Building Mobile Apps with the ArcGIS API for JavaScript

Andy Gup & Lloyd Heberlie

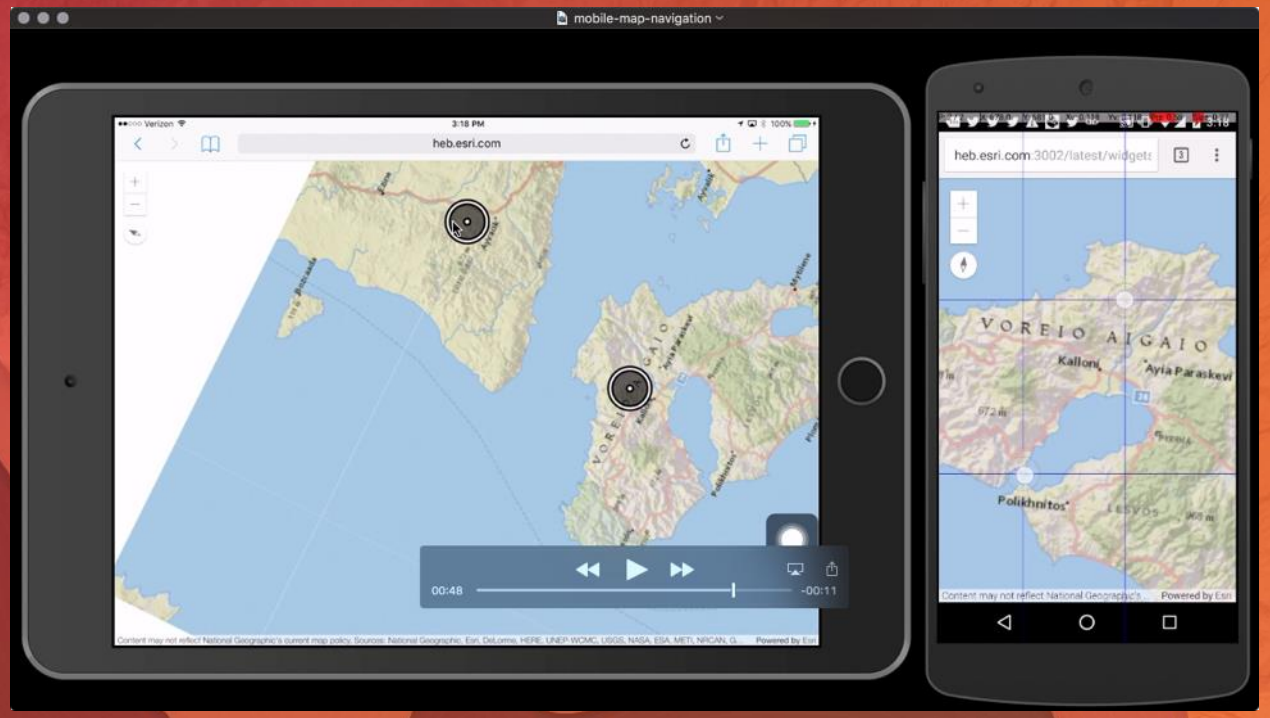
Agenda

- Capabilities
- Managing app life-cycle
- Working with locally hosted builds
- Working from JS frameworks
- Debugging
- GPS

Expectations

Capabilities

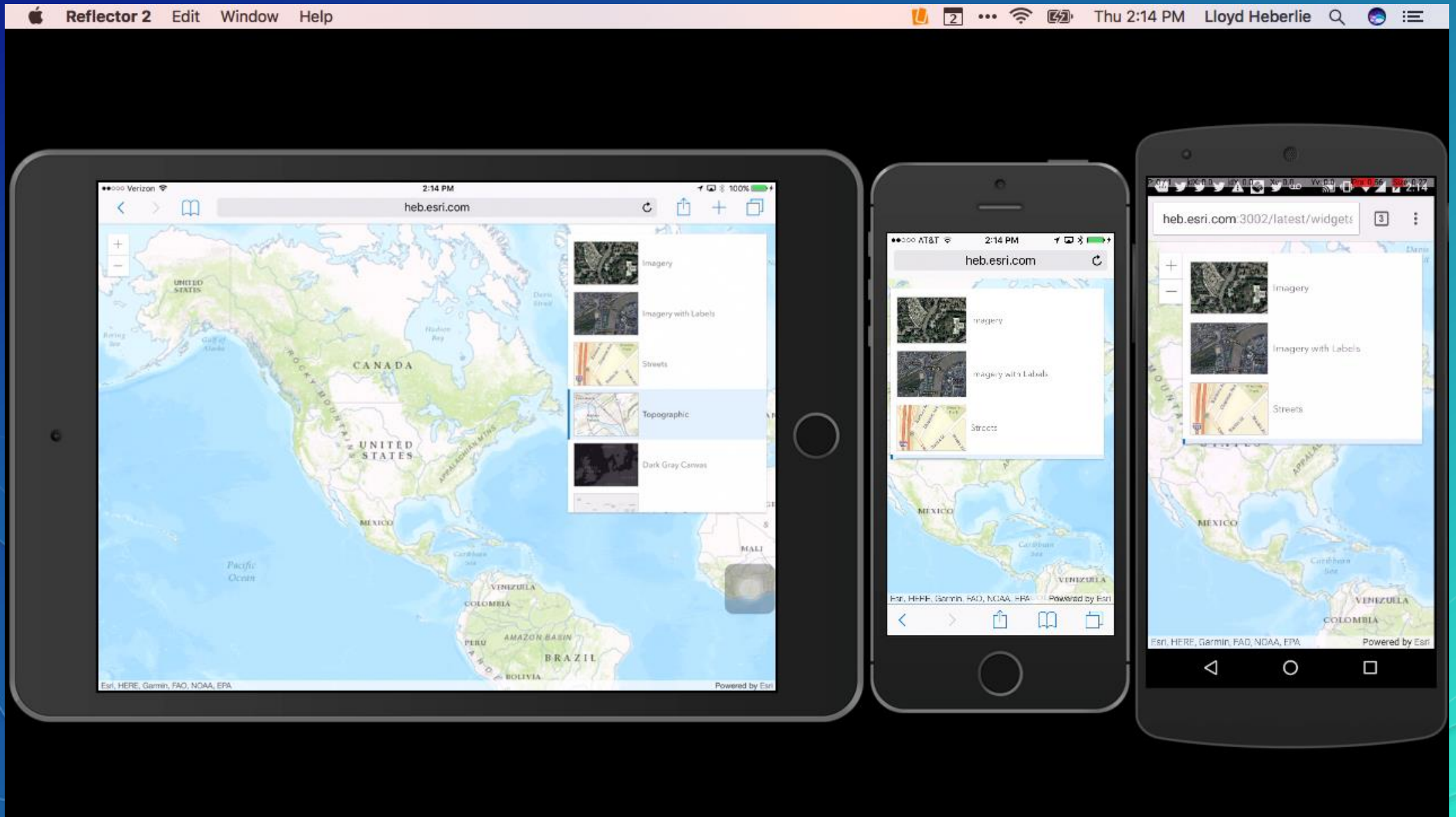
Lloyd Heberlie


mobile-map-navigation
heb.esri.com
00:48
-00:11
heb.esri.com:3002/latest/widget
VOREIO AIGAIO
Kallonis
Ayia Paraskevi
Polikhnitos
LESVOS

