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Performance Tips for Maps API Mashups

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May 27, 2009

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code.google.com/events/io/questions



“Every millisecond counts”

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<http://www.google.com/corporate/ux.html>



Loading the JavaScript API





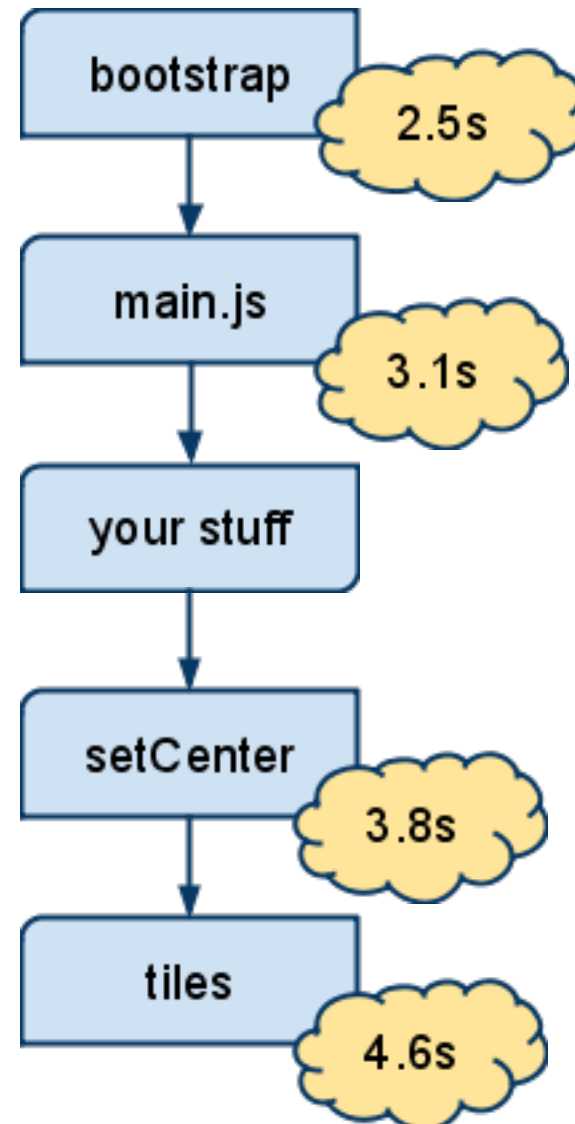
Lots of Resources to Display a Map



Console	HTML	CSS	Script	DOM	Net
+	GET	maps?file=api&v=2&key=AB	200 OK	maps.google.com	5 KB
+	GET	main.js	200 OK	maps.google.com	72 KB
+	GET	vp?spn=146.673954,351.5625	200 OK	maps.google.com	3 KB
+	GET	%7Bmod_legacy_api_gc,mod	200 OK	maps.google.com	11 KB
+	GET	vp?spn=146.673954,351.5625	200 OK	maps.google.com	3 KB
5 requests					92 KB



The Load Sequence - How Is Time Spent*?



*Median times, measured from when the hosting page was requested



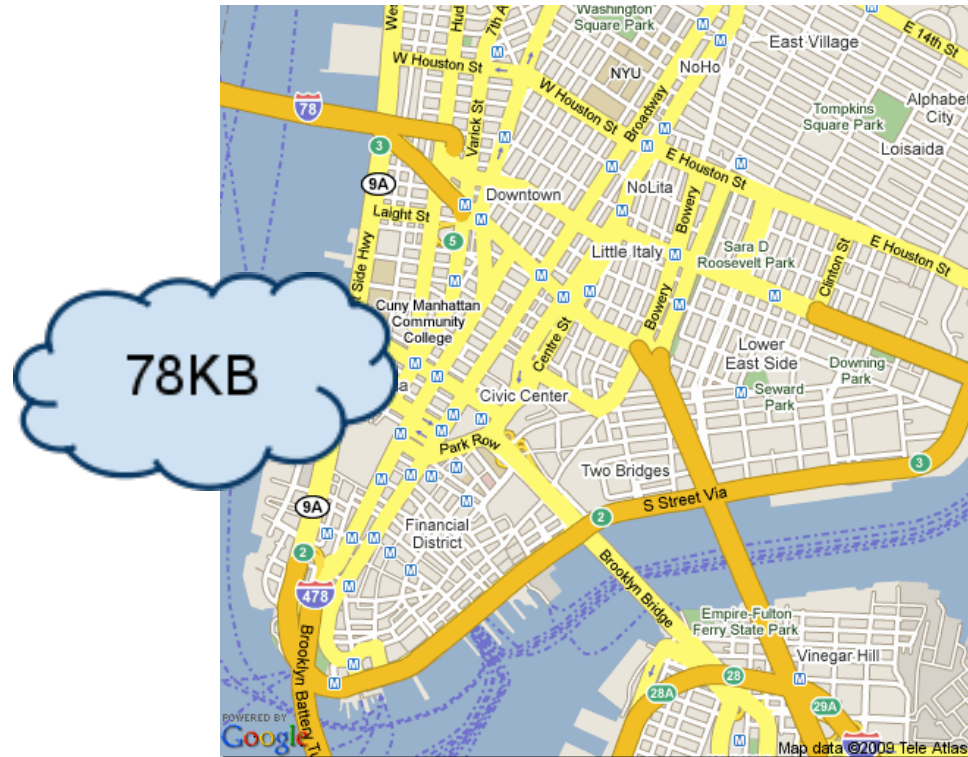
iPhone and Android



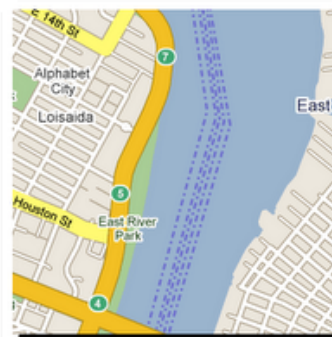
© 2008 CNET Networks, Inc.



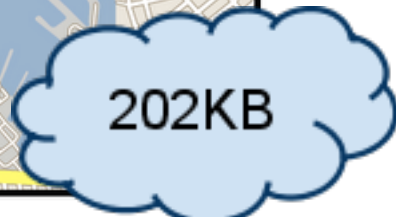
Too Many Files To Download



bootstrap + main.js



Demo: [Barry Hunter's](#)





Too Much Code To Parse

Control Classes:

[GControl](#)
[GControlAnchor](#)
[GControl](#)
[GControlPosition](#)

[GHierarchicalMapTypeControl](#)
[GMapType](#)
[GMapTypeControl](#)
[GMapTypeOptions](#)

[GMapUIOptions](#)
[GMenuMapTypeControl](#)
[GNavLabelControl](#)

Overlay Classes:

[GCopyright](#)
[GCopyrightCollection](#)
[GGroundOverlay](#)
[GIcon](#)
[GLayer](#)
[GMarker](#)
[GMarkerManager](#)
[GMarkerManagerOptions](#)
[GMarkerOptions](#)

[GMercatorProjection](#)
[GOverlay](#)
[GProjectionEditingOptions](#)
[GProjectionOptions](#)

[GScreenOverlay](#)
[GScreenPoint](#)
[GScreenSize](#)
[GTileLayer](#)
[GTileLayerOptions](#)
[GTileLayerOverlay](#)
[GTileLayerOverlayOptions](#)

Service Classes:

[GAdsManager](#)
[GAdsManagerOptions](#)
[GClientGeocoder](#)
[GDirections](#)
[GDirectionsOptions](#)
[GDownloadUrl](#)
[GFacturalGeocodeCache](#)
[GGeoAddressAccuracy](#)
[GGeoStatusCode](#)
[GGeoXml](#)
[GGeocodeCache](#)
[GGoogleBar](#)

