

Lesson 11: Sharing Geographic Information on the Web: GeoWeb Mapping

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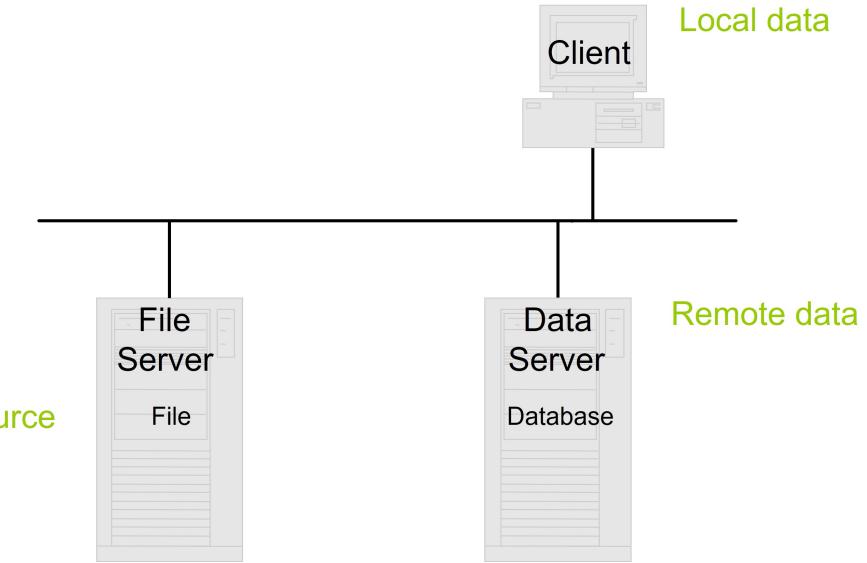
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Content

- Motivation of GeoWeb Mapping
- History of GeoWeb Mapping
- Fundamental of GeoWeb Mapping
- GeoWeb Mapping Protocols
- GeoWeb Mapping software
- GeoWeb Mapping 2.0

Motivation: Sharing geographic information

- Three possible ways to share geographic data.
- Web GIS allows data to be shared over the Web