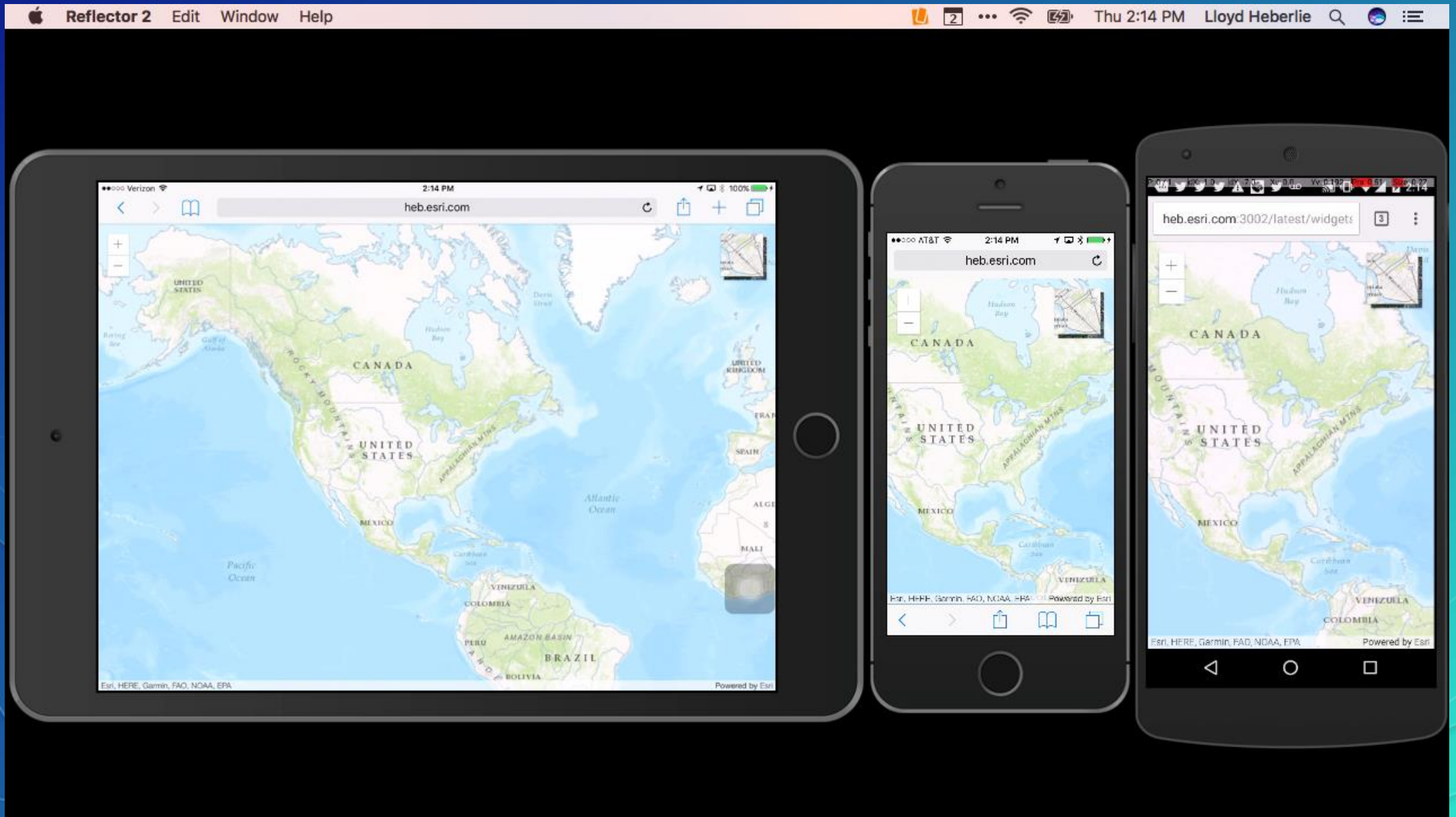
Touch

Demo

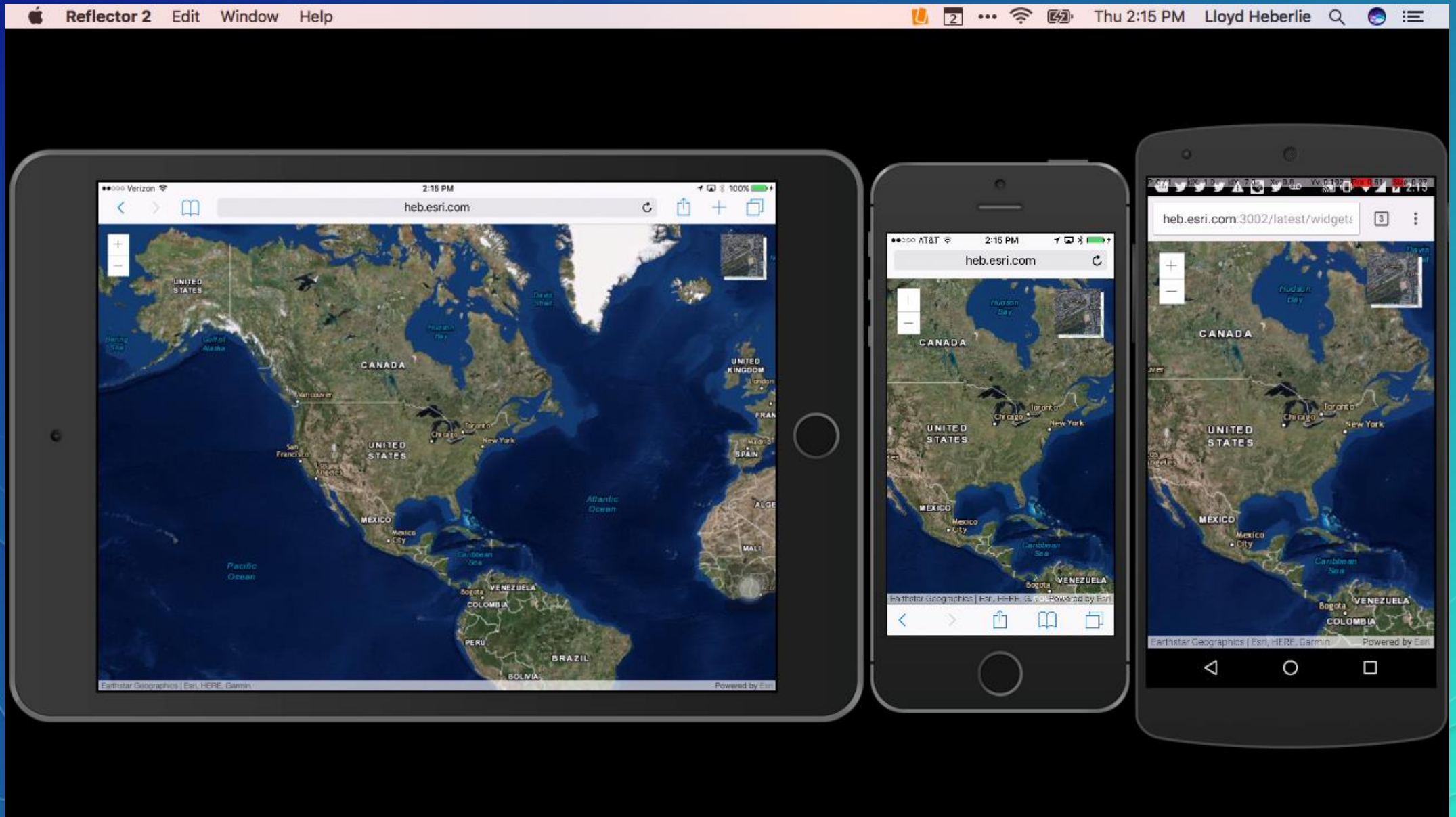
BasemapGallery



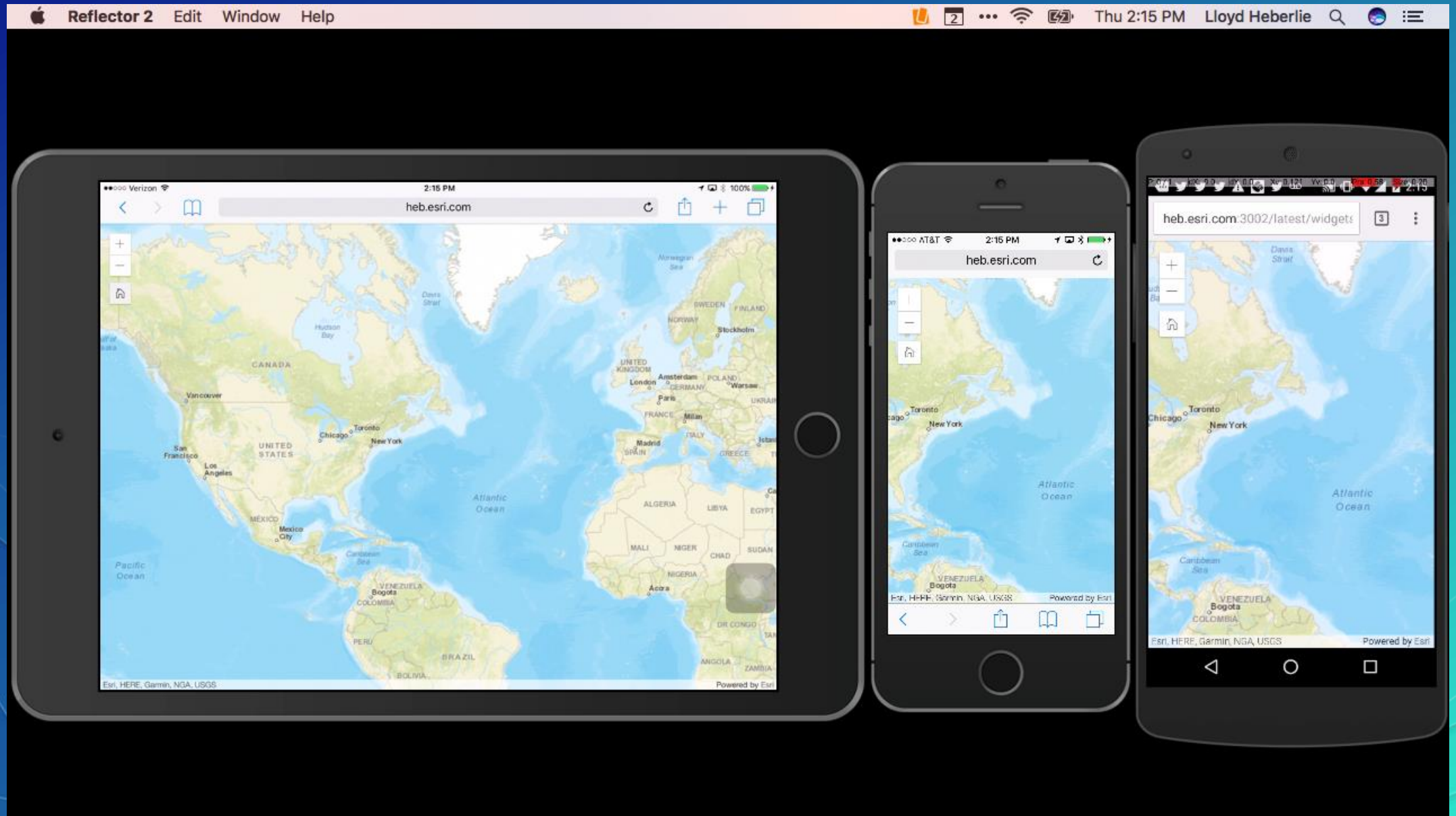
BasemapToggle



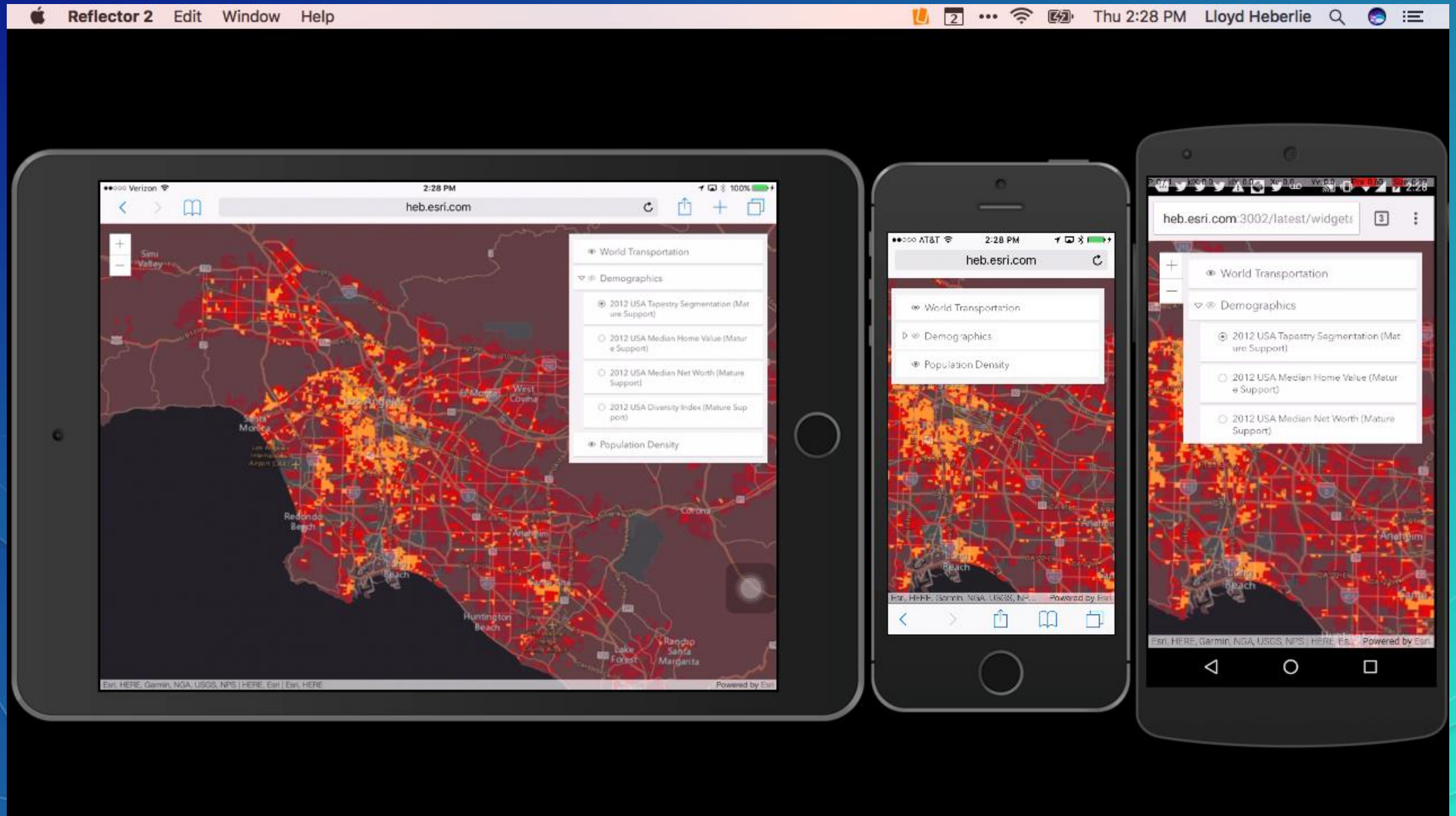
BasemapToggle



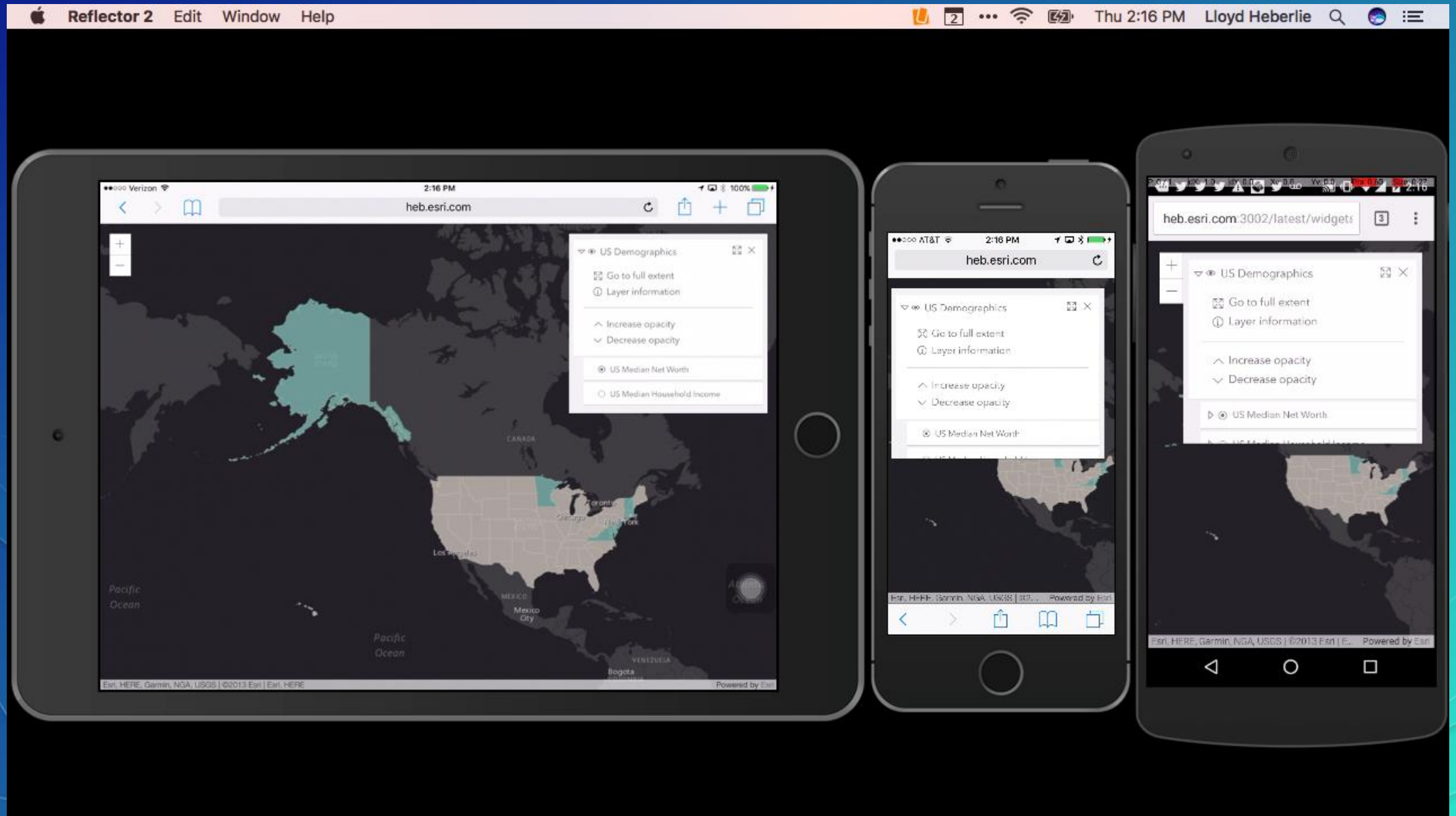
Home


Reflector 2
Edit
Window
Help
Thu 2:15 PM
Lloyd Heberlie
heb.esri.com
heb.esri.com:3002/latest/widgets
Atlantic Ocean
Pacific Ocean
Esri, HERE, Garmin, NGA, USGS
Powered by Esri