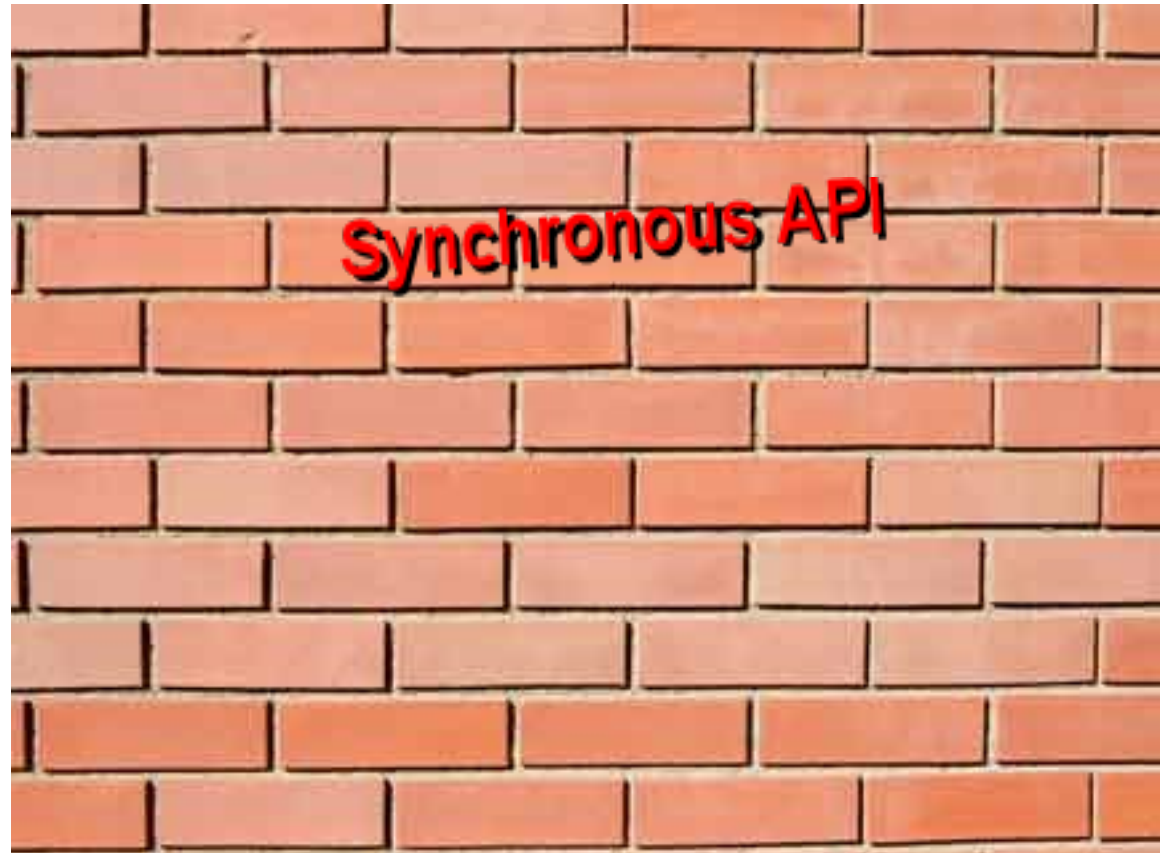
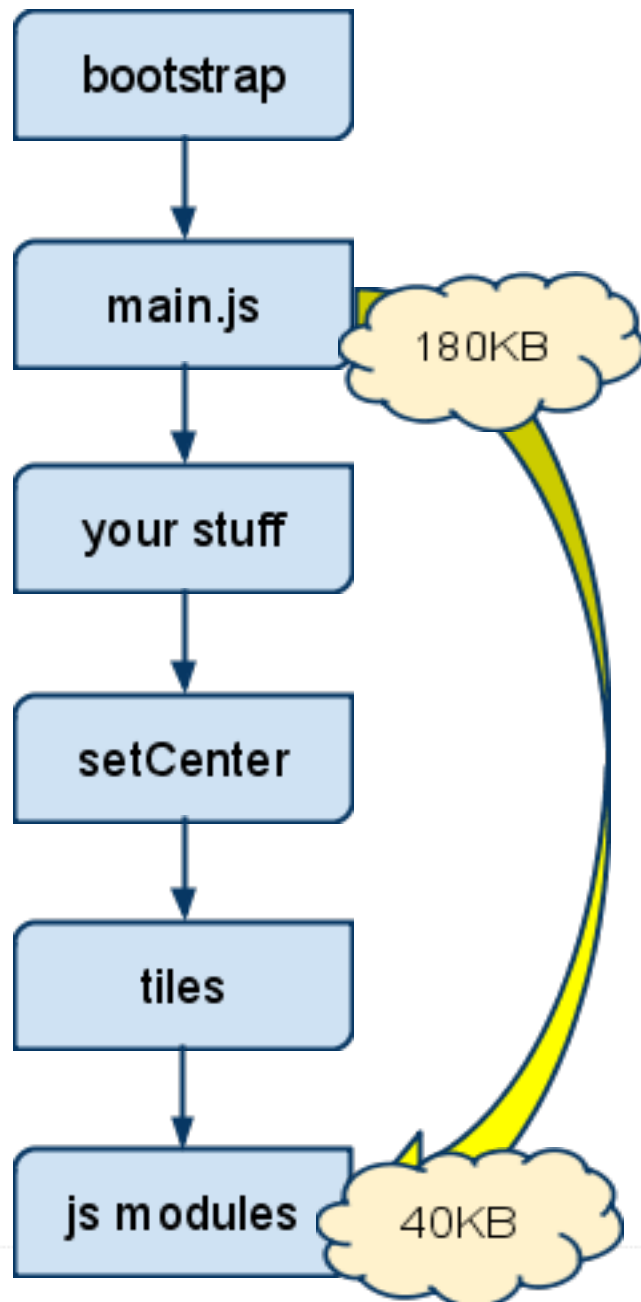
[GGeocoderList](#)
[GGeocoderOptions](#)
[GGeocoderResultList](#)
[GGeocoderResultListOptions](#)
[GGeocoderResultListOptions](#)
[GGeocoderResultListOptions](#)
[GGeocoderResultListOptions](#)
[GGeocoderResultListOptions](#)
[GGeocoderResultListOptions](#)
[GGeocoderResultListOptions](#)
[GGeocoderResultListOptions](#)

[GStreetviewLocation](#)
[GStreetviewOverlay](#)
[GStreetviewPanorama](#)
[GStreetviewPanorama_ErrorValues](#)
[GStreetviewPanoramaOptions](#)
[GTrafficOverlay](#)
[GTrafficOverlayOptions](#)
[GTravelModes](#)
[GXml](#)
[GXmlHttp](#)
[GXslt](#)

220KB
*** 20ms / KB = 4.4 sec**

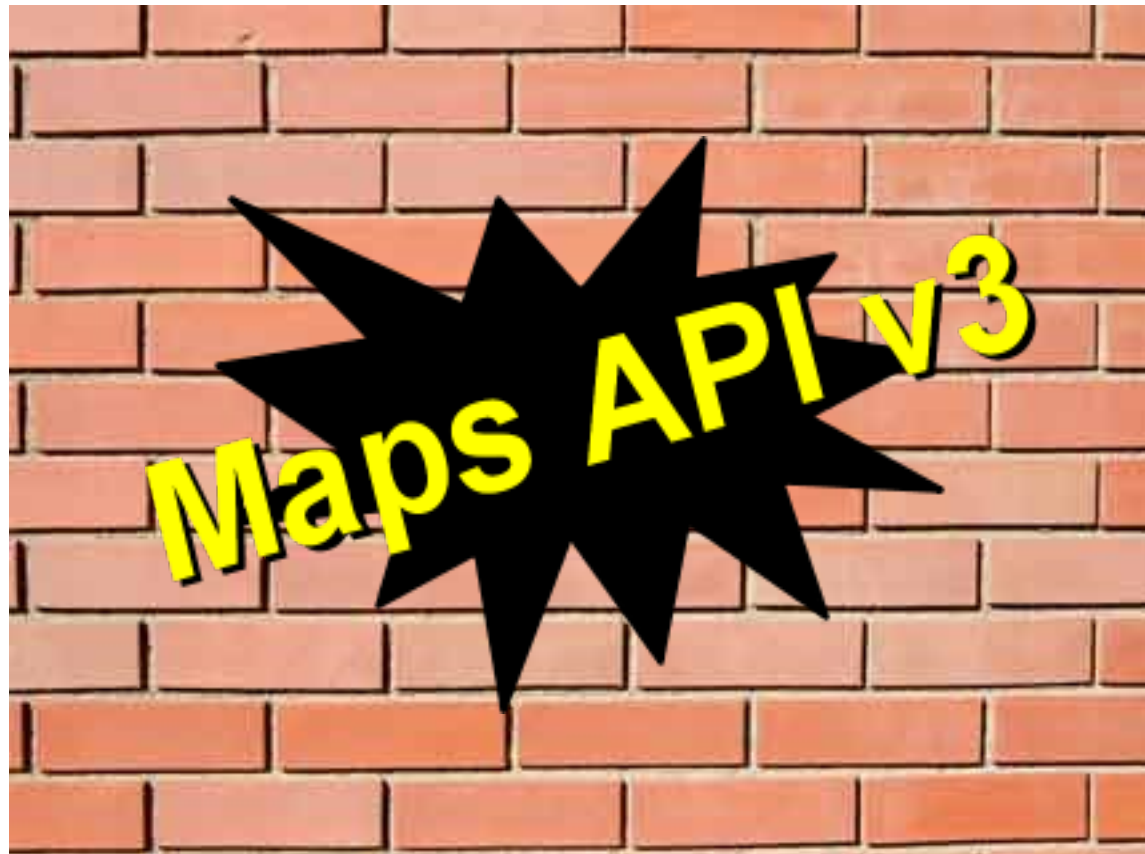


Delay Loading JavaScript





Bringing Down The Wall





Maps API V3 (labs)



<http://googlegeodevelopers.blogspot.com/2009/05/announcing-google-maps-api-v3.html>

<http://code.google.com/apis/maps/documentation/v3/>

- Latency: #1 priority
 - Aggressive modularization
 - Latency features
 - iPhone / Android

