

Geography 485L/585L - Internet Mapping

Karl Benedict

Spring 2018

Week 11 - Module 2b - OpenLayers Javascript Framework

Overview

- More detailed Map Object Options
- More detailed Layer Object Options
- Additional Map Layer Types - With Examples

Map Object Options

- Map Object Options [API Reference](#)
- View Object Options [API Reference](#)
- Layer Object Options
 - `ol.layer.Tile` [API Reference](#)
 - `ol.layer.Image` [API Reference](#)
 - `ol.layer.Vector` [API Reference](#)
 - `ol.layer.VectorTile` [API Reference](#)
 - `ol.layer.Heatmap` [API Reference](#)

A variety of strategies for constructing a new `OpenLayers.Map` object

```
1 // create a map with minimum required elements and default
2 // options in an element with the id "map1"
3 var myMap = new ol.Map({
4     target: 'map1',
5     // a map without layers can be defined and in that case a map with no layers
6     // will be rendered
7     layers: [
8         new ol.layer.Tile({
9             source: new ol.source.OSM()
10        })
11    ],
12    view: new ol.View({
13        center: ol.proj.fromLonLat([-106.624083, 35.08427]),
14        zoom: 18
15    })
16 });
```

```

17
18
19 // create a map with options specified in a separate 'options' variable and
20 // included by reference in the code to create the new map object
21 var options = {
22     // required options
23     target:'map2',
24     layers: ...,
25     view: ...,
26
27     // optional options - only include those that you need
28     controls: ...,
29     pixelRatio: ...,
30     interactions: ...,
31     keyboardEventTarget: ...,
32     loadTilesWhileAnimating: ...,
33     loadTilesWhileInteracting: ...,
34     logo: ...,
35     overlays: ...,
36     renderer: ...
37 };
38 var map = new ol.Map(options);
39
40 // map with non-default options - same as above but with a single argument
41 var map = new ol.Map({
42     // required options
43     target:'map2',
44     layers: ...,
45     view: ...,
46
47     // optional options - only include those that you need
48     controls: ...,
49     pixelRatio: ...,
50     interactions: ...,
51     keyboardEventTarget: ...,
52     loadTilesWhileAnimating: ...,
53     loadTilesWhileInteracting: ...,
54     logo: ...,
55     overlays: ...,
56     renderer: ...
57 });
58
59 // the following commands can be executed to add, set or remove the layers in a map
60 // after a map object has been created
61
62 map.addLayer(layer)
63 map.removeLayer(layer)
64 map.setLayerGroup(layerGroup)
65
66 // the view of a layer can be created or modified after the map object has been
67 // created by using the following command
68
69 map.setView()
70

```

```

71 // the target DOM object for the map object can be set or changed using
72 // the following command
73
74 map.setTarget

```

Layer Object Options

Layer Types and a subset of sources for each type

- `ol.layer.Image` - a single map image is rendered for this layer type
 - `ol.source.ImageMapGuide` - [API](#) source is a [MapGuide](#) server hosting data of interest.
 - `ol.source.ImageStatic` - [API](#) source renders a specified static image file within a specified extent within the map.
 - `ol.source.ImageWMS` - [API](#) source retrieves a single map image from the specified OGC Web Map Service (WMS).
 - `ol.source.ImageArcGISRest` - [API](#) source retrieves a single map image from the specified ArcGIS REST service.
- `ol.layer.Tile` - map images in a tiled grid are rendered for this layer type
 - `ol.source.TileArcGISRest` - [API](#) source is an ArcGIS REST map or image service
 - `ol.source.TileWMS` - [API](#) source is an OGC Web Map Service (WMS)
 - `ol.source.WMTS` - [API](#) source is an OGC Web Map Tile Service ([WMTS](#))
- `ol.layer.VectorTile` - map content is delivered vector data that has been divided into a tile grid and cannot be edited
 - `ol.source.VectorTile` - [API](#) source delivers vector data tiles for rendering in the client
- `ol.layer.Vector` - map content is delivered as vector data that is rendered by the client and may be edited within the client
 - `ol.source.Vector` - [API](#) the source for vector feature(s) that constitute a vector layer. The individual features are [ol.Feature](#) objects that consist of at least one [geometry](#), or a [collection](#) of geometries and any additional attributes that are associated with each feature.