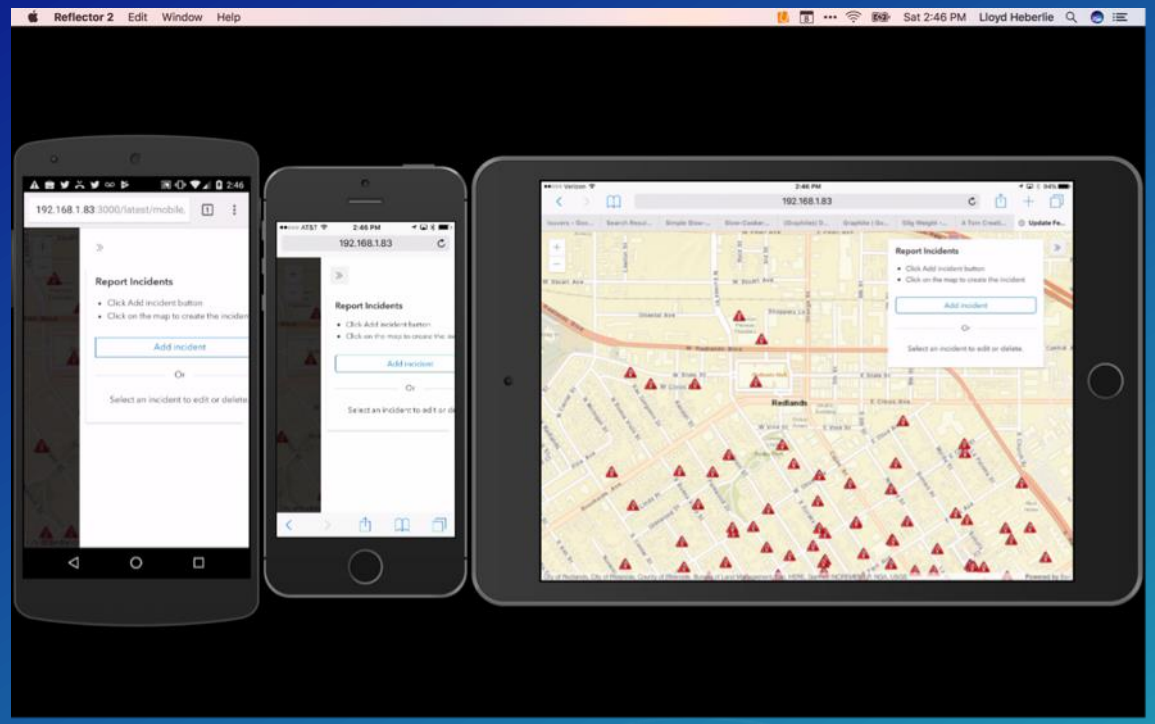
LayerList


Reflector 2
Edit
Window
Help
Thu 2:28 PM
Lloyd Heberlie
heb.esri.com
World Transportation
Demographics
2012 USA Tapestry Segmentation (Mature Support)
2012 USA Median Home Value (Mature Support)
2012 USA Median Net Worth (Mature Support)
2012 USA Diversity Index (Mature Support)
Population Density
heb.esri.com:3002/latest/widgets

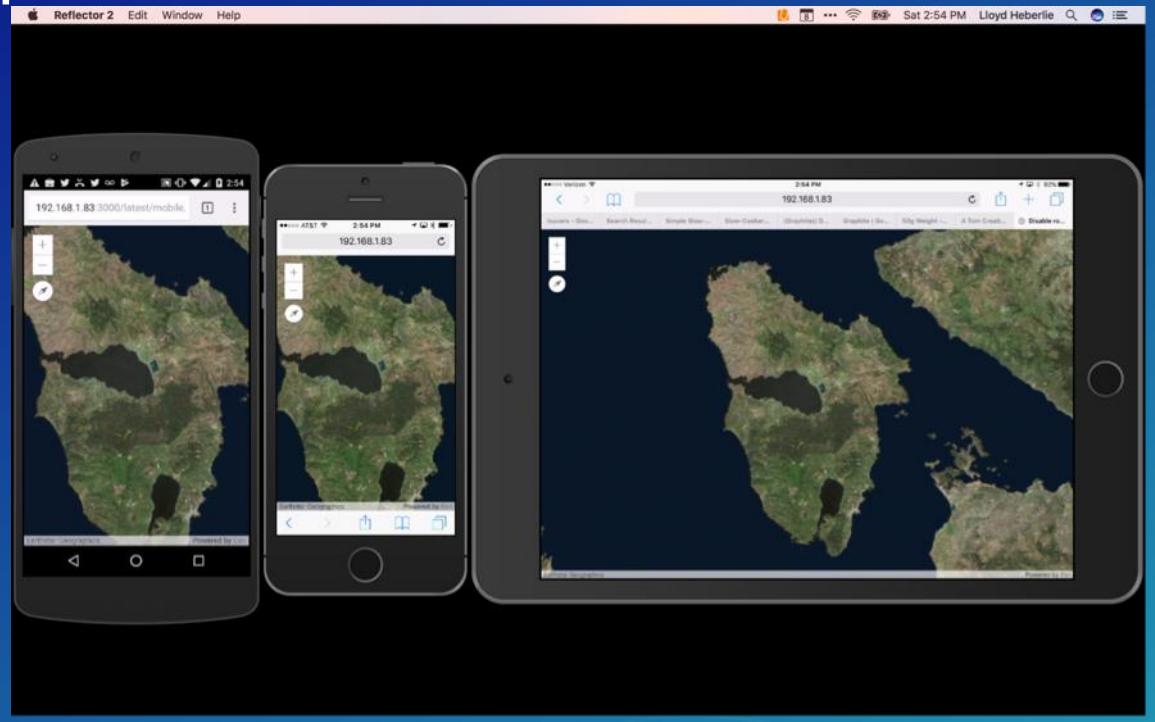
LayerList action



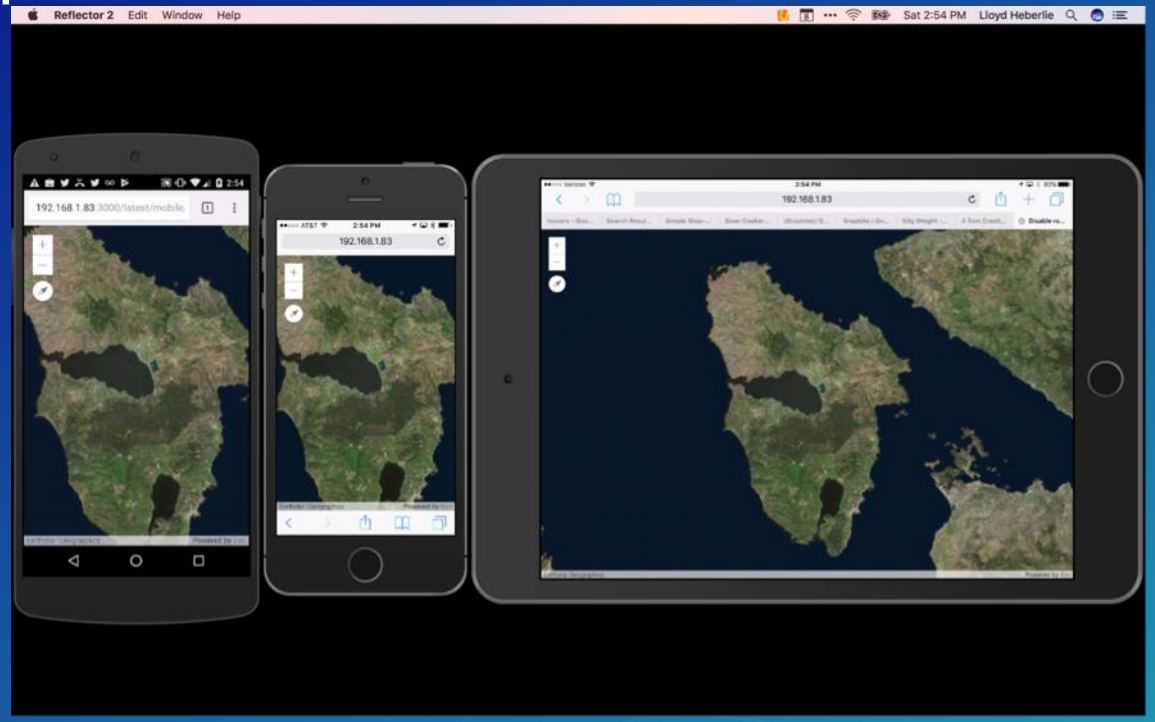
Expand

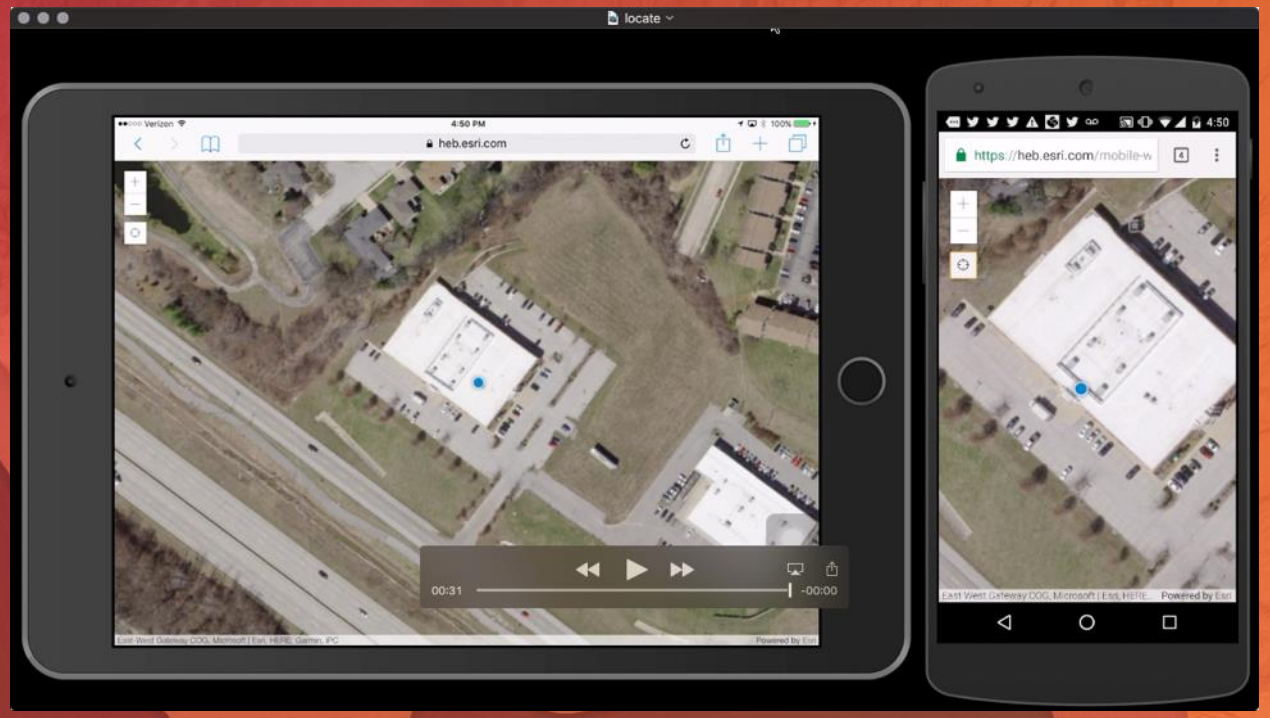

Reflector 2 Edit Window Help
Sat 2:46 PM Lloyd Heberlie
192.168.1.83
Report Incidents
Add incident
Or
Select an incident to edit or delete
Redlands

Compass


Reflector 2
Edit
Window
Help
Sat 2:54 PM
Lloyd Heberlie
192.168.1.83:3000/latest/mobile.
192.168.1.83
192.168.1.83