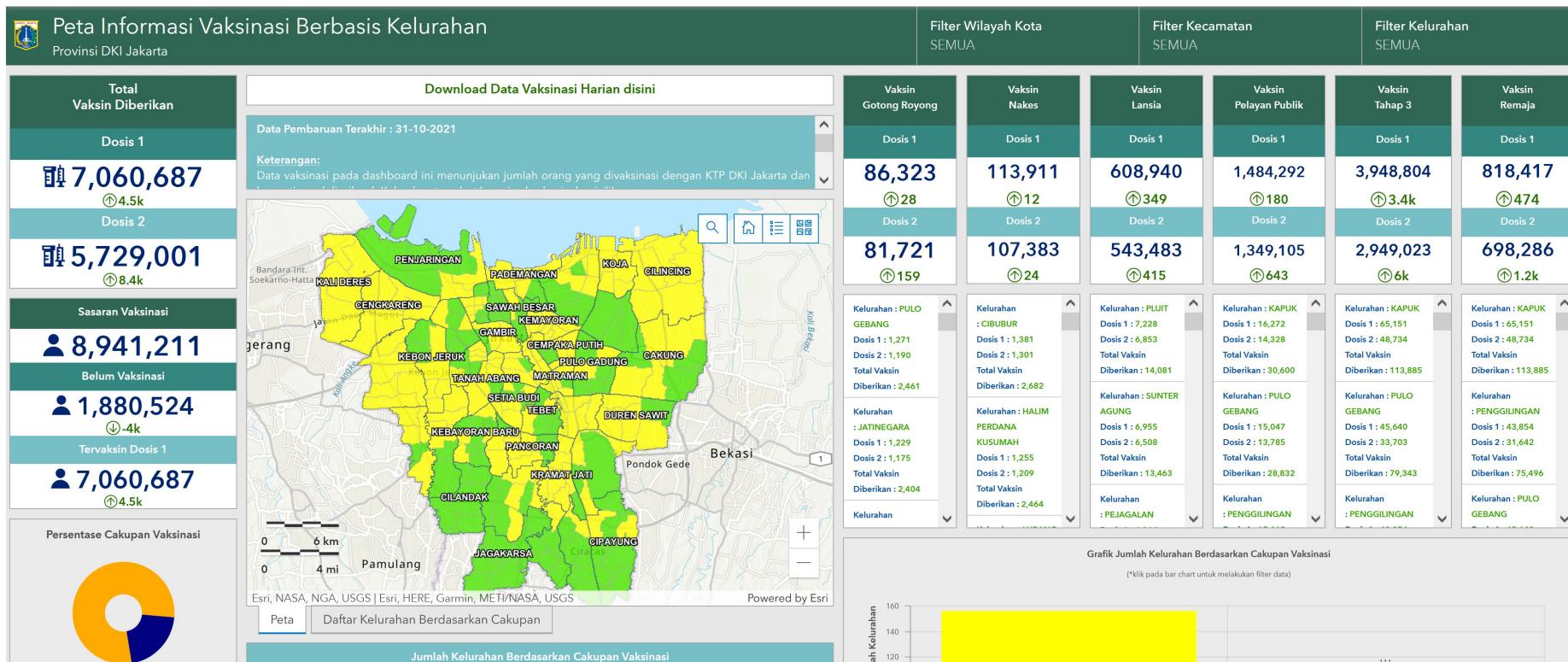
Motivation: Isolated Island

- Duplication
- Limited sharing
- Poor access
- No mobility
- High cost



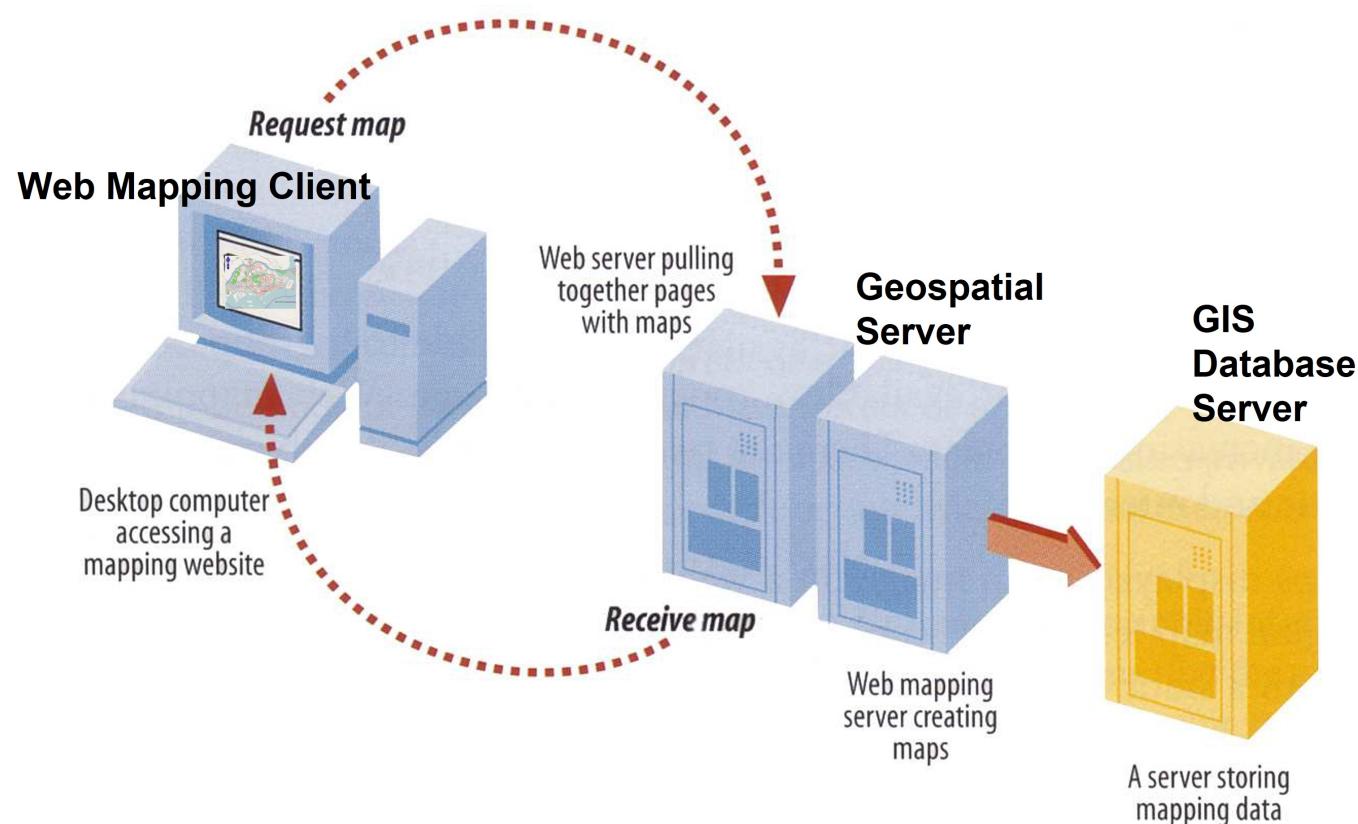
GeoWeb Mapping in Action

- An interesting **GeoWeb** create by our neighbour country for sharing COVID-19 vaccination information.



How A GeoWeb Mapping Service Works

- Client-server architecture

