojson geometry tools
 - GeoStores: create indexed, queryable GeoJSON data stores for browser or Node.js backend
 - ArcGIS Parser
 - WKT Parser



ESRI REST API

- ESRI's licensing allows developers with a paid plans to use ESRI REST Services in applications built with tools like OpenLayers and Leaflet.
- Can take advantage of ESRI tools without building apps using the ESRI frameworks.
- Open source JS wrapper library available for ease of integration into JS projects
- <https://developers.arcgis.com/rest/>


 A logo consisting of the word "REST" in a bold, blue, sans-serif font, enclosed within large, light blue curly braces.

Terraformer + REST API Example

Use Case:

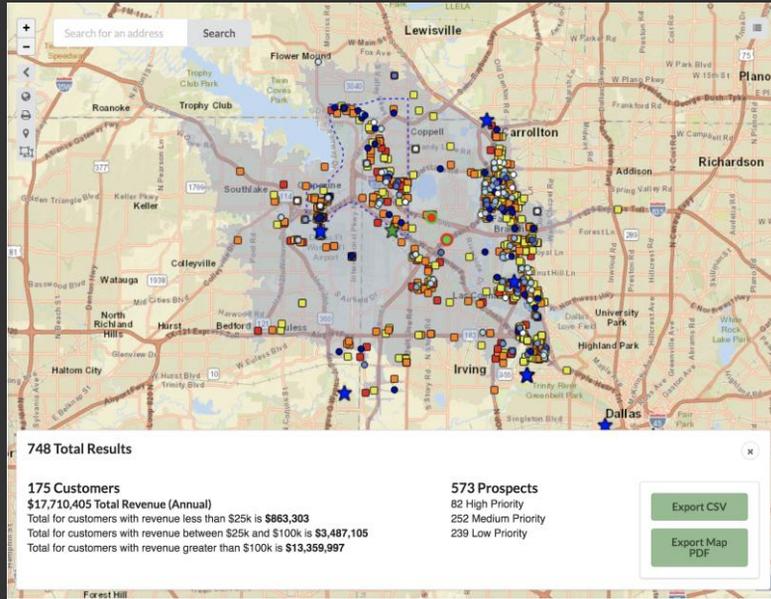
- Web mapping application built with OpenLayers, needs ability to generate service areas dynamically.
- Uses the ArcGIS REST API endpoint for Service Areas, which returns geometries in the EsriJSON (aka ArcGIS JSON) format.
- Example of using Terraformer in a NodeJS API to convert EsriJSON to GeoJSON, which is readable by OpenLayers.

```
//proxy api for ESRI Drive Time service
app.get('/drive-times', (req, res) => {
  var facilities = req.query.location;
  var defaultBreaks = req.query.time;

  //get the client token
  request.post(
    {
      url: 'https://www.arcgis.com/sharing/rest/oauth2/token/',
      json: true,
      form: {
        f: 'json',
        client_id: 'Your id goes here',
        client_secret: 'Your ArcGIS Developer account secret goes here',
        grant_type: 'client_credentials'
      }
    },
    function(error, response, body) {
      if (error) {
        console.log(error);
      } else {
        var token = body.access_token;

        var url =
          'http://route.arcgis.com/arcgis/rest/services/World/ServiceAreas/NA/Server/ServiceArea_World/solveServiceArea?token=${token}&facilities=${facilities}&defaultBreaks=${defaultBreaks}&travelDirection=esriNATravelDirectionToFacility&f=json';

        axios.get(url).then(function(response) {
          var responseFeatures = response.data.saPolygons.features;
          if (responseFeatures.length > 0) {
            var esriJson = responseFeatures[0];
            var geojson = terraformerArcGIS.parse(esriJson); //Terraformer used right here
            res.json(geojson);
          } else {
            console.log('no data returned!');
          }
          console.log(response.data.saPolygons.features[0]);
        });
      }
    }
  );
});
```



Thank You!

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