Compass

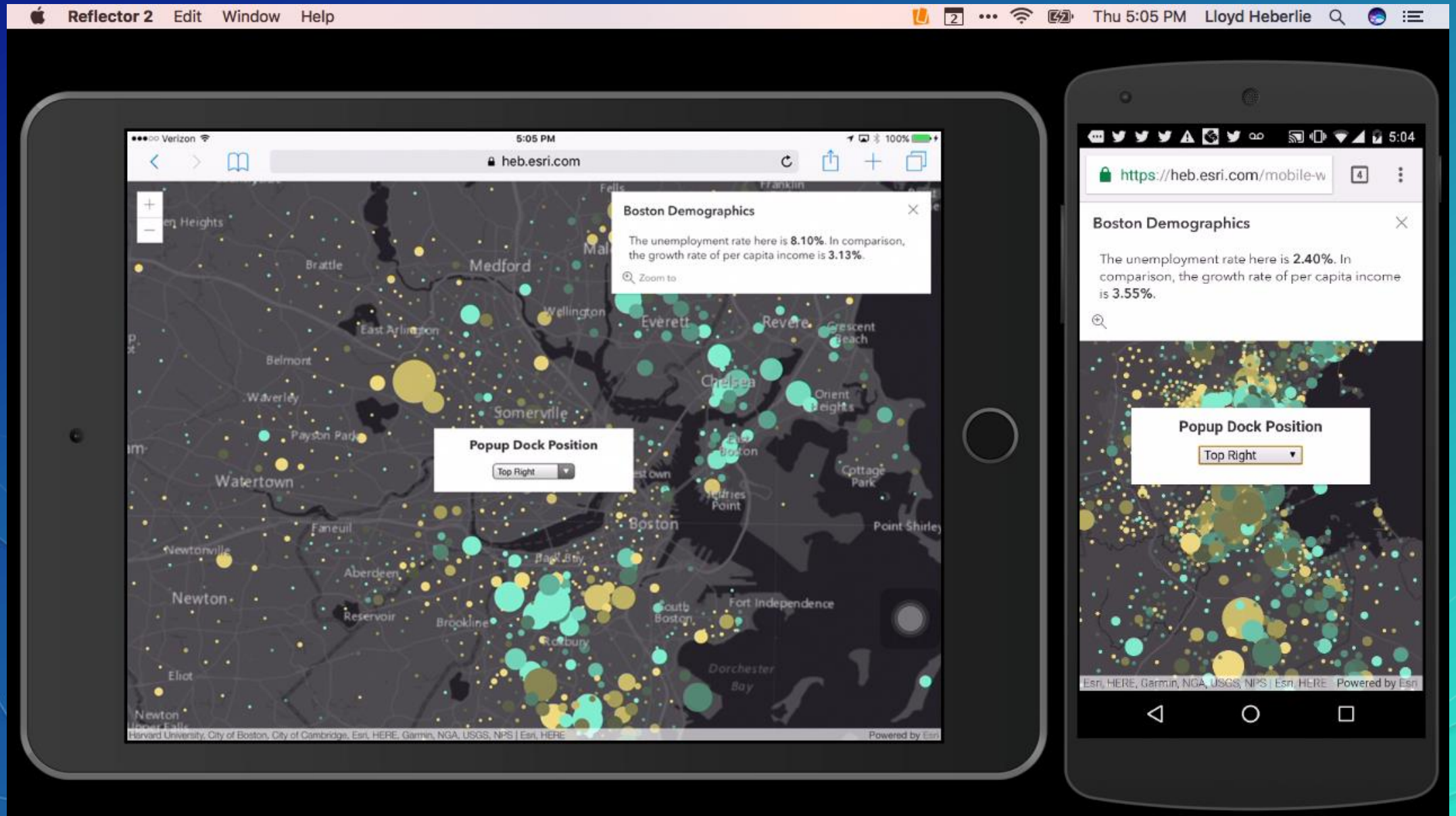

Reflector 2
Edit
Window
Help
Sat 2:54 PM
Lloyd Heberlie
192.168.1.83:3000/latest/mobile.
192.168.1.83
192.168.1.83



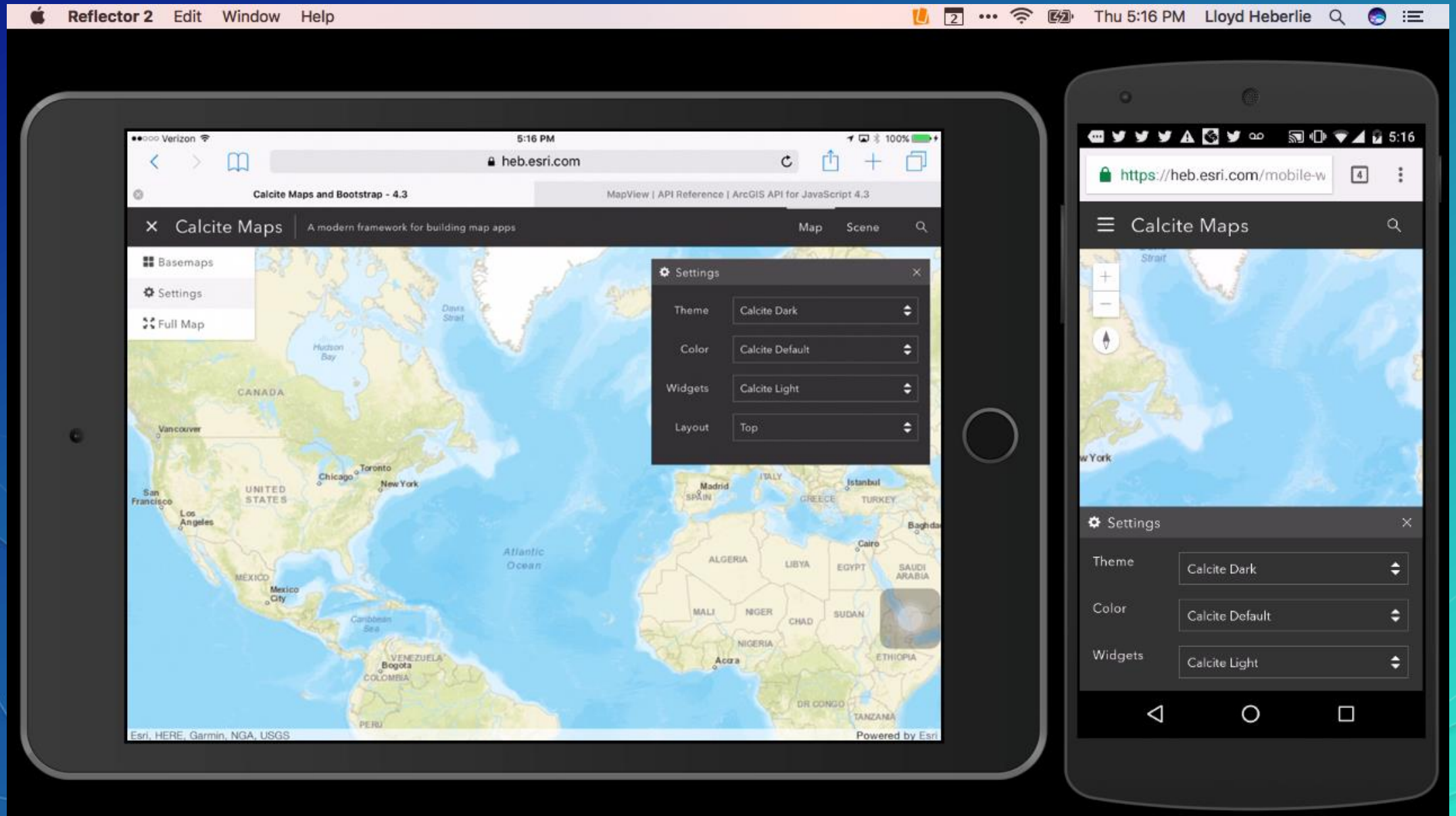
Locate

Demo

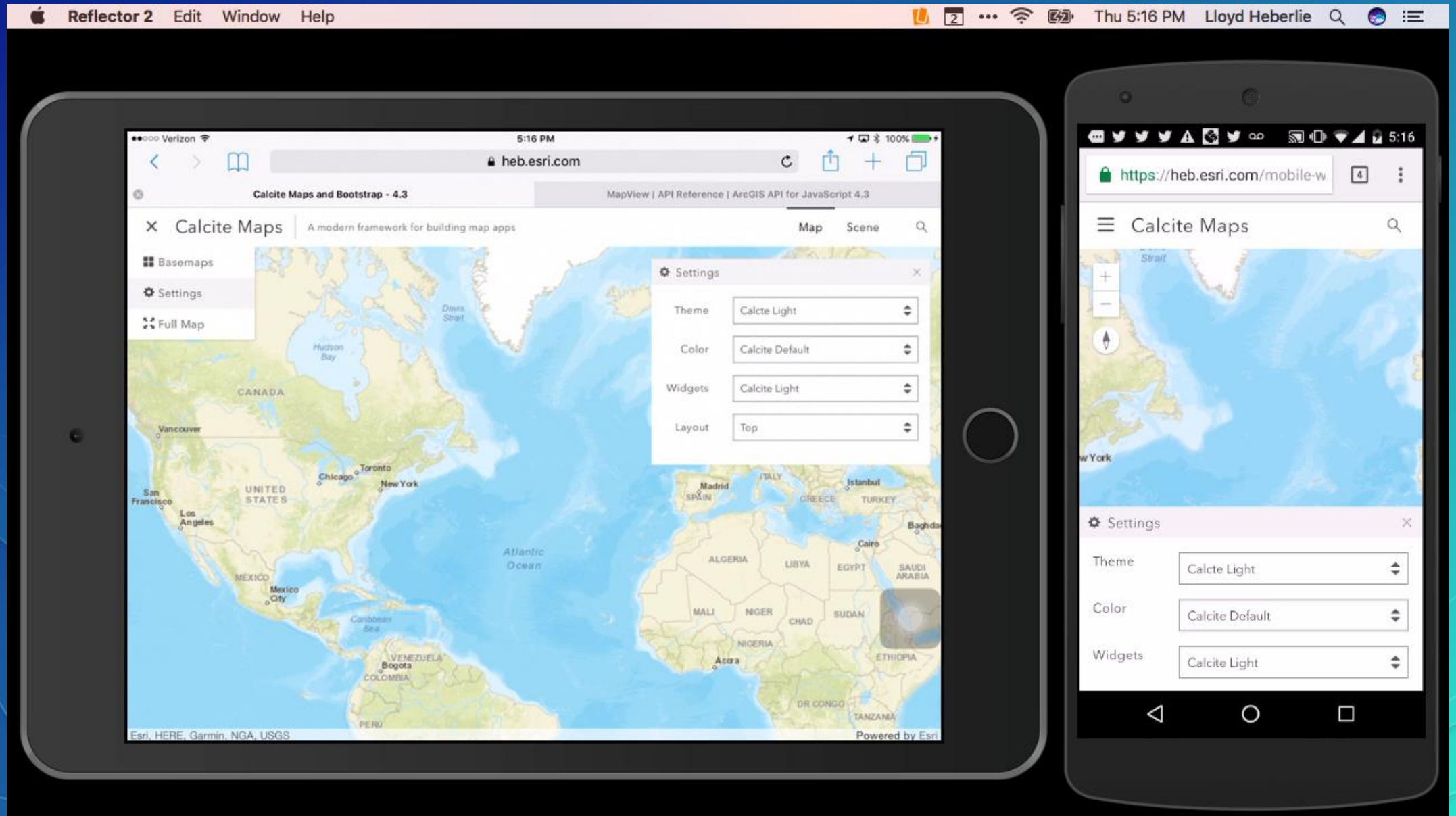
Popups


Reflector 2 Edit Window Help
Thu 5:05 PM Lloyd Heberlie
Verizon 5:05 PM 100%
heb.esri.com
Boston Demographics
The unemployment rate here is 8.10%. In comparison, the growth rate of per capita income is 3.13%.
Zoom to
Popup Dock Position
Top Right
Medford
Everett
Revere
Somerville
Chelsea
Watertown
Boston
Newton
Brookline
Roxbury
Fort Independence
Dorchester Bay
Harvard University, City of Boston, City of Cambridge, Esri, HERE, Garmin, NGA, USGS, NPS | Esri, HERE
Powered by Esri
5:04
https://heb.esri.com/mobile-w
Boston Demographics
The unemployment rate here is 2.40%. In comparison, the growth rate of per capita income is 3.55%.
Popup Dock Position
Top Right
Esri, HERE, Garmin, NGA, USGS, NPS | Esri, HERE
Powered by Esri