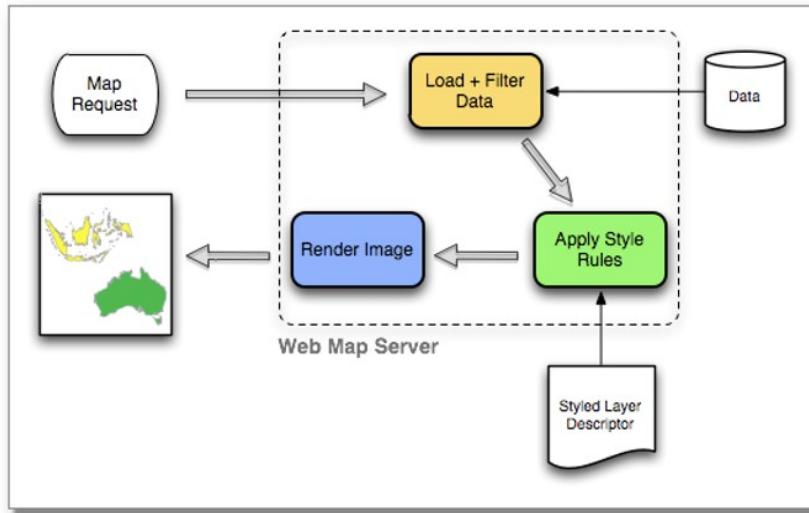


GeoWeb Mapping Protocols

- Web Map Service (WMS)
- Web Feature Service (WFS)
- Extensible Markup Language (XML)
- Geography Markup Language (GML)
- Keyhole Markup Language (KML)

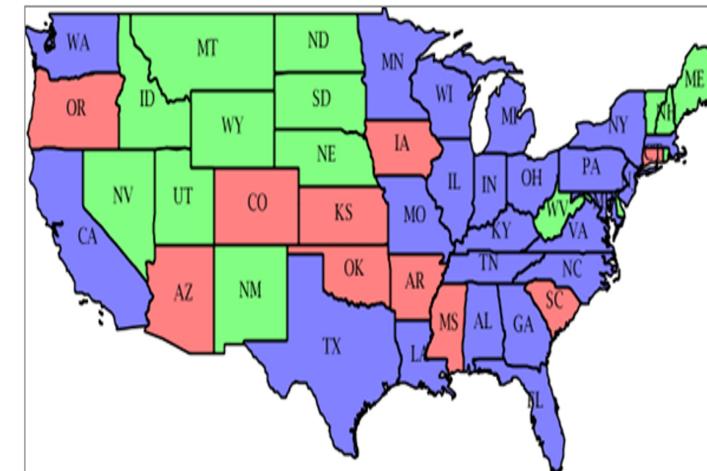
Web Map Service (WMS)

- A standard protocol for serving georeferencing map images generated by a map server.
- An example of WMS request.