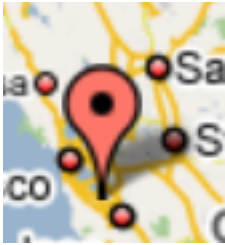


Displaying Many Markers





Problem: GMarker is a Feature-full Fatty

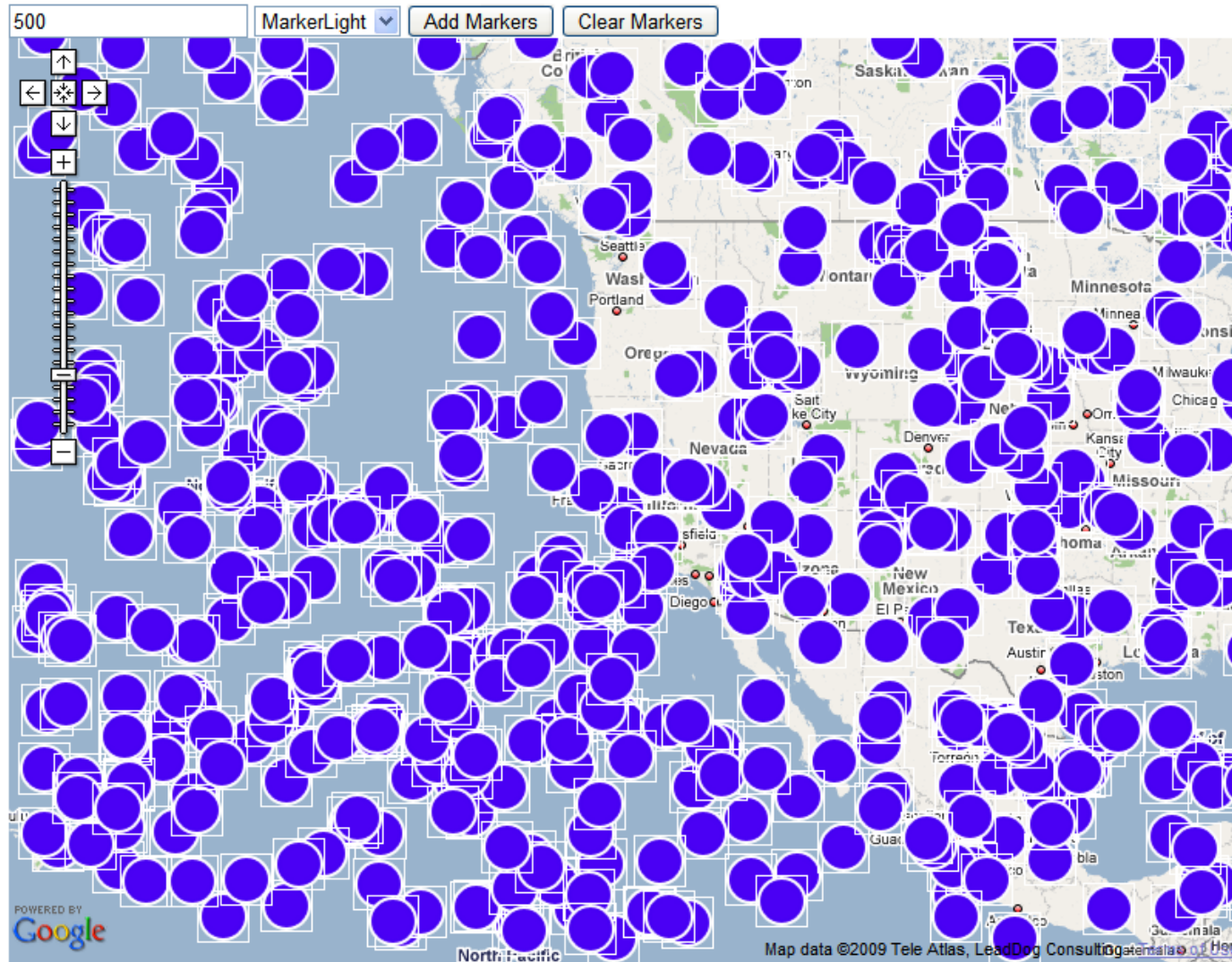


$$= \langle \text{img} \rangle * 5 + \langle \text{map} \rangle * 1$$

Property	Type	Description
<code>image</code>	<code>String</code>	The foreground image URL of the icon.
<code>shadow</code>	<code>String</code>	The shadow image URL of the icon.
<code>printImage</code>	<code>String</code>	The URL of an alternate foreground icon image used for printing on browsers incapable of handling the default GIcon.image . Versions of IE typically require an alternative image in these cases as they cannot print the icons as transparent PNGs. Note that browsers capable of printing the default <code>image</code> will ignore this property.
<code>mozPrintImage</code>	<code>String</code>	The URL of an alternate non-transparent icon image used for printing on browsers incapable of handling either transparent PNGs (provided in the default GIcon.image) or transparent GIFs (provided in GIcon.printImage). Older versions of Firefox/Mozilla typically require non-transparent images for printing. Note that browsers capable of printing the default <code>image</code> will ignore this property.
<code>printShadow</code>	<code>String</code>	The URL of the shadow image used for printed maps. It should be a GIF image since most browsers cannot print PNG images.
<code>transparent</code>	<code>String</code>	The URL of a virtually transparent version of the foreground icon image used to capture click events in Internet Explorer. This image should be a 24-bit PNG version of the main icon image with 1% opacity, but the same shape and size as the main icon.
<code>imageMap</code>	<code>Number[]</code>	An array of integers representing the x/y coordinates of the image map we should use to specify the clickable part of the icon image in browsers other than Internet Explorer.



Solution: Light-weight Marker



Many Markers Comparison



Redfin: Map Driven UI

- Online real estate search site
- Map drives our whole user interface
- We show up to 500 houses at a time, so speed is critical
- We use a custom overlay to achieve performance

Redfin - Find San Francisco Bay Area Real Estate

http://www.redfin.com/search#lat=37.76979880604299&long=-122.41739273071289&market=sanfrancisco&num_baths=1&sf=1,2&sta

Location: Enter a neighborhood, city, or MLS # Search Listings

Price: No min to No max Beds: No min More Options

AGENTS BUY SELL FORUMS MY REDFIN

227 results (3 unmapped) Email Me New Listings
MLS listings, MLS-listed foreclosures, 1+ baths, e...

178 San Carlos St
San Francisco, CA 94110 \$425,000

Beds: 2 On Redfin: 5 days
Baths: 1 Year Built: 1996
Sq.Ft.: - Lot Size: -
\$/Sq.Ft.: - MLS#: 356348
Status: Active
Last Sale: \$1,407,667 (02/28/2002)
Listing: Brown & Co. Real Estate

ADDRESS	LOCATION	PRICE	BEDS	BATHS	SQFT	\$/SQFT	DAYS
178 San Carlos St	Inner Mission	\$425,000	2	1	-	-	5
22 Hancock St	Eureka Valley/Dolore	\$1,528,000	3	2	2,000	\$764	69
707 KANSAS ST	San Francisco	\$800,000	2	1	1,190	\$672	7
707 Kansas St	Potrero Hill	\$800,000	2	1	1,190	\$672	7
439 Arkansas St	Potrero Hill	\$1,079,000	3	2	2,307	\$468	62
617 CAROLINA St #60	San Francisco	\$750,000	2	2	1,100	\$682	71
LISTING STATS:		\$679,000	2.1	1.8	1,535	\$568	59

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Report a Problem



Demo: Custom Overlay



Custom Overlay: Code

First, subclass GOverlay:

```
var SuperMarker = function() {  
  //This will be the pseudo-marker objects  
  this.layer = null;  
  
  //This will hold the layer DOM object  
  this.node = null;  
}
```

```
SuperMarker.prototype = new GOverlay();
```



Custom Overlay: Code

Next, implement initialize, which is called by the API:

```
SuperMarker.prototype.initialize = function(map) {  
  
  this.map_ = map;  
  
  //Create a DIV dom node for the layer  
  this.node = document.createElement("div");  
  
  // add the node to the map marker pane.  
  this.map_.getPane(G_MAP_MARKER_PANE)  
    .appendChild(this.node);  
  
  this.redraw(true);  
};
```




Custom Overlay: Code

Finally, add just one SuperMarker to the GMap, and call the SuperMarker's draw method when you want to draw pseudo-markers:

```
var superMarker = new SuperMarker();  
map.addOverlay(superMarker);
```

```
// draw one marker at 10' lat 10' lon
```

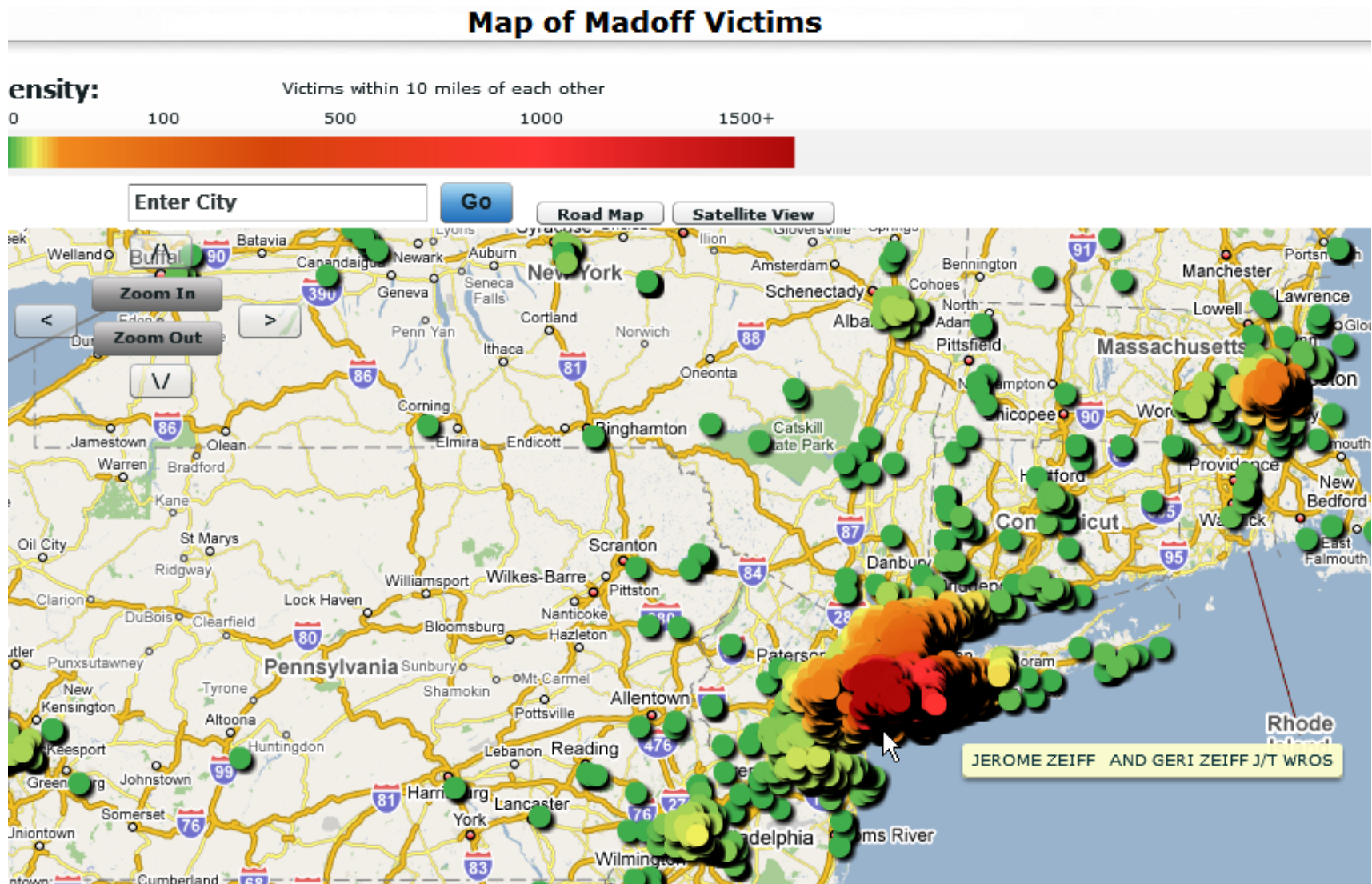
```
layer = {markers:[id:1, point:new GLatLng(10, 10)]};  
superMarker.draw(layer);
```

```
// do some more stuff, now draw a different marker
```

```
layer = {markers:[id:2, point:new GLatLng(20, 20)]};  
superMarker.draw(layer);
```