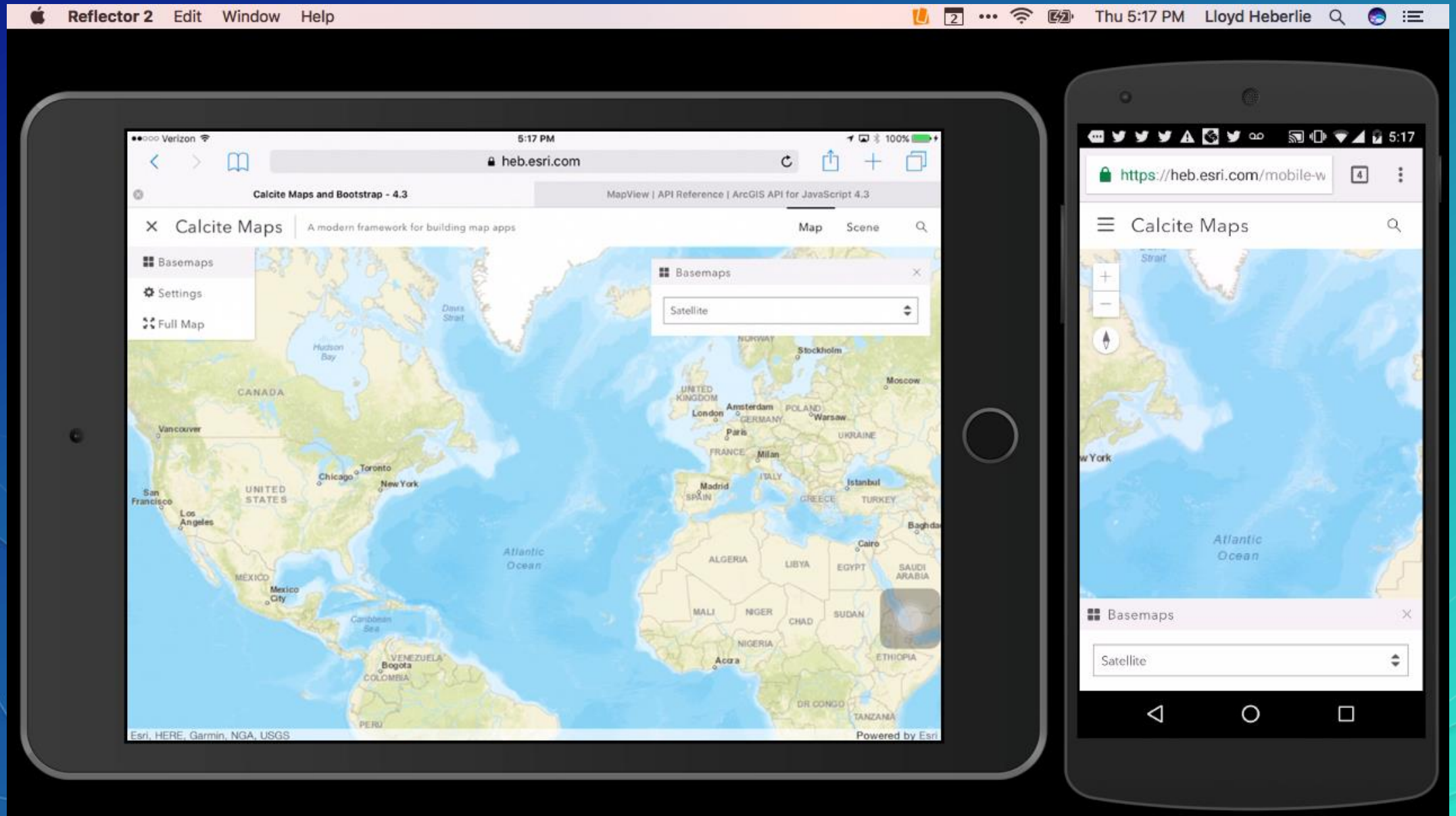
Calcite Maps - Settings



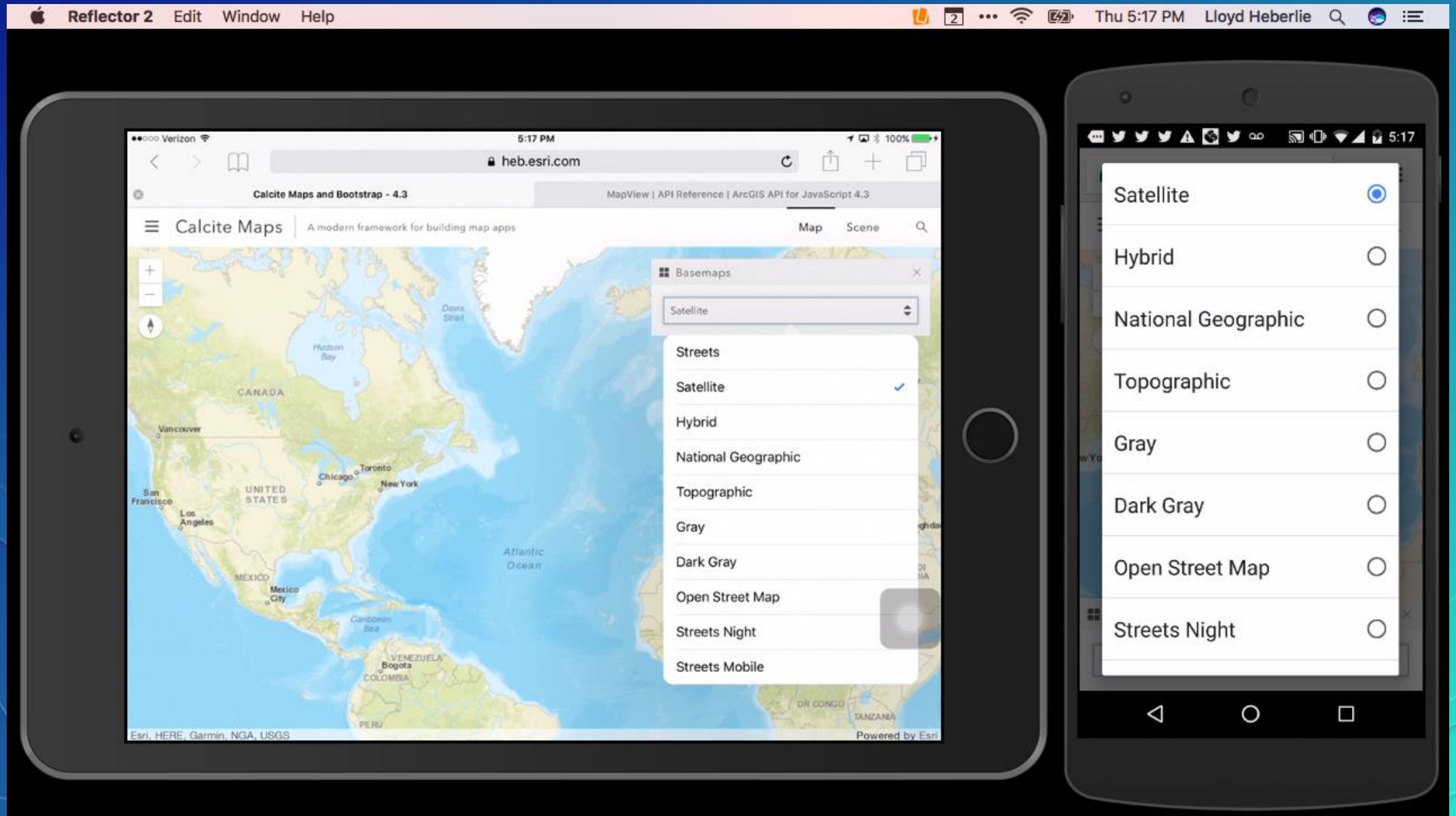
Calcite Maps - Settings



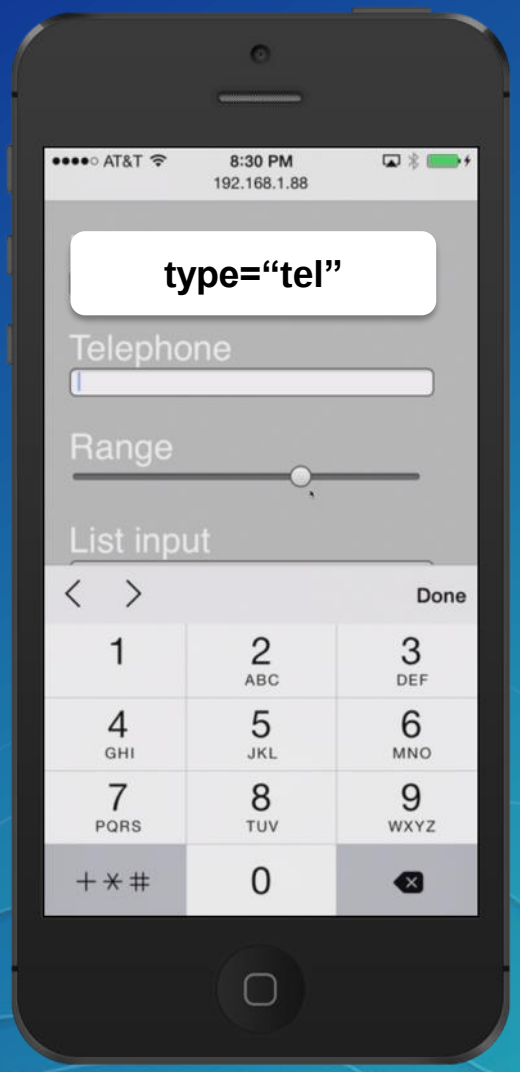
Calcite Maps - Basemaps

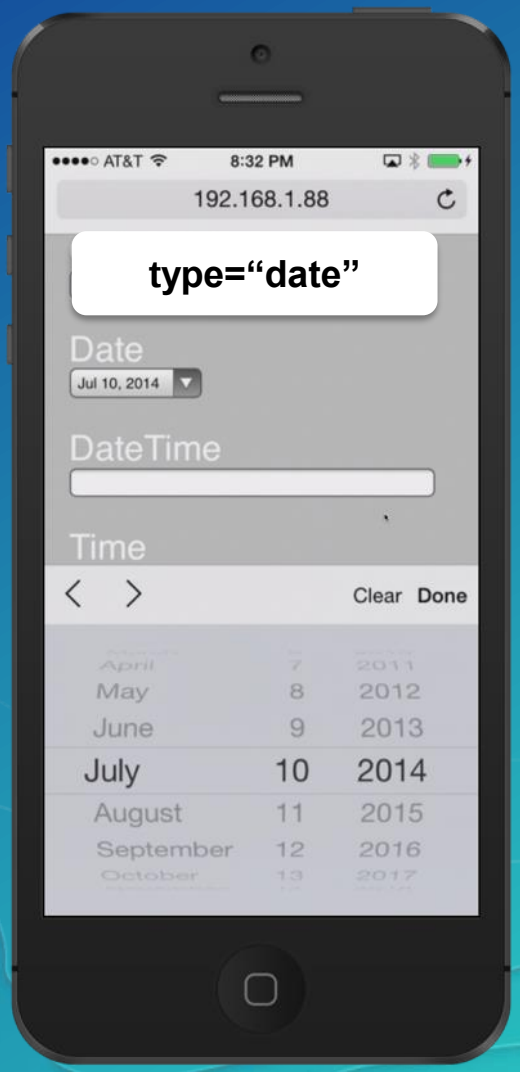


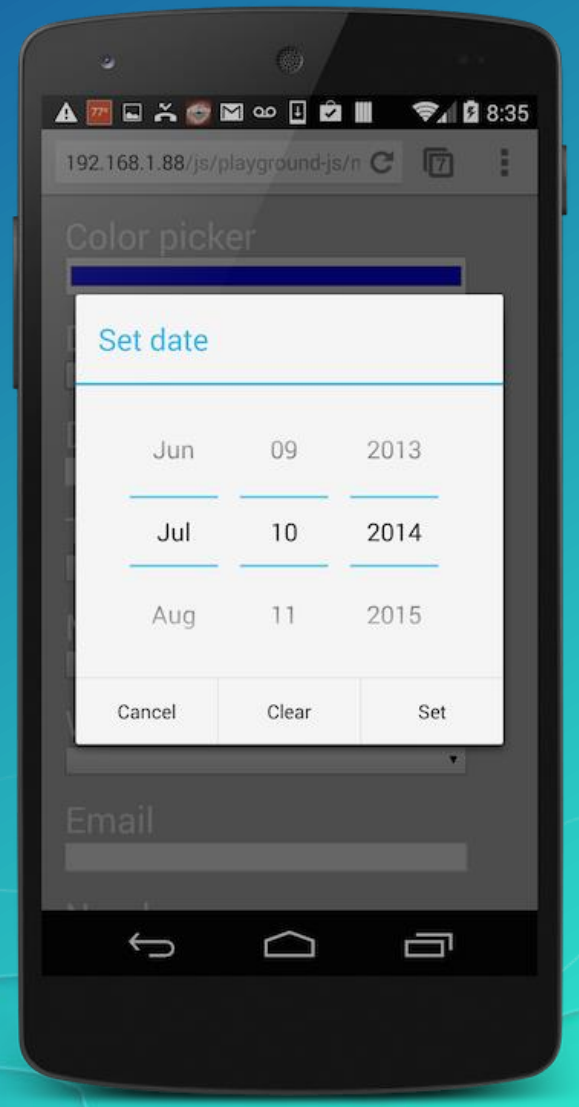
Calcite Maps - Basemaps



HTML5 input types







Mobile media queries

2

```
<!DOCTYPE html>
<html data-browser="Mozilla/5.0 (Linux; Android 6.0; Nexus 5 Build/MRA58N) AppleWebKit/537.36
(KHTML, like Gecko) Chrome/59.0.3071.115 Mobile Safari/537.36">
<head>
  <meta charset="utf-8">
  <meta name="viewport" content="initial-scale=1,maximum-scale=1,user-scalable=no">
  <title> - 4.4</title>
  <head>

  </head>
<body>
  <script>
    // ------------------------------------------------------------------
    // js, sass - user-agent mixin
    // ------------------------------------------------------------------
    document.documentElement.setAttribute("data-browser", navigator.userAgent);
  </script>
</body>
</html>
```