Source: http://en.wikipedia.org/wiki/Web_Map_Service and <http://server.arcgis.com/en/server/latest/publish-services/linux/communicating-with-a-wms-service-in-a-web-browser.htm#GUID-EF5721D1-C928-447A-8EA5-5AF60FFE2EFC>

```
http://demo.opengeo.org/geoserver/wms?
SERVICE=WMS&
VERSION=1.1.0&
REQUEST=GetMap&
LAYERS=topp:states&
SRS=EPSG:4326&
BBOX=-124.731,24.956,-66.97,49.372&
FORMAT=image/png&
STYLES=&
WIDTH=600&
HEIGHT=255
```



An example of WFS request

```
http://demo.opengeo.org/geoserver/wfs?  
SERVICE=wfs&  
VERSION=1.1.0&  
REQUEST=GetFeature&  
TYPENAME=topp:states&  
FEATUREID=states.39
```

```
- <wfs:FeatureCollection numberOfFeatures="1" timeStamp="2010-06-29T16:34:42.179-04:00" xsi:schemaLocation="http://www.openplans.org/topp  
http://demo.opengeo.org/geoserver/wfs?service=WFS&version=1.1.0&request=DescribeFeatureType&typeName=topp%3Astates http://www.opengis.net/wfs  
http://demo.opengeo.org/geoserver/schemas/wfs/1.1.0/wfs.xsd">  
- <gml:boundedBy>  
- <gml:Envelope srsName="urn:x-ogc:def:crs:EPSG:4326">  
  <gml:lowerCorner>40.505898 -79.763466</gml:lowerCorner>  
  <gml:upperCorner>45.0061 -71.870476</gml:upperCorner>  
  </gml:Envelope>  
</gml:boundedBy>  
- <gml:featureMembers>  
- <topp:states gml:id="states.39">  
- <gml:boundedBy>  
- <gml:Envelope srsName="urn:x-ogc:def:crs:EPSG:4326">  
  <gml:lowerCorner>40.505898 -79.763466</gml:lowerCorner>  
  <gml:upperCorner>45.0061 -71.870476</gml:upperCorner>  
  </gml:Envelope>  
- <gml:the_geom>  
- <gml:MultiSurface srsName="urn:x-ogc:def:crs:EPSG:4326">  
- <gml:surfaceMember>  
- <gml:Polygon>  
- <gml:exterior>  
- <gml:LinearRing>  
- <gml:posList>  
  42.267269 -79.763466 42.41930400000001 -79.44252 42.493404 -79.355118 42.574557999999996 -79.142471  
  42.69187999999999 -79.04391 42.792686 -78.859444 42.974174000000005 -78.93679 43.022301 -78.883034  
  43.06657000000001 -78.925835 43.09054900000001 -79.061348 43.14468400000001 -79.039558 43.26816199999999  
  -79.062469 43.371937 -78.464905 43.36551299999999 -77.992271 43.33510999999986 -77.745277 43.24148600000001  
  -77.575989 43.27565000000001 -77.377602 43.27852999999999 -76.914841 43.34266700000006 -76.737152  
  43.32337599999999 -76.718796 43.414085 -76.619957 43.500652 -76.454994 43.55408499999986 -76.223114 43.633129  
  -76.184921 43.68263200000001 -76.206017 43.83506399999999 -76.240341 43.91243 -76.194069 43.93214800000001  
  -76.129417 44.013172 -76.134872 44.06554399999999 -76.201889 44.04196200000001 -76.297226 44.09830999999999  
  -76.363213 44.390269 -75.942351 44.51747408899999 -75.758972 44.91657000000001 -75.329201 44.942532 -74.969219
```

Keyhole Markup Language (KML)

- KML is an XML notation for expressing geographic annotation and visualization within Internet-based, two-dimensional maps and three-dimensional Earth browsers.

For more information: [Keyhole Markup Language@wiki](#) and [Google mapping spec](#) now an industry standard.

```
<?xml version="1.0" encoding="UTF-8"?>
<kml xmlns="http://www.opengis.net/kml/2.2">
<Document>
<Placemark>
  <name>New York City</name>
  <description>New York City</description>
  <Point>
    <coordinates>-74.006393,40.714172,0</coordinates>
  </Point>
</Placemark>
</Document>
</kml>
```

Geography Markup Language (GML)

- GML is the XML grammar defined by the Open Geospatial Consortium (OGC) to express geographical features.
- It serves as a modeling language for geographic systems as well as an open interchange format for geographic transactions on the Internet.

```
<gml:Polygon>
  <gml:outerBoundaryIs>
    <gml:LinearRing>
      <gml:posList>0,0 100,0 100,100 0,100 0,0</gml:posList>
    </gml:LinearRing>
  </gml:outerBoundaryIs>
</gml:Polygon>
<gml:Point>
  <gml:posList>100,200</gml:posList>
</gml:Point>
<gml:LineString>
  <gml:posList>100,200 150,300</gml:posList>
</gml:LineString>
```

For more information, refer to this [link](#)

Geospatial Server Software

Commercial off-the-shelf (COS)



MapInfo.