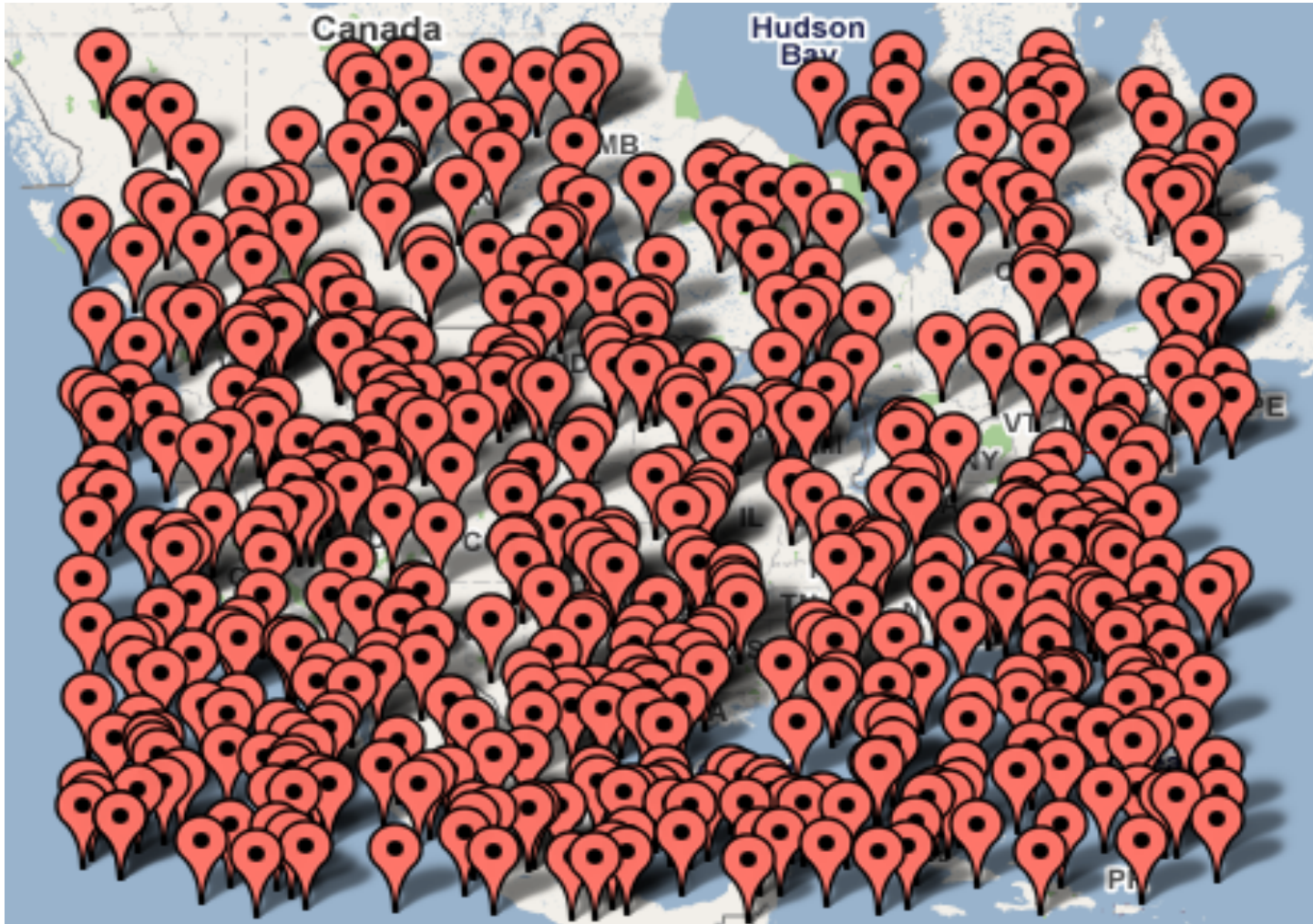
Solution: Light-weight Marker.. for Flash, too!



[MadoffMap](#)



Problem: Too Many DOM Nodes





Solution: Clustering

CURRENTLY DISPLAYING: Last 100 articles published



[AuthorMapper](#)



Solution: k-means Clustering



[360Cities](http://360Cities.com)



Solution: Grid-Based Clustering



[MarkerClusterer](#)



Solution: Regional Clustering

Map | **Satellite** | **Hybrid**

California

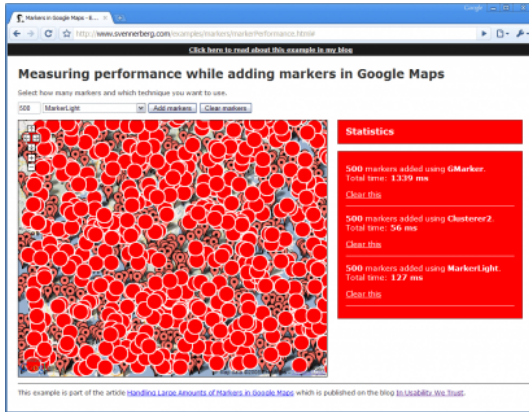
- Frankie Johnnie & Luigo Too**
939 w el camino real, mountain view, ca
- Amici's East Coast Pizzeria**
790 castro st, mountain view, ca
- Kapp's Pizza Bar & Grill**
191 castro st, mountain view, ca
- Round Table Pizza: Mountain View**
570 n shoreline blvd, mountain view, ca
- Sausage Factory Inc**

Map data ©2009 Tele Atlas, Europa Technologies - [Terms of Use](#)

[US Pizzas](#)

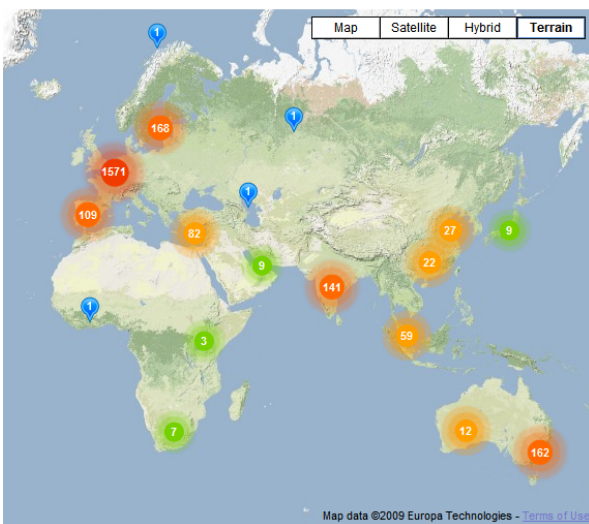


More Clustering Resources



[Article: Handling Large Amounts of Markers](#)

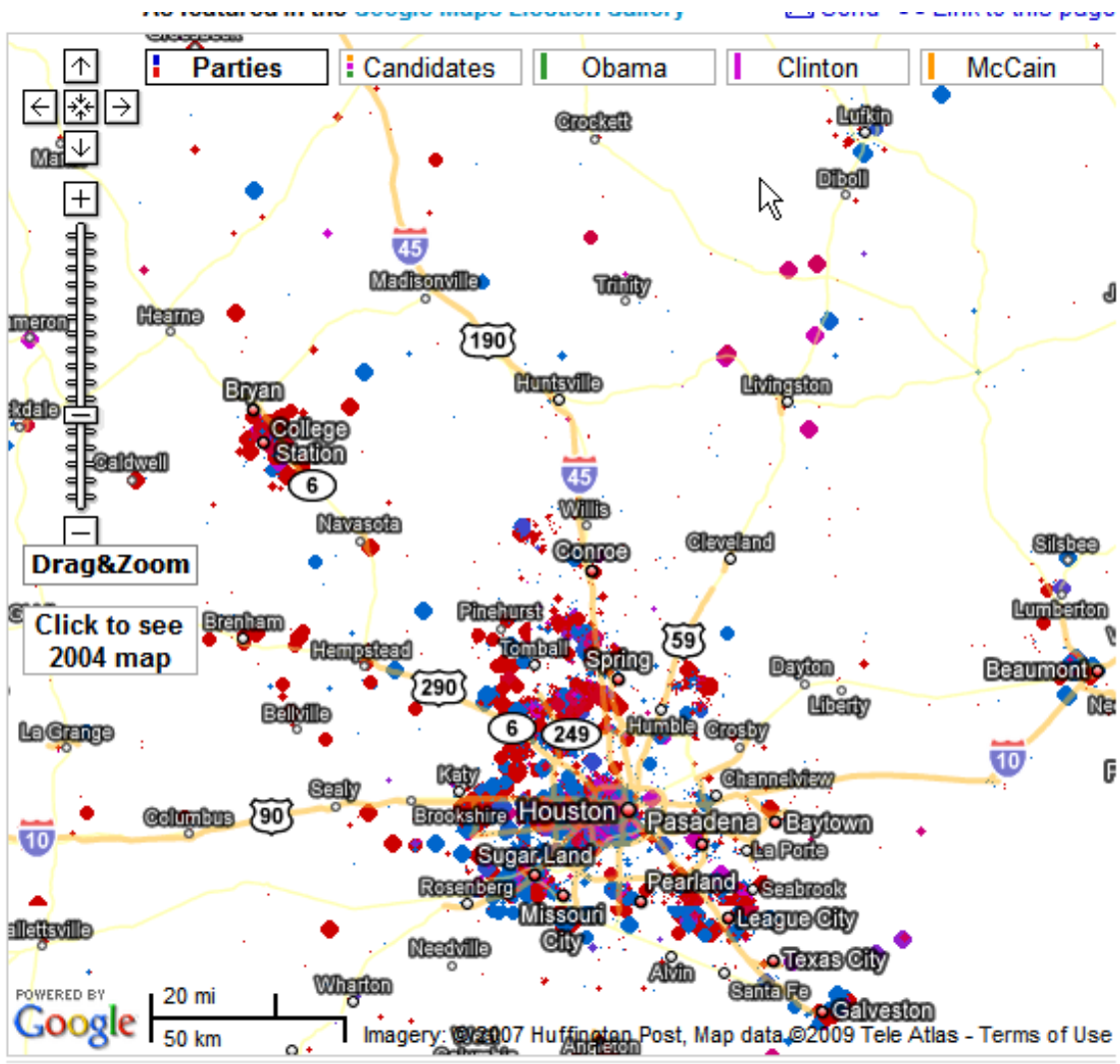
[Python k-means](#)



[Maptimize](#)