1

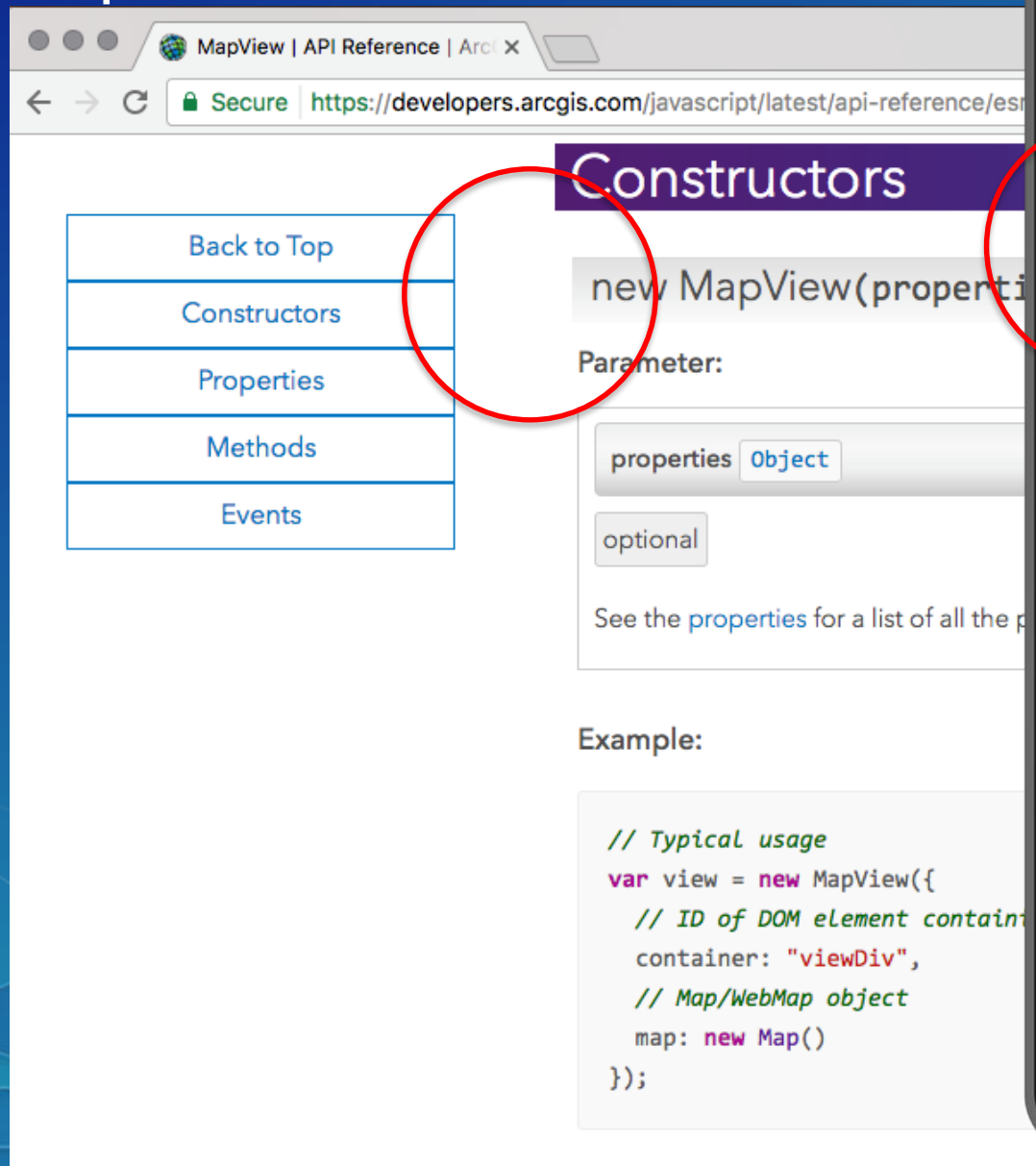
Mobile media queries

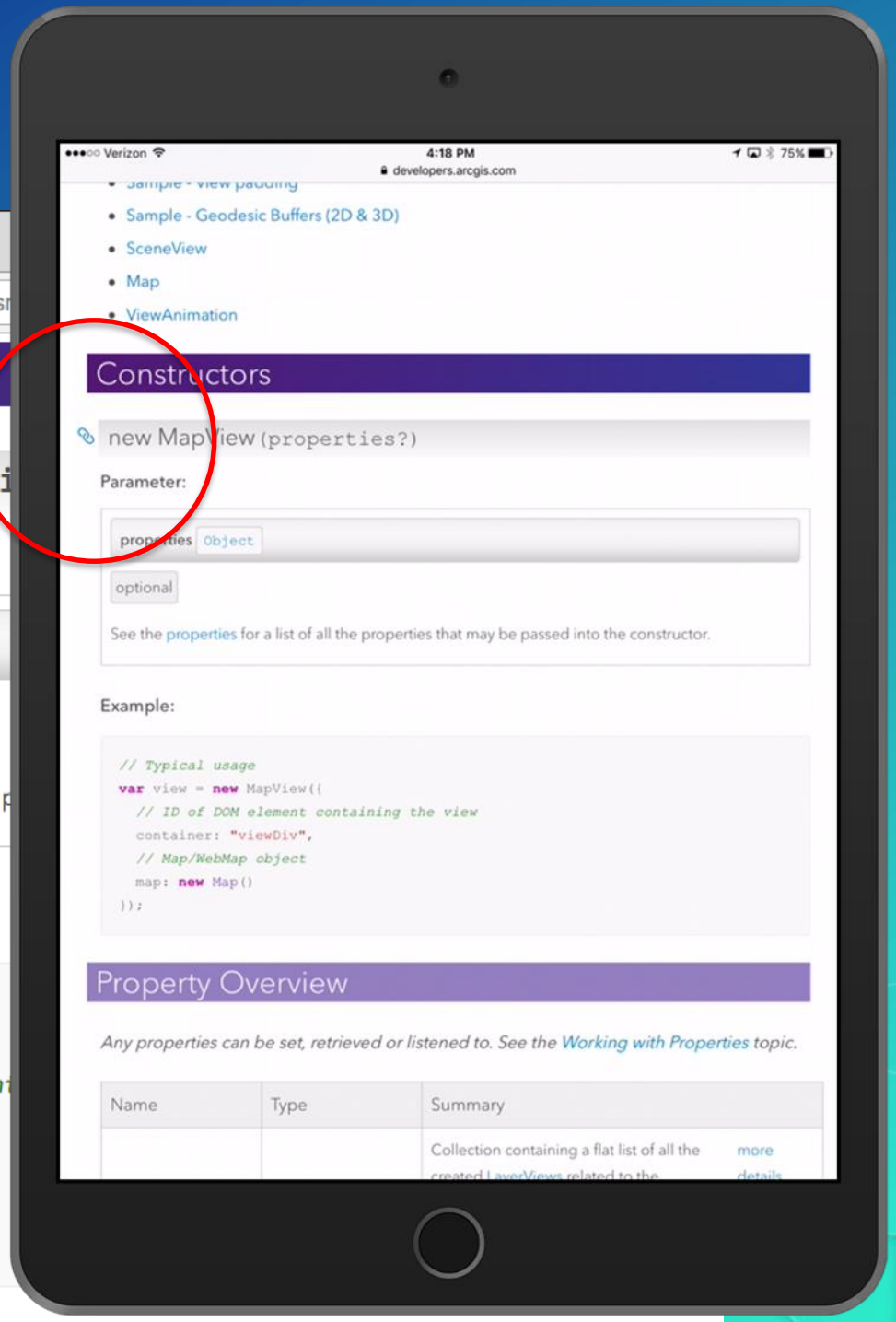

```
html[data-browser*="Mobile"]
.detail-name
.icon-anchor
.icon-ui-link {
/* - - - - Positioning - - - - */
display: inline-block;
/* - - - - Box-model   - - - - */
margin-left: -30px;
}

html[data-browser*="Mobile"]
.detail-name
.icon-anchor
.icon-ui-link:before {
/* - - - - Box-model   - - - - */
padding-right: 0.5625rem;
}

.detail-name
.icon-anchor
.icon-ui-link {
/* - - - - Positioning - - - - */
display: none;
/* - - - - Appearance  - - - - */
vertical-align: middle;
}
```

Mobile media queries





Mobile media queries

```html
<!DOCTYPE html>
<html data-browser="Mozilla/5.0 (Linux; Android 6.0; Nexus 5 Build/MRA58N) AppleWebKit/537.36
(KHTML, like Gecko) Chrome/59.0.3071.115 Mobile Safari/537.36">
<head>
  <meta charset="utf-8">
  <meta name="viewport" content="initial-scale=1,maximum-scale=1,user-scalable=no">
  <title></title>
  <head>
  </head>
<body>
  <script>
    // ---------------------------------------------------------------------
    // Tablet and phone viewports need a different CSS selector than desktop viewports.
    // ---------------------------------------------------------------------
    var mqDesktop = window.matchMedia("(min-width: 1024px) and (max-width: 2560px)");
    var mqTablet = window.matchMedia("(min-width: 768px) and (max-width: 1023px)");
    var mqPhone = window.matchMedia("(max-width: 767px)");
    if (mqDesktop.matches){
      console.log("Desktop");
    }
    if (mqTablet.matches){
      console.log("Tablet");
    }
    if (mqPhone.matches){
      console.log("Phone");
    }
  </script>
</body>
</html>
```

Capabilities

Demos

Managing initial load times

Initial loading in a mobile browser

Often misunderstood

Many things happening

Vulnerable to timing issues

Consider user’s experience

Initial loading in a mobile browser

CSS
3rd party libraries
Frameworks
Framework plugins
ArcGIS JS API
GIS queries
GET map tiles

Initial loading in a mobile browser

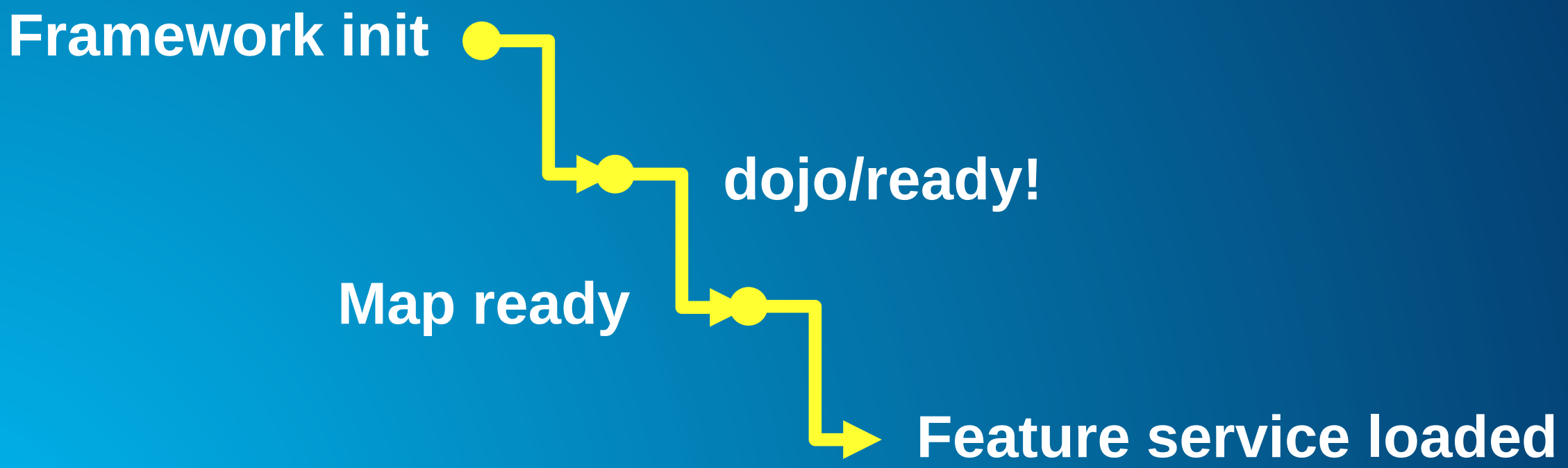
CSS
3rd party libraries
Frameworks
Framework plugins
ArcGIS JS API
GIS queries
GET map tiles

Initial loading in a mobile browser

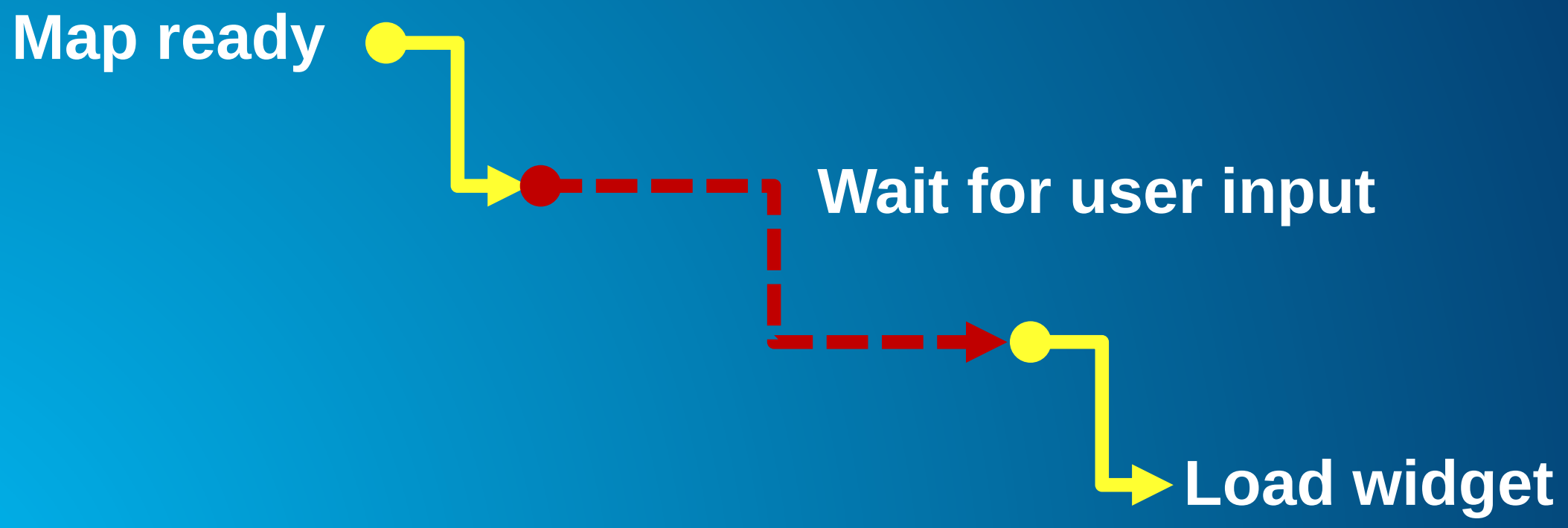
Wait for framework initialization

- In Angular: implements OnInit
- In Cordova: ‘deviceready’ event
- In ArcGIS: dojo/domReady!