Common Pattern of [Layer Object](#) Creation (varies some depending upon the specific layer type)

```

1 var layer = new ol.layer.***({
2   source: new ol.source.***({
3     ...
4   }),
5   other options ...
6 })

```

Additional Map and Layer Object Functions & Events

Both Map and Layer Objects have a number of associated functions as well

- Retrieving object properties programmatically with **Get** functions.
- Modifying existing object properties with **Set** functions
- Map destruction, and reconfiguration
- Linkage of object events with Javascript functions

WMS Layer Configuration

Some key issues to be aware of when using the two WMS supporting layers (`ol.layer.Tile`, and `ol.layer.Image`) and their associated WMS sources (`ol.source.TileWMS` and `ol.source.ImageWMS` respectively) include:

- The *projection* of the map object must be supported by the included WMS service (review the WMS GetCapabilities response to see what projections are supported by the service). If you don't specify a **projection** parameter as part of the map object's **view** property a default *Web Mercator* (EPSG:3857) projection is used for the map. Information about how to define and set map projections in OpenLayers is found [here](#)
- The *layers* parameter as part of the **params** option must be provided as part of the server-related property list (the layer names may also be found in the GetCapabilities response)
- Other WMS parameters (again as part of the **params** option) may be provided as well to "adjust" the request automatically generated by OpenLayers
- Use of a tiled WMS may produce unwanted repetition of labels included in the WMS. If that is the case you can use a single-image `ol.layer.Image` layer type to allow the WMS server to handle the distribution of layers across the entire map image instead of including them in each individual map image.

Sample WMS Layer Object Creation

```
1  // OpenLayers_03_wms.js
2
3  ///////////////////////////////////////////////////////////////////
4  // define layer objects
5
6  var basemap_tiled = new ol.layer.Tile({
7      source: new ol.source.TileWMS({
8          url: 'https://basemap.nationalmap.gov/arcgis/services/USGSTopo/MapServer/WmsServer?',
9          params: {
10              LAYERS: 0,
11              FORMAT: 'image/png',
12              TRANSPARENT: true
13          },
14          attributions: [
15              new ol.Attribution({
16                  html: 'Data provided by the <a href="http://basemap.nationalmap.gov">National Map</a>.'
17              })
18          ]
19      })
20  })
21
22  var basemap_single = new ol.layer.Image({
23      source: new ol.source.ImageWMS({
24          url: 'https://basemap.nationalmap.gov/arcgis/services/USGSTopo/MapServer/WmsServer?',
25          params: {
26              LAYERS: 0,
27              FORMAT: 'image/png',
28              TRANSPARENT: true
29          },
30          attributions: [
31              new ol.Attribution({
```

```

32         html: 'Data provided by the <a href="http://basemap.nationalmap.gov">National Map</a>.'
33     })
34 ]
35 })
36 })
37
38 var states_single = new ol.layer.Image({
39     source: new ol.source.ImageWMS({
40         attributions: new ol.Attribution({
41             html: 'State Boundary Restructured - USGS, National Atlas Release 5-14-12'
42         }),
43         params: {'LAYERS': 'global:statep010'},
44         url: 'http://mapper.internetmapping.net:8081/geoserver/global/wms?',
45         serverType: 'geoserver'
46     })
47 })
48
49 var states_tiled = new ol.layer.Tile({
50     source: new ol.source.TileWMS({
51         attributions: new ol.Attribution({
52             html: 'State Boundary Restructured - USGS, National Atlas Release 5-14-12'
53         }),
54         params: {'LAYERS': 'global:statep010'},
55         url: 'http://mapper.internetmapping.net:8081/geoserver/global/wms?',
56         serverType: 'geoserver'
57     })
58 })
59
60
61
62 ///////////////////////////////////////////////////////////////////////////////////////////////////////////////////////////////////
63 // create our base map objects
64 var singleMap = new ol.Map({
65     target: 'map_image',
66     layers: [basemap_single, states_single], //[basemap_single, states_single]
67     view: new ol.View({
68         // the approximate geographic center of the continental US
69         center: ol.proj.fromLonLat([-98.58, 39.83]),
70         zoom: 3,
71         projection: 'EPSG:3857'
72     })
73 });
74
75
76 var tiledMap = new ol.Map({
77     target: 'map_tiled',
78     layers: [basemap_tiled, states_tiled], //[basemap_tiled, states_tiled]
79     view: new ol.View({
80         // the approximate geographic center of the continental US
81         center: ol.proj.fromLonLat([-98.58, 39.83]),
82         zoom: 3,
83         projection: 'EPSG:3857'
84     })
85 });