Solution: View-only Visualization

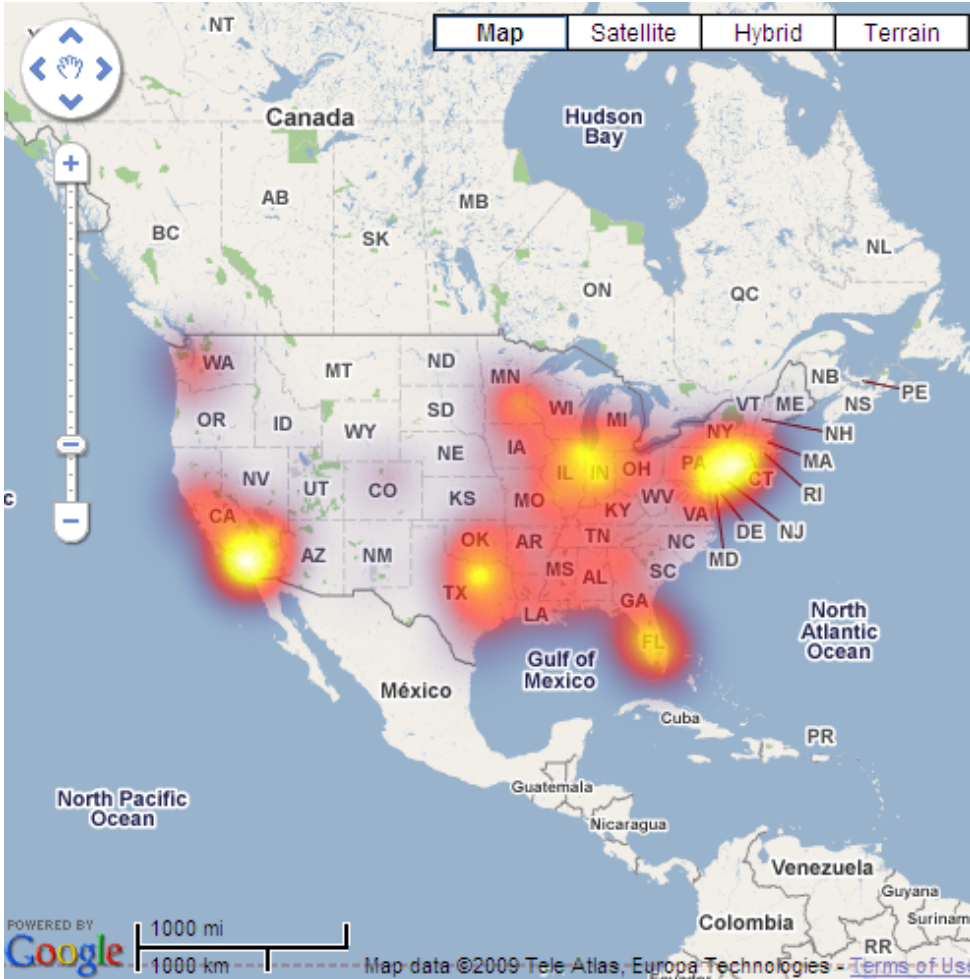


	Lyndall Medearis Executive Vice President Axa Advisors, Llc.	Updated Q3/2007 Hillary Clinton \$4,600	4509 HOLT ST Bellaire TX
	Dana Guefen Homemaker Not employed	Updated Q3/2007 Hillary Clinton \$4,600	4602 HOLT ST Bellaire TX
	Andrew Gelbaugh Managing Director Dynegy, Inc.	Updated Q3/2008 Barack Obama \$4,600	839 LINKWOOD DRIVE Houston TX
	Alamdar Hamdani Attorney Borunda, Hamdani, Simon LLP	Updated Q3/2007 Barack Obama \$3,300	4834 MCDERMED DR Houston TX
	Deborah Moran Musician Houston Symphony	Updated Q2/2008 Hillary Clinton \$3,002	3819 LATMA DR Houston TX
	Jim Slack PRESIDENT & CEO SLACK & COMPANY CONTRACTING, INC	Updated Q3/2008 John McCain \$2,300	10622 MAIN ST Houston TX
	Paul Johnson ENGINEER UNIVERSAL PERSONNEL	NEW Updated Q1/2008 Fred Thompson \$2,300	4031 MISCHIRE DRIVE Houston TX
	Felix Chevalier Managing Member	Updated Q2/2007 Hillary Clinton	9711 MARLIVE LN Houston TX

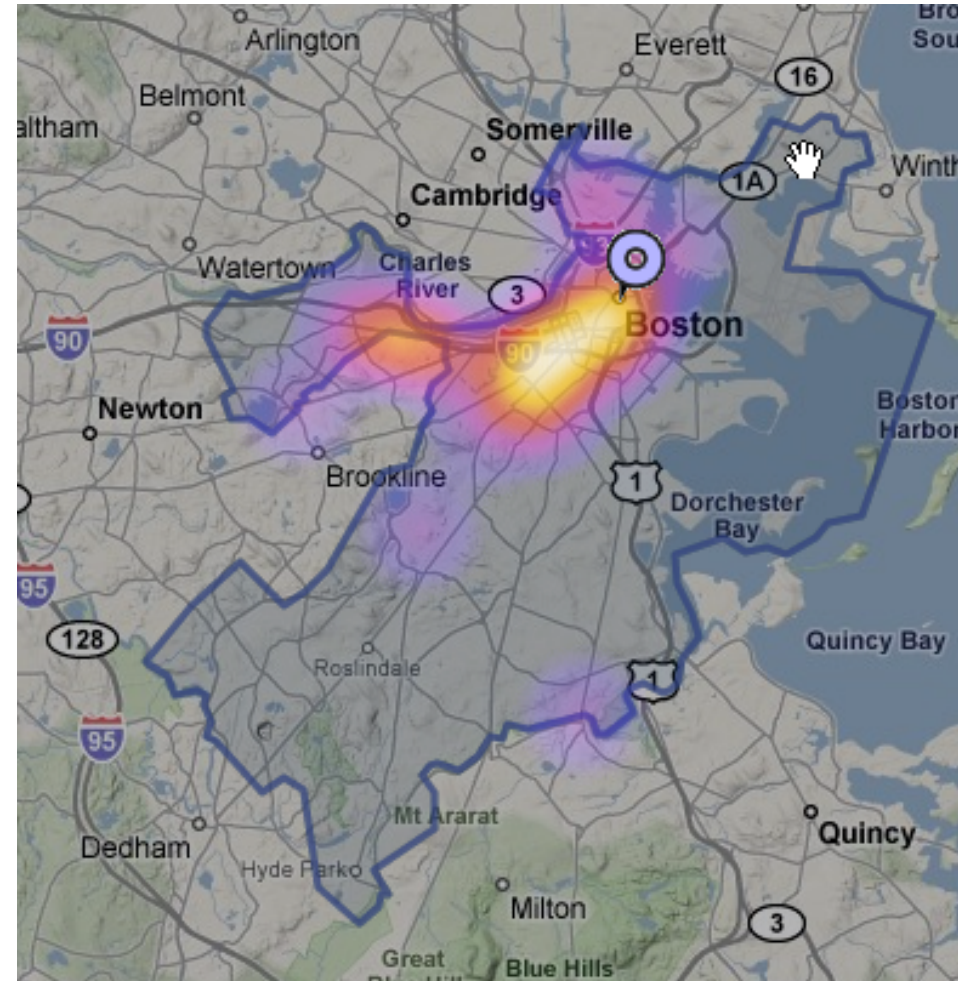
[FundRace](#)



Solution: View-only Visualization



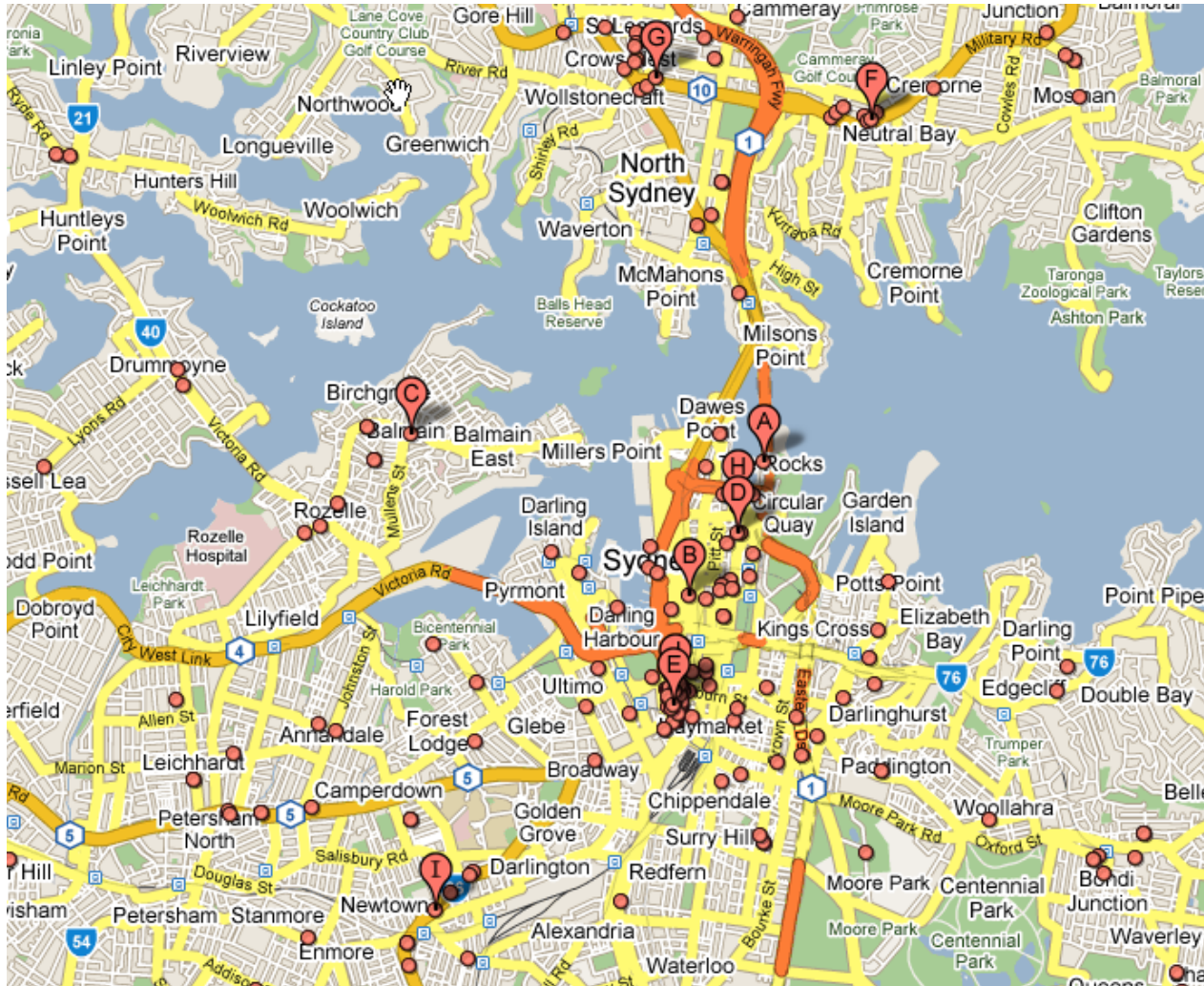
[HeatMapAPI](#)



[Boston Pizza](#)



Solution: Tiny Clickable Markers



[Clickable Tile Layer](#)

[Google Local Search](#)