Consider synchronous patterns



Lazy load modules and libraries



Lazy load demo

```
function lazyLoadPointCloudLayer(){
  require([
    "esri/layers/PointCloudLayer"
  ], function(PointCloudLayer) {
    var plc = new PointCloudLayer();
  });
}
```

Demo

Reserve async for after app load

Wait for framework initialization

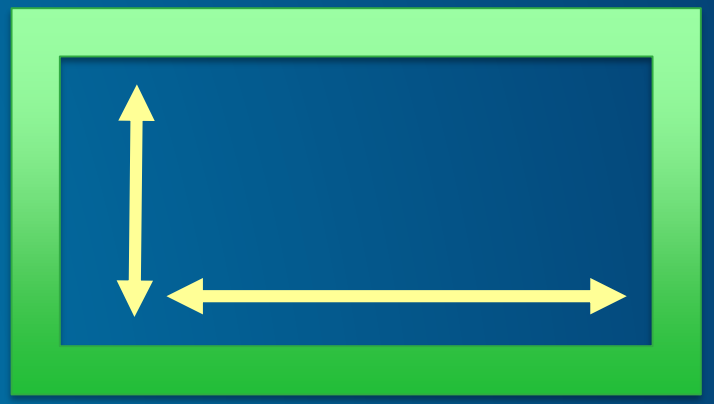
- In Angular: implements OnInit
- In Cordova: ‘deviceready’ event
- In ArcGIS: dojo/domReady!

MapView ready?

The View has a Map
View container size is greater than zero
View has a spatial reference

API Reference MapView.ready

Demo



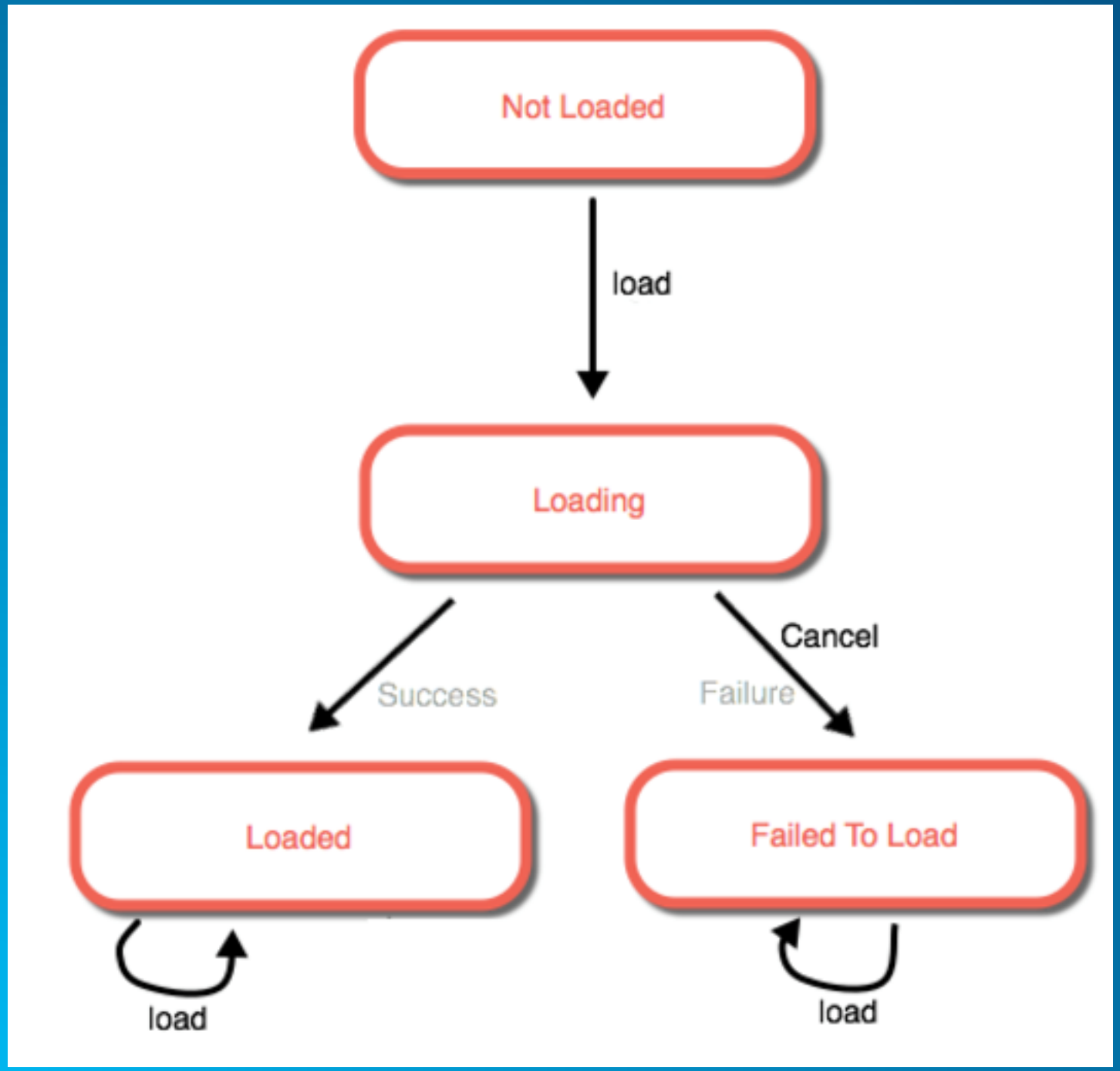
Loadable Patterns

Any resource that handles async data access
Examples: feature layers, tasks, web maps

loadStatus `String` `readonly`

Represents the status of a load operation.

Value	Description
`not-loaded`	The object's resources have not loaded.
`loading`	The object's resources are currently loading.
`loaded`	The object's resources have loaded without errors.
`failed`	The object's resources failed to load. See loadError for more details.



API reference
[WebMap.loadStatus]

load() example

```
var webmap = new WebMap({
  portalItem: { // autocasts as new PortalItem()
    id: "f2e9b762544945f390ca4ac3671cfa72"
  }
});

var view = new MapView({
  //map: webmap,
  container: "viewDiv"
});

webmap.load().then(function(r){
  view.map = webmap;
  console.log(r);
  console.log("Load Status: " + webmap.loadStatus)
}).otherwise(function(err){
  console.log("Problem loading webmap: " + error);
});
```

Demo

Splash Screens

Distract end user from long load times
Gives you control over when main app visible
Wait for MapView.then()

https://github.com/andygup/splash-screen-js

Using local builds

Lloyd Heberlie

Why?

More modules – more requests

Optimized build for app

Web application vs. Hybrid

Reduce http service calls for Hybrid apps

How to create custom builds?

ArcGIS API for JavaScript Web Optimizer – 3x

Bower

npm

More information

- **Optimizing Your JavaScript App for Performance**
  - Thursday, July 13 - *12:30* - *1:15 pm* - 45 minutes
  - **SDCC - Demo Theater 11 - Developer**

Using local builds

Demo

Working with Cordova and Ionic Native Mobile

Cordova/Phonegap

Wait for “`deviceready`” event

https://github.com/Esri/quickstart-map-phonegap

Ionic and loading ArcGIS JavaScript modules

Many helper libraries!

- angular-esri-loader (Angular 4+, wraps esri-loader)
- esri-loader (platform agnostic)
- Ionic2-esri-map (Sample app)
- ArcGIS TypeScript definitions

Working with Frameworks
Mobile browser-only

Other frameworks

- Plain old Bootstrap
- calcite-maps

- ember-esri-loader
- esri-loader-react
- esri-system-js

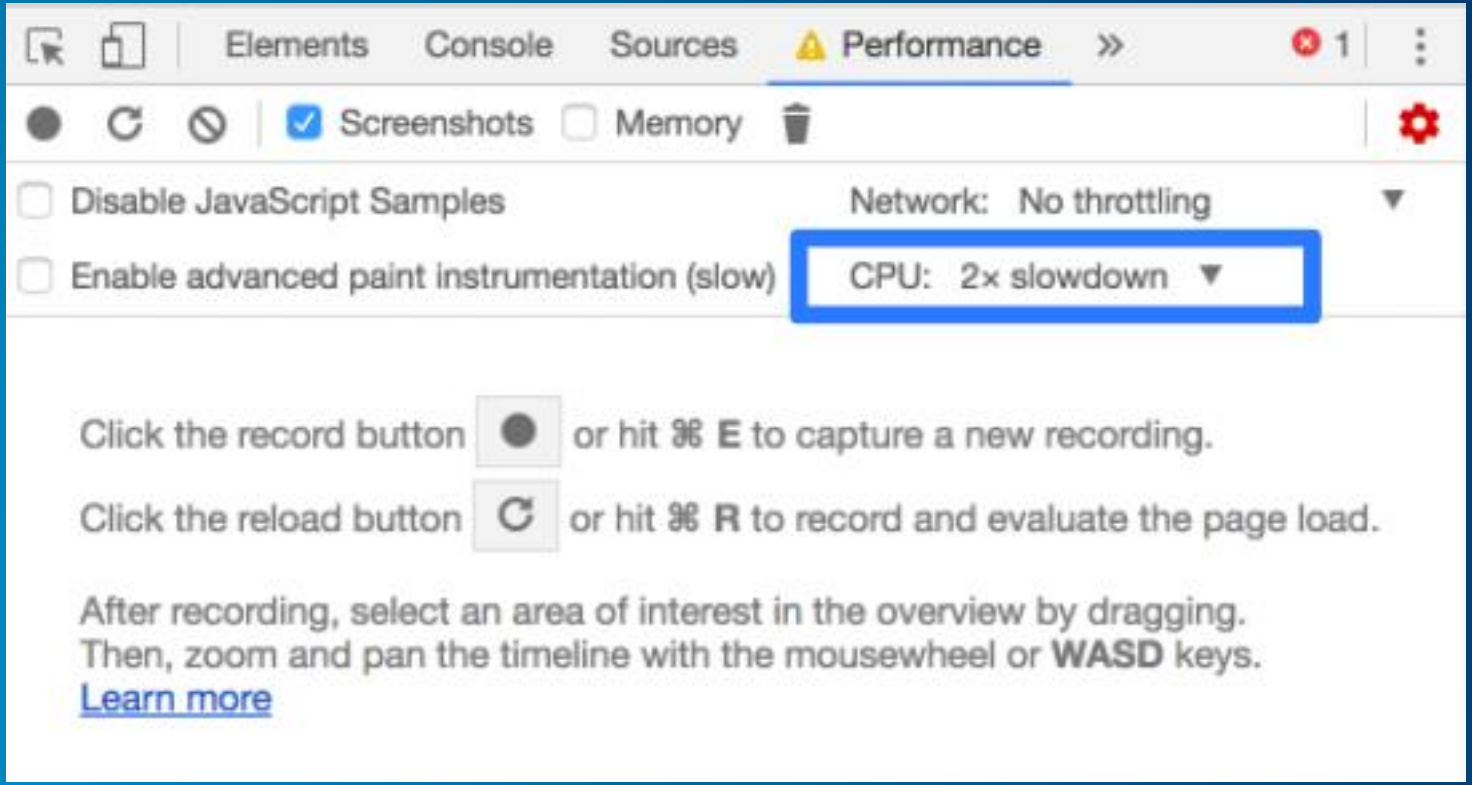
Test Mobile Performance

Google Chrome DevTools

https://developers.google.com/web/tools/chrome-devtools/evaluate-performance/

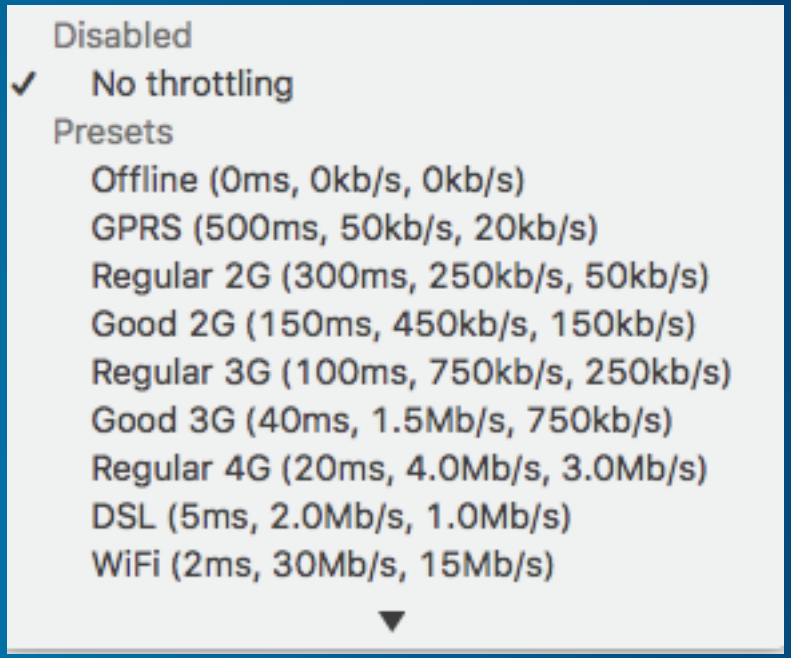
Google Chrome DevTools

Performance > Capture Settings > CPU



Google Chrome DevTools

Performance > Capture Settings > Network



WebPageTest

https://webpagetest.org/

Need help improving?