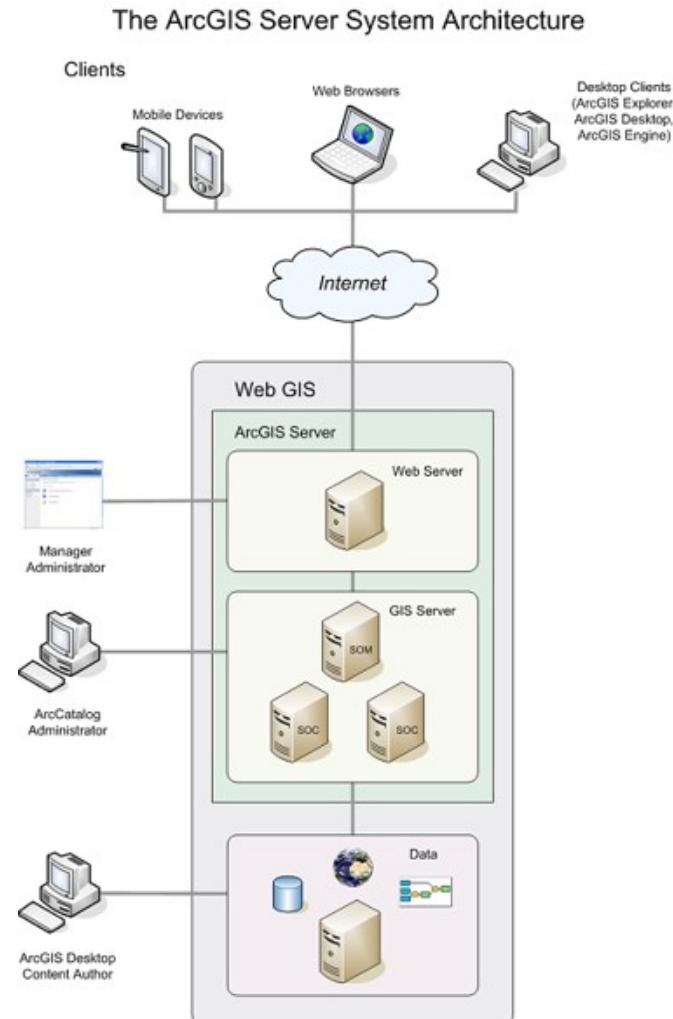


Open Source



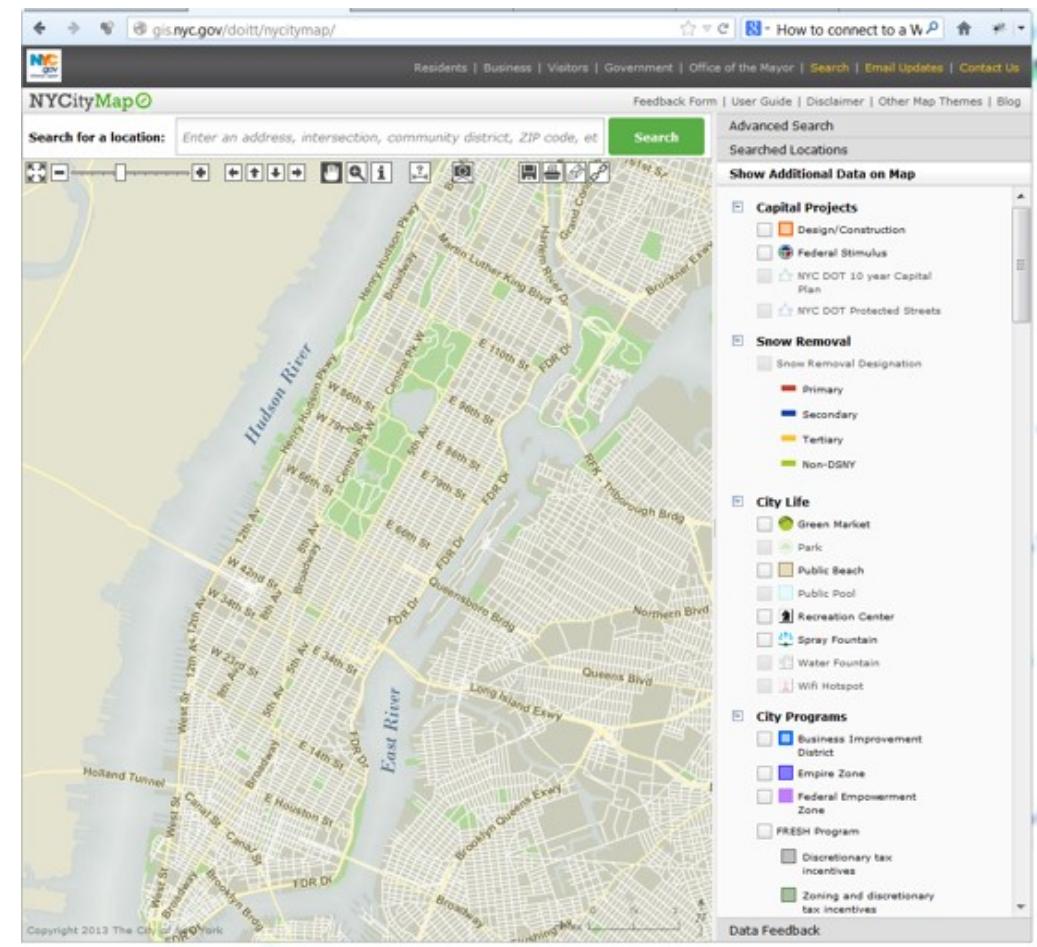
ArcGIS Server (ESRI)

- A back-end server software component of ArcGIS Enterprise that makes your geographic information available to others in your organization and, optionally, anyone with an internet connection.
- This is accomplished through GIS services, which allow a server computer to receive and process requests for information sent by other devices.
- To learn more, click on this [link](#)



GeoServer

- Java-based software server that allows users to view and edit geospatial data.