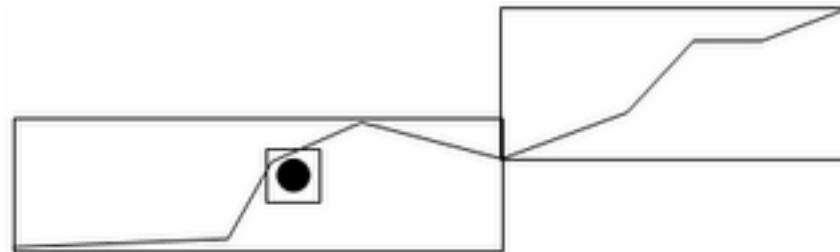
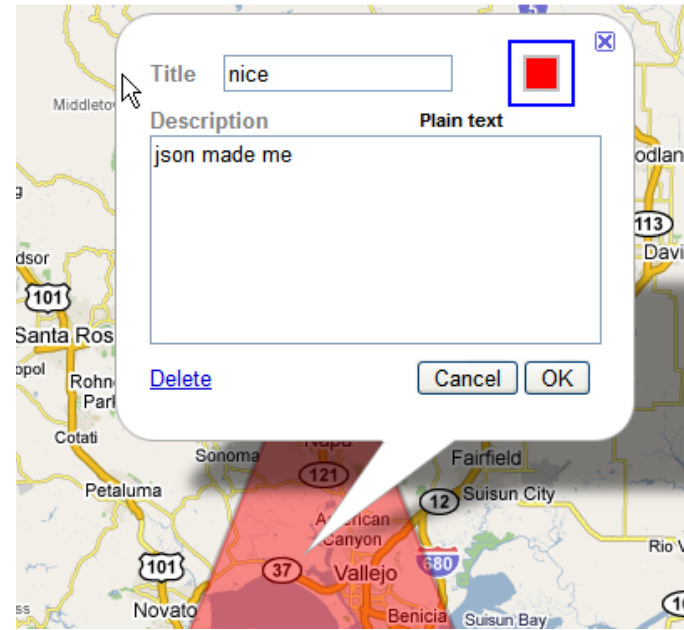
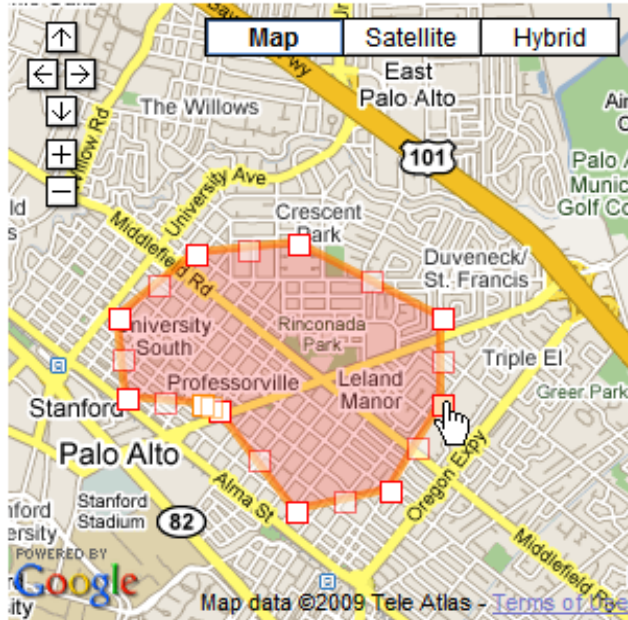


Rendering Large Polys



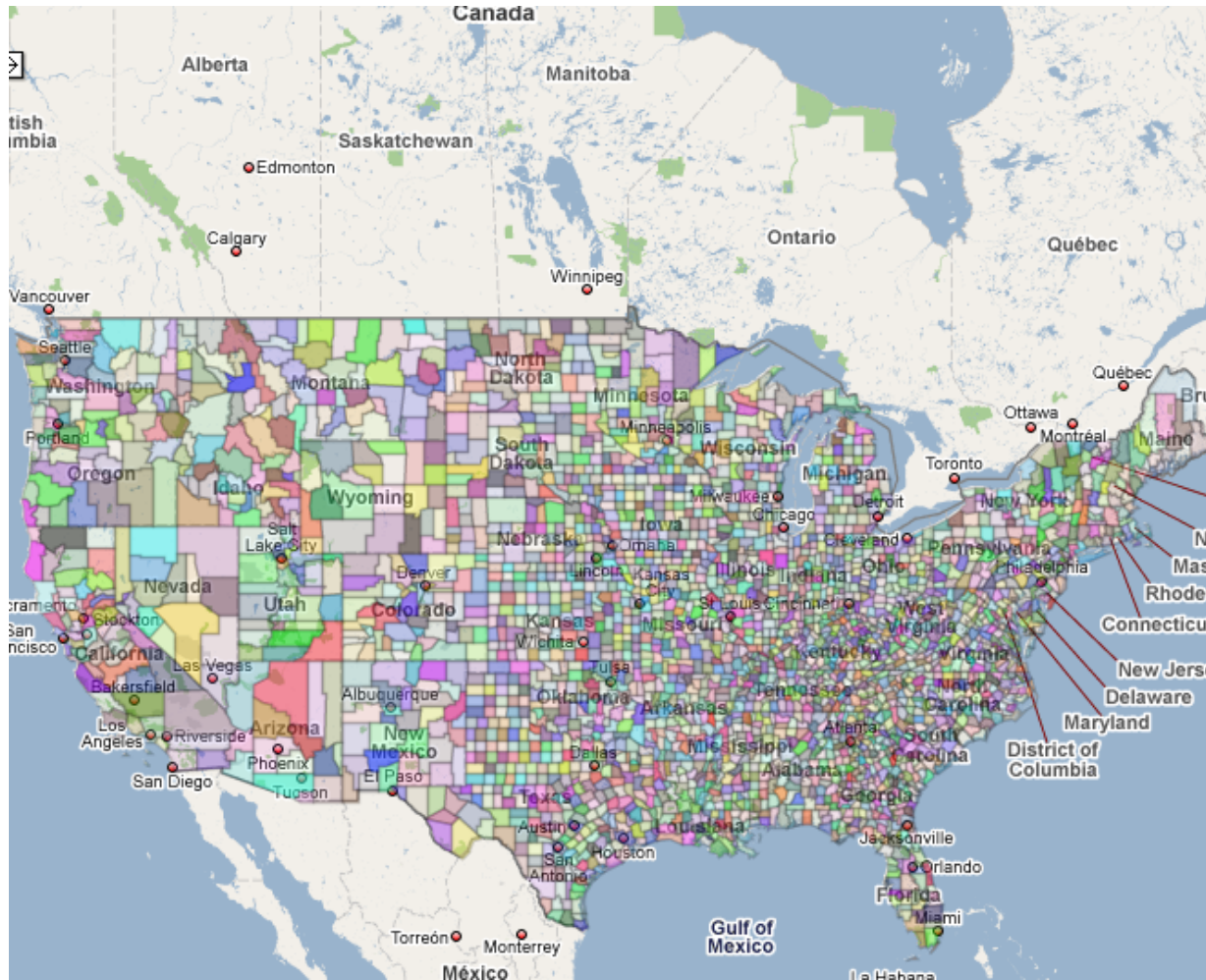


Problem: GPolygon is a Full-Featured Fatty





Solution: Lightweight Polys



All 3199 Counties (slow in IE!)

Animate

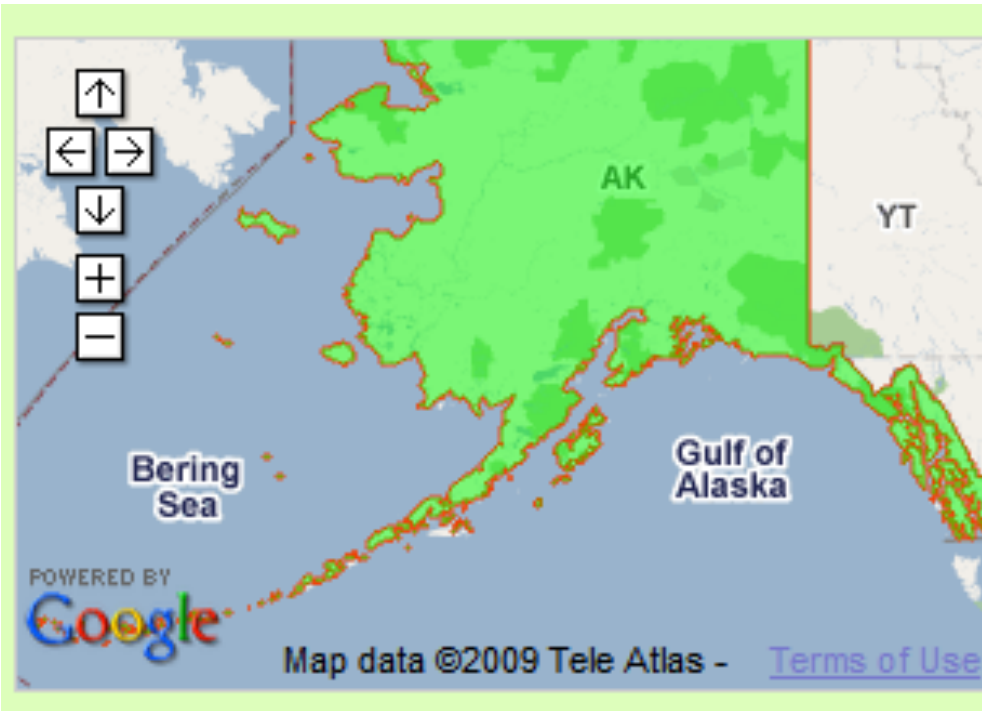
nowhere

```
0.000 start gonzo.redraw
0.298 end gonzo.redraw
0.000 3199 places, 3357 shapes, 33557 points
```