```

```

86
87 var mixedMap = new ol.Map({
88     target: 'map_mixed',
89     layers: [basemap_tiled,states_single], //[basemap_tiled,states_single]
90     view: new ol.View({
91         // the approximate geographic center of the continental US
92         center: ol.proj.fromLonLat([-98.58,39.83]),
93         zoom: 3,
94         projection: 'EPSG:3857'
95     })
96 });
97
98 //////////////////////////////////////////////////////////////////////////////////////////////////////////////////////////////////

```

Example: [HTML](#), [Javascript](#)

Vector Layer Configuration

Vector layers support

- External Data in a Variety of supported [formats](#) for both *reading* and *writing* (just a sample): [GML 2](#) and [GML 3](#), [GPX](#), [GeoJSON](#), [KML](#), [WFS](#), [WKT](#), [Open Streetmap XML](#)
- Directly encoded [geometries](#): Circle, Geometry, GeometryCollection, LinearRing, LineString, MultiLineString, MultiPoint, MultiPolygon, Point, Polygon, SimpleGeometry
- User created features, including support for interactive editing of features
- [Styling](#) of Vector features

Sample Point Feature Object creation

```

1 var classroomCoord = [-106.624073,35.084280]
2 var officeCoord = [-106.624899,35.084506]
3
4 var classroomPoint = new ol.geom.Point(ol.proj.fromLonLat(classroomCoord, projection));
5 var officePoint = new ol.geom.Point(ol.proj.fromLonLat(officeCoord, projection));

```

Sample KML Layer Object creation with style

```

1 //////////////////////////////////////////////////////////////////////////////////////////////////////////////////////////////////
2 // define some styles
3
4 var block_color = [0,255,0,.1]
5 var block_line_color = [0,255,0,1]
6 var county_color = [124,124,255,.25]
7 var county_line_color = [124,124,255,1]
8
9 var county_style = new ol.style.Style({
10     fill: new ol.style.Fill({
11         color: county_color
12     }),
13     stroke: new ol.style.Stroke({
14         color: county_line_color,
15         width: 2
16     })
17 });

```

```

16     }},
17   });
18
19   var block_style = new ol.style.Style({
20     fill: new ol.style.Fill({
21       color: block_color
22     }),
23     stroke: new ol.style.Stroke({
24       color: block_line_color,
25       width: 1
26     }),
27   });
28   ///////////////////////////////////////////////////////////////////////////////////////////////////////////////////////////////////
29
30   // unstyled layers
31
32   var blocks_kml = new ol.layer.Vector({
33     source: new ol.source.Vector({
34       url: 'https://s3.amazonaws.com/kkb-web/data/tl_2010_35001_tabbblock10.kml',
35       projection: projection,
36       format: new ol.format.KML()
37     })
38   })
39
40   var counties_kml = new ol.layer.Vector({
41     source: new ol.source.Vector({
42       url: 'https://s3.amazonaws.com/kkb-web/data/2007fe_35_county00.kml',
43       projection: projection,
44       format: new ol.format.KML()
45     })
46   })
47
48
49   // styled layers
50
51   var counties_kml_styled = new ol.layer.Vector({
52     source: new ol.source.Vector({
53       url: 'https://s3.amazonaws.com/kkb-web/data/2007fe_35_county00.kml',
54       projection: projection,
55       format: new ol.format.KML({
56         extractStyles:false
57       })
58     }),
59     style: county_style
60   })
61
62   var blocks_kml_styled = new ol.layer.Vector({
63     source: new ol.source.Vector({
64       url: 'https://s3.amazonaws.com/kkb-web/data/tl_2010_35001_tabbblock10.kml',
65       projection: projection,
66       format: new ol.format.KML({
67         extractStyles:false
68       })
69     }),

```

```
70     style: block_style
71   })
72
73
```

Example: [HTML](#), [Javascript](#)

This work by Karl Benedict is licensed under a Creative Commons Attribution-ShareAlike 4.0 International License.