- Designed for interoperability, it publishes data from any major spatial data source using open standards.
- Use free and open source software
- Integrate with existing mapping APIs such as Google Map, Yahoo Map, and Microsoft Bing Map.
- To learn more, click on this [link](#).



- To visit the site, click on this [link](#).

Deficiencies of conventional web mapping

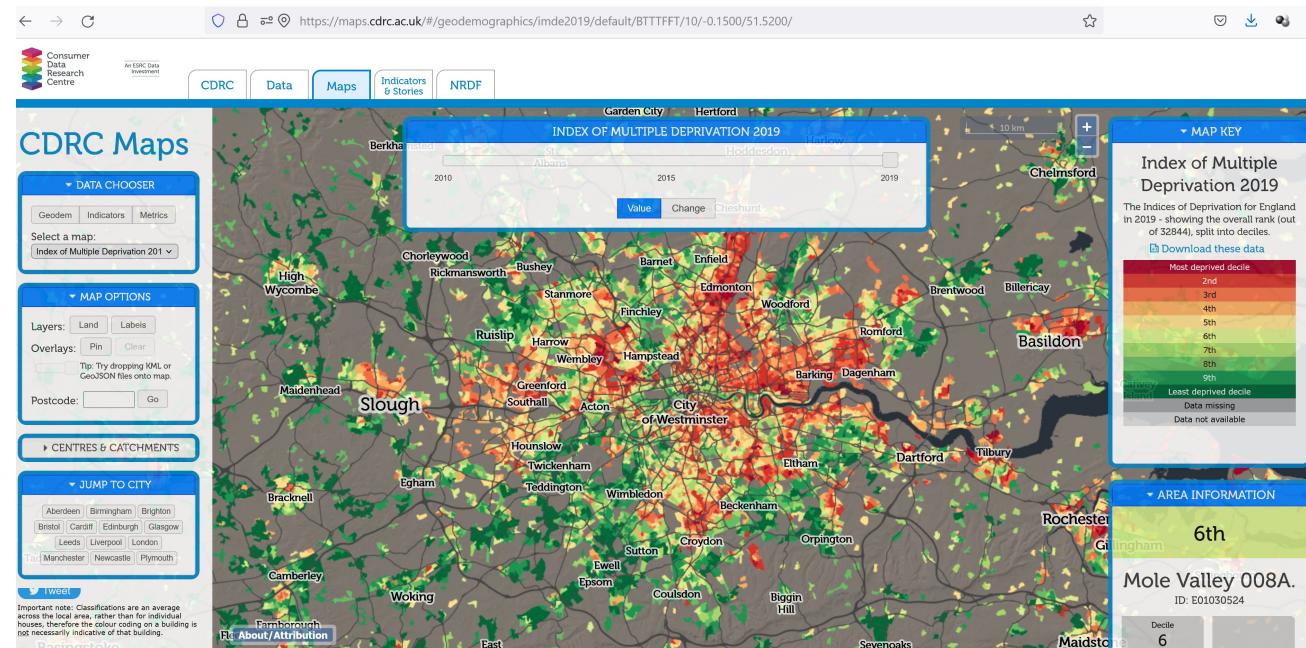
- Extremely high investment cost of backend server technologies, especially the COS system.
- Data rich, content poor
- Poor usability
- Low client side capability
- Platform incompatibilities