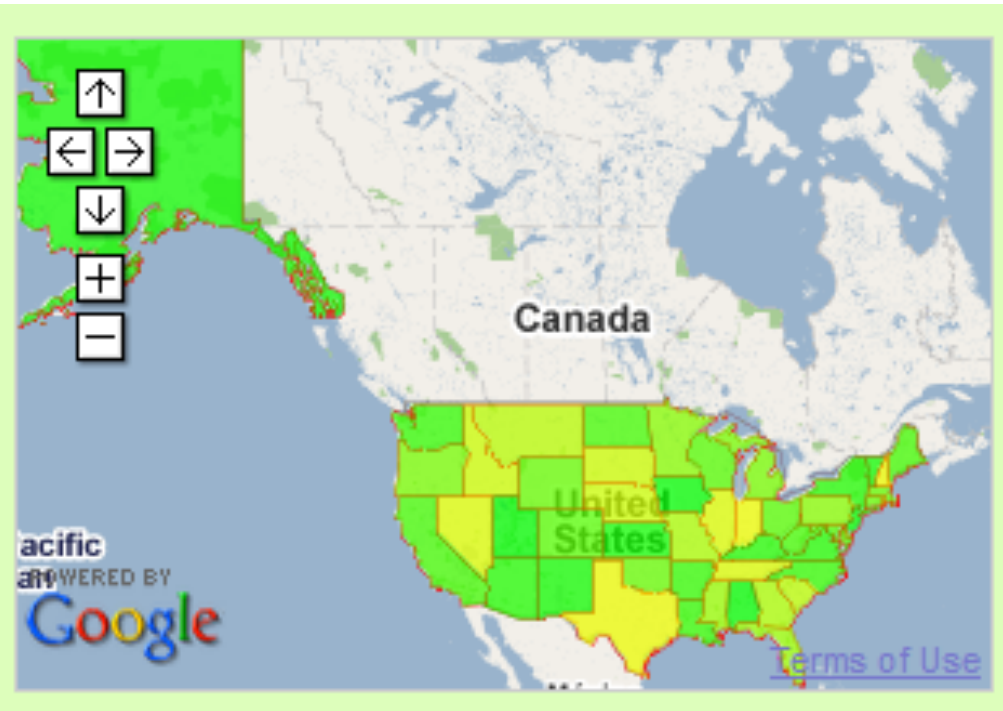
[Polygonzo](#)



Problem: Too Many Points



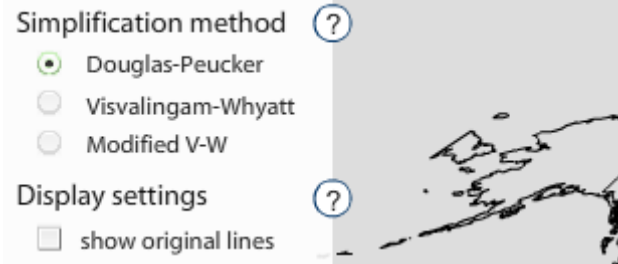
13500 points



2200 points

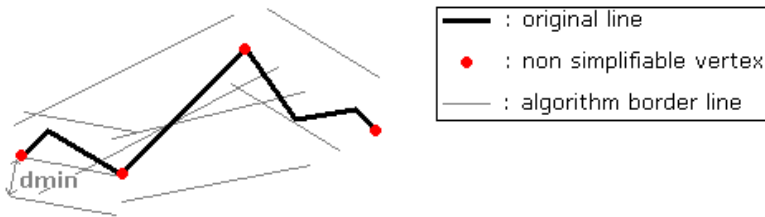


Data Simplification



[MapShaper](#)
[MapSimplification](#)

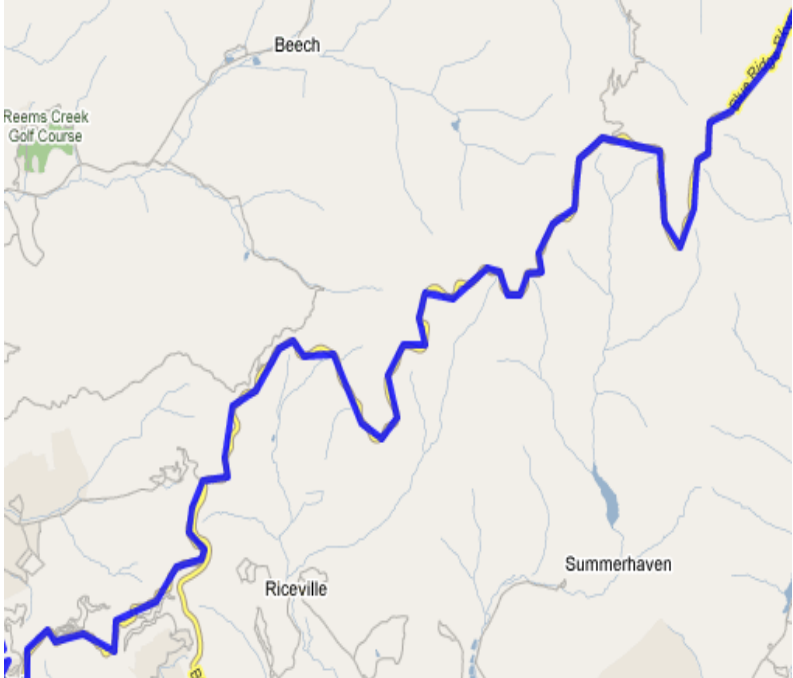
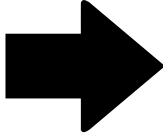
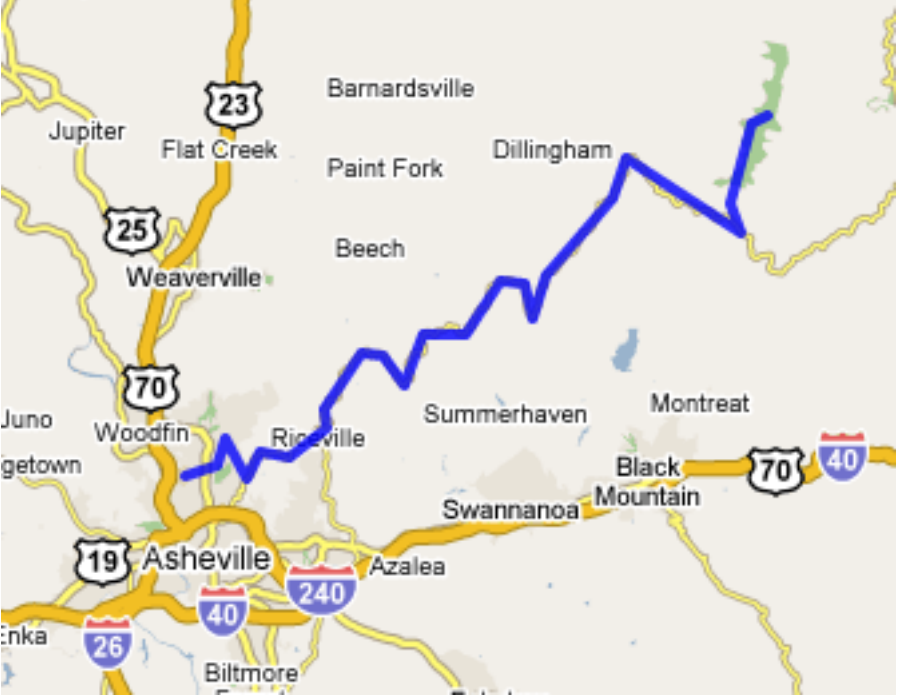
A short example of the Douglas-Peucker algorithm on a polyline



[Mapping the Votes: Resources](#)



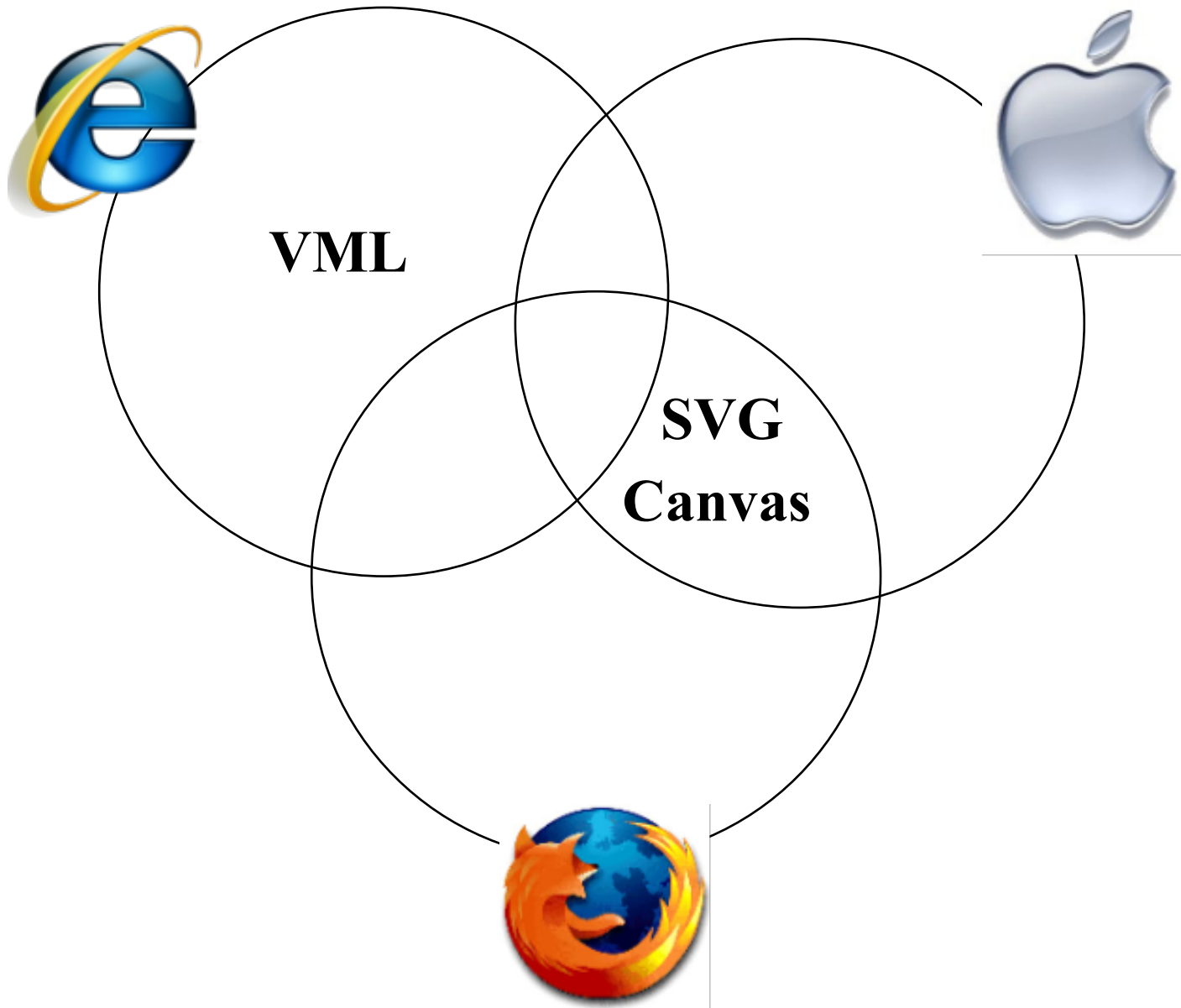
Solution: Encoded Polys



Encoded Poly Example

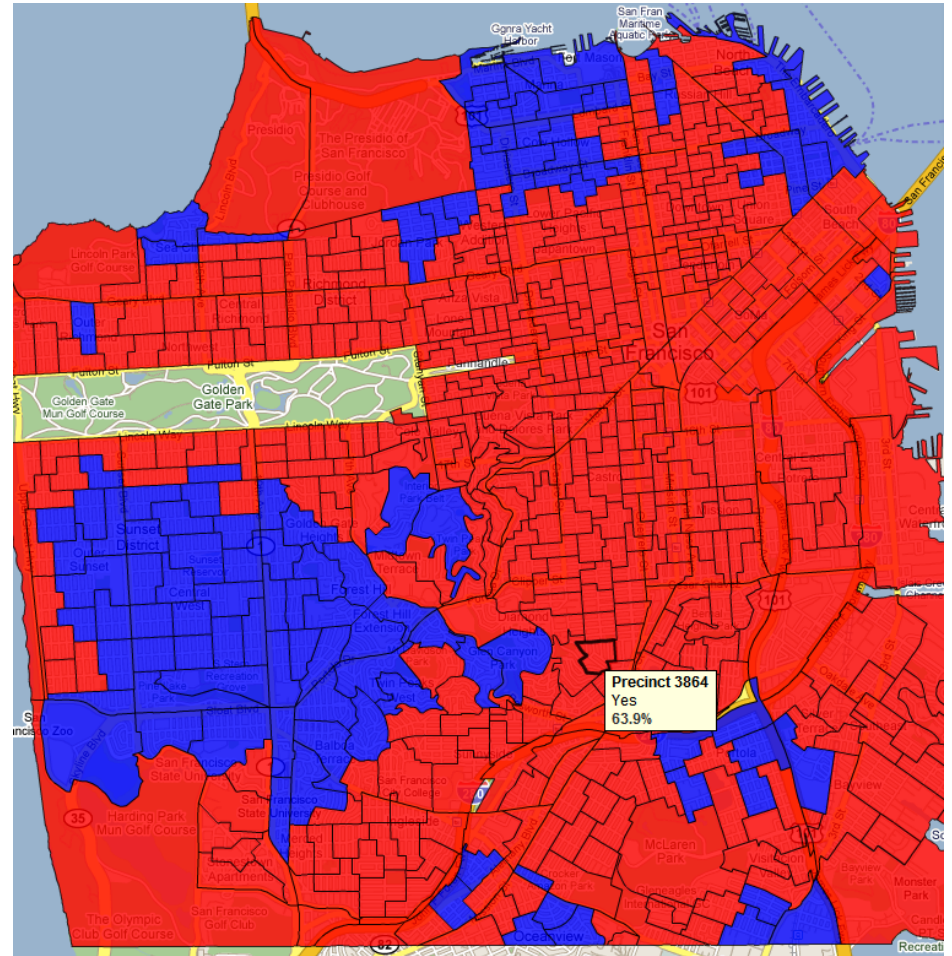


Browsers + Vector Graphics = :(





Solution: Flash API

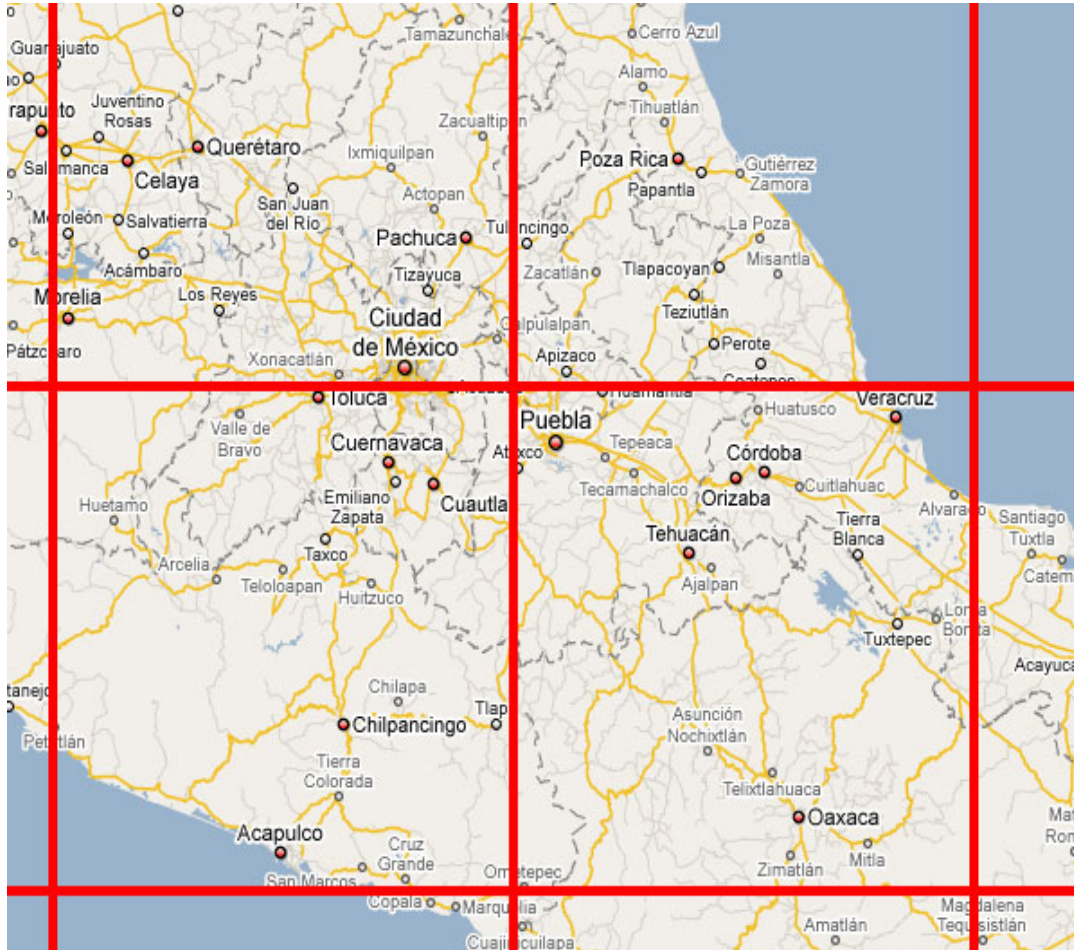


Thematic Mapping

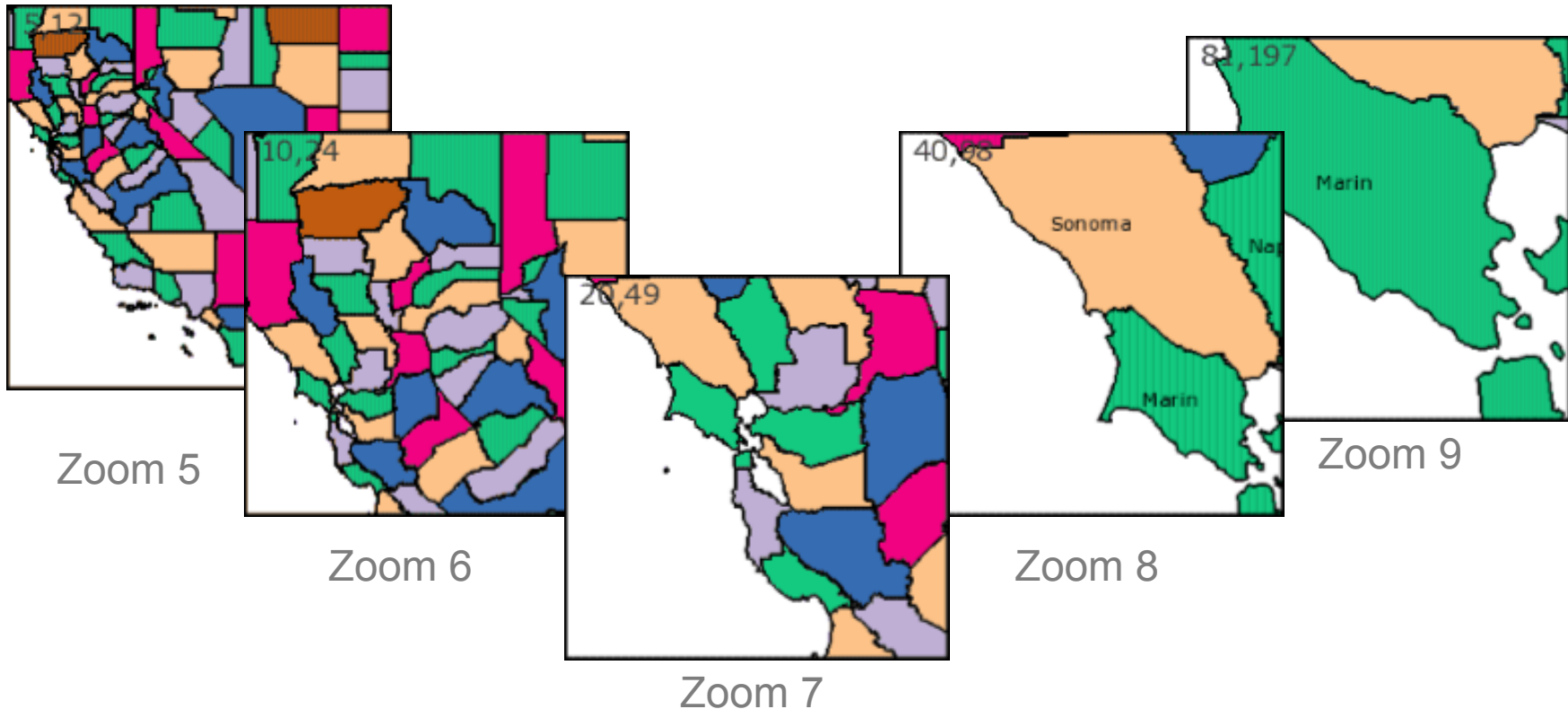
(Compare to the [Javascript API](#))

HowSFVotes

Solution: Tile Layers



Static data tiles: Counties Example



Generated County Tiles

- Tiles generated with Perl script using data in PostGRE database for zoom levels 5-9

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