GeoWeb Mapping evolution

- Impact of Rich Internet Application (RIA)

OpenLayer

- An open source (provided under a modified BSD license) JavaScript library for displaying map data in web browsers.
- To find out more including download, click on this [link](#) and a collection of [Awesome OpenLayer](#).

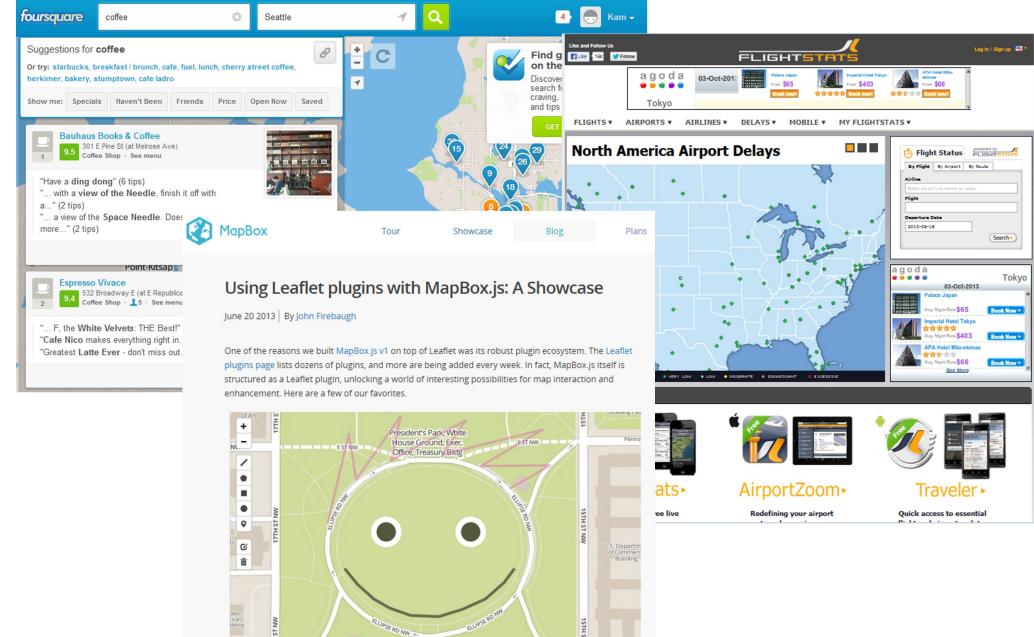


The site [link](#).

Leaflet: JavaScript GeoWeb Mapping APIs

- An open-source (BSD license) JavaScript library for mobile-friendly interactive maps. (<https://leafletjs.com/>)
- It helps you bring geospatial data to life using HTML5, SVG and CSS, no plugin is required.
- It can be used with almost any online map including proprietary tile servers.
- Weighing just about 31 KB of JS, it has all the features most developers ever need for online maps including mobile.
- To learn more and download, click on this [link](#).

- Who use Leaflet?



qgis2web plug-in

- qgis2web generates a web map from your current QGIS project, either as OpenLayers, Leaflet, or Mapbox GL JS.
- It replicates as many aspects of the project as it can, including layers, styles (including categorized and graduated), and extent.
- No server-side software required.
- To learn more, click on this [link](#).