Web Page Performance Test for

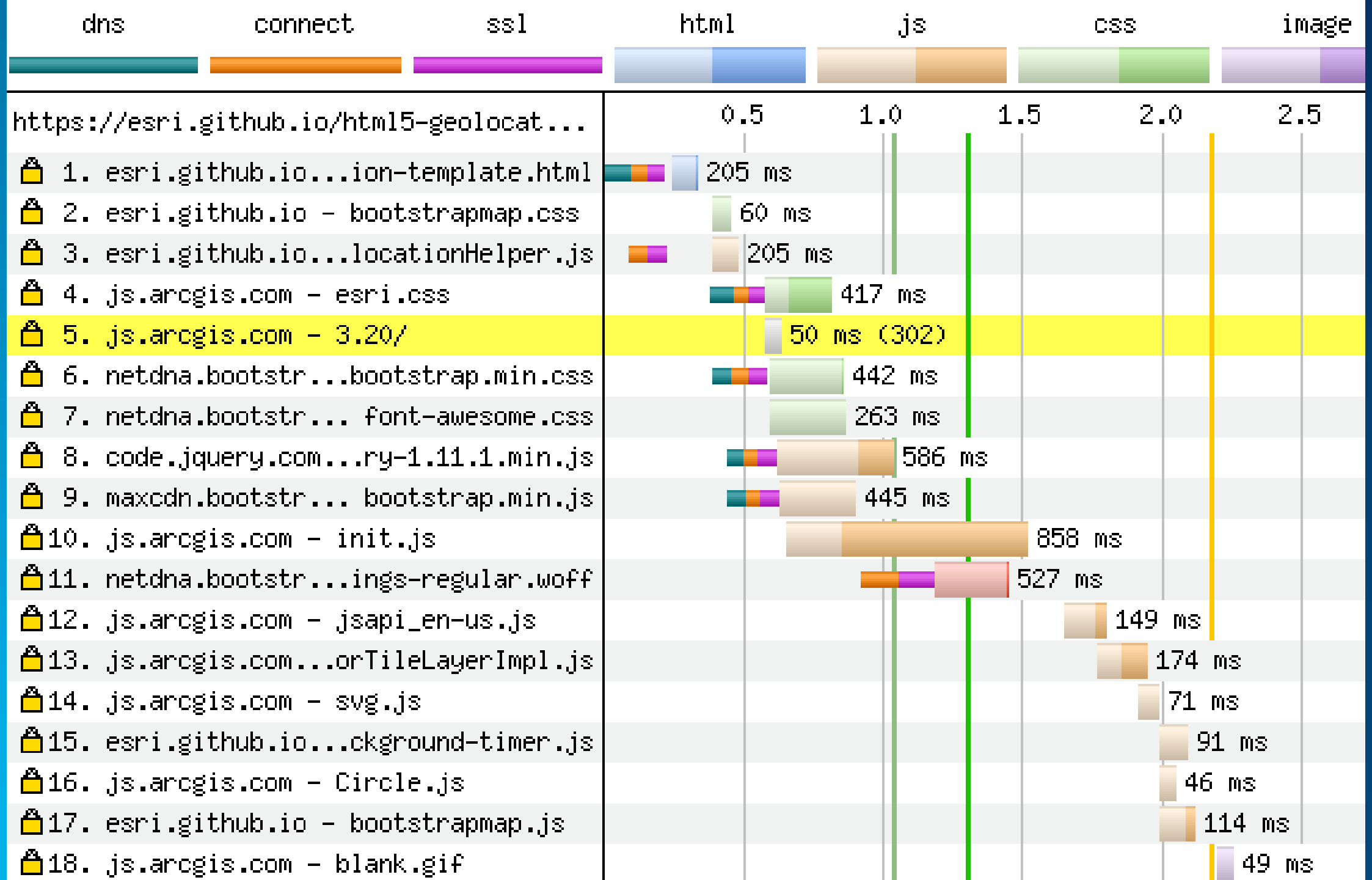
https://esri.github.io/html5-geolocation-tool-js/field-location-template.html

From: Denver, Colorado USA - **Chrome** - **Cable**
6/29/2017, 11:55:46 AM

A	A	A	B	F	✓
First Byte Time	Keep-alive Enabled	Compress Transfer	Compress Images	Cache static content	Effective use of CDN

Performance Results (Median Run)

					Document Complete			Fully Loaded				
	Load Time	First Byte	Start Render	Speed Index	Time	Requests	Bytes In	Time	Requests	Bytes In	Certificates	Cost
First View (Run 1)	2.808s	0.325s	1.297s	3528	2.808s	22	710 KB	5.809s	40	960 KB	67 KB	$$---


dns
connect
ssl
html
js
css
image
https://esri.github.io/html5-geolocat...
0.5
1.0
1.5
2.0
2.5
1. esri.github.io...ion-template.html
205 ms
2. esri.github.io - bootstrapmap.css
60 ms
3. esri.github.io...locationHelper.js
205 ms
4. js.arcgis.com - esri.css
417 ms
5. js.arcgis.com - 3.20/
50 ms (302)
6. netdna.bootstr...bootstrap.min.css
442 ms
7. netdna.bootstr... font-awesome.css
263 ms
8. code.jquery.com...ry-1.11.1.min.js
586 ms
9. maxcdn.bootstr... bootstrap.min.js
445 ms
10. js.arcgis.com - init.js
858 ms
11. netdna.bootstr...ings-regular.woff
527 ms
12. js.arcgis.com - jsapi_en-us.js
149 ms
13. js.arcgis.com...orTileLayerImpl.js
174 ms
14. js.arcgis.com - svg.js
71 ms
15. esri.github.io...ckground-timer.js
91 ms
16. js.arcgis.com - Circle.js
46 ms
17. esri.github.io - bootstrapmap.js
114 ms
18. js.arcgis.com - blank.gif
49 ms

Performance metrics to keep in mind

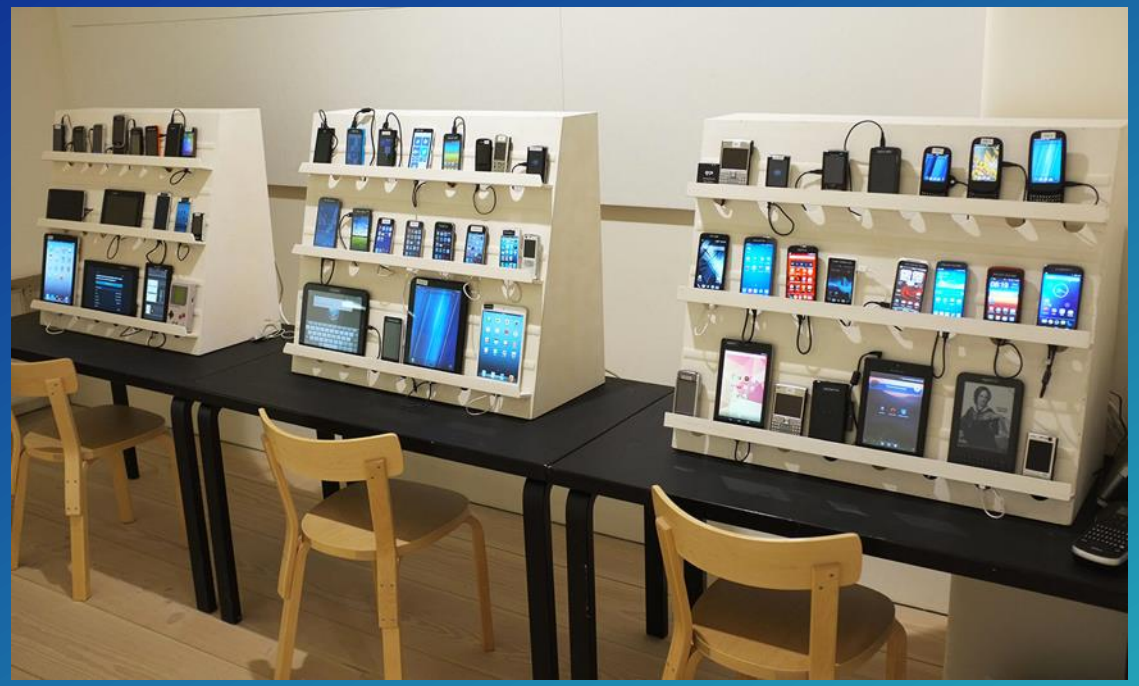
Time until first map tile
Time until last map tile
Example

Each new URL requires a DNS lookup + SSL negotiation
- Solution: self-host as much as possible

Debugging and testing

Lloyd Heberlie

Physical devices

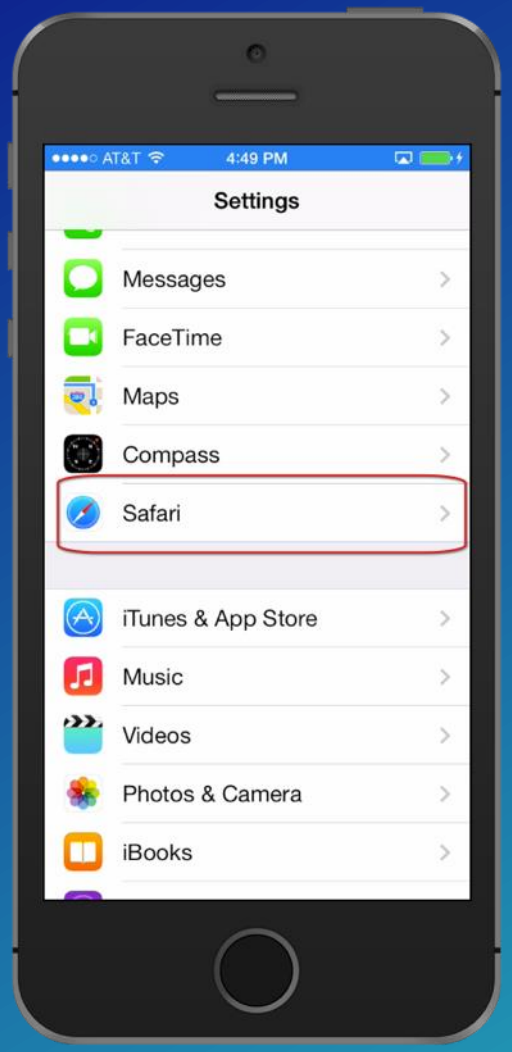


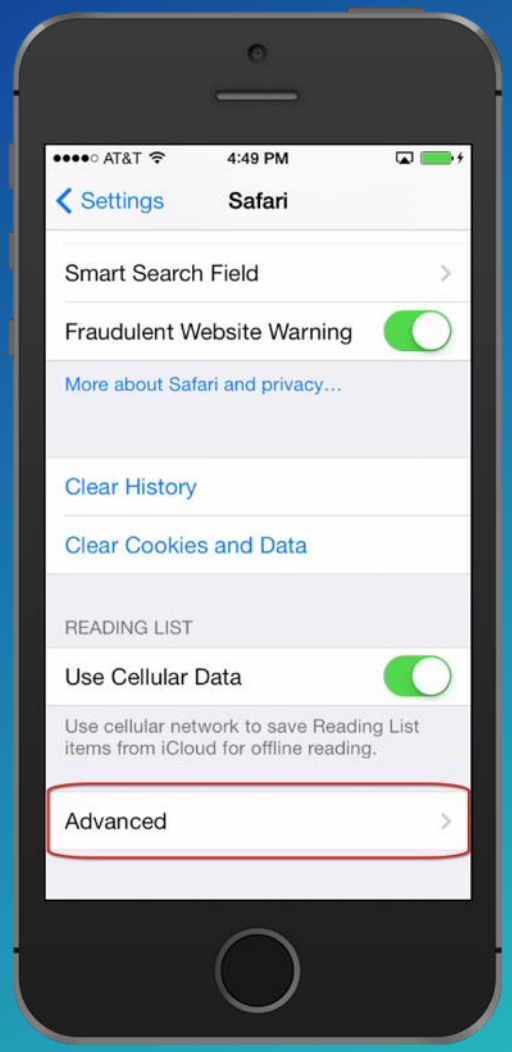
http://blog.adtile.me/2014/01/08/adtile-device-lab/

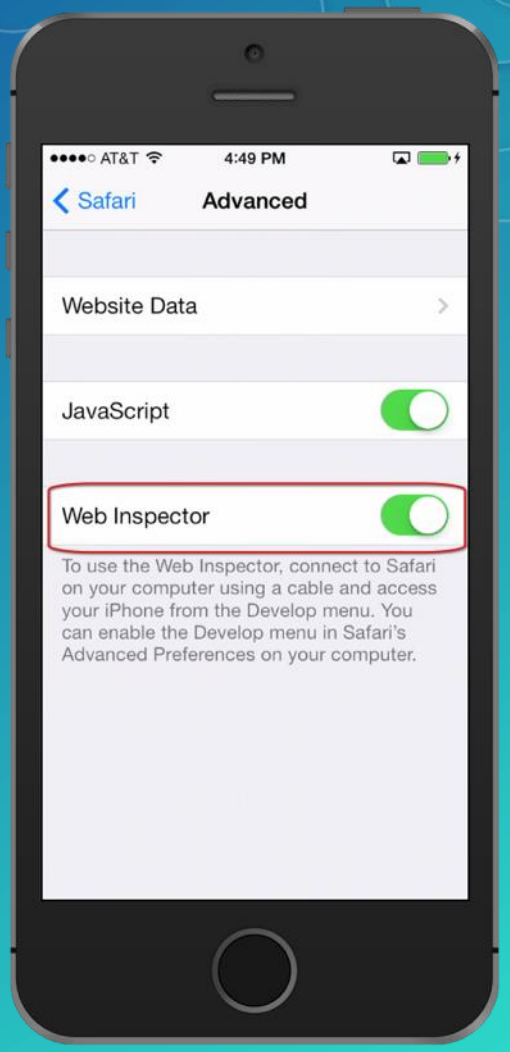
Remote debugging

- Safari Web Inspector Remote
- Google Chrome remote debugging
- http://livereload.com/
- Browser-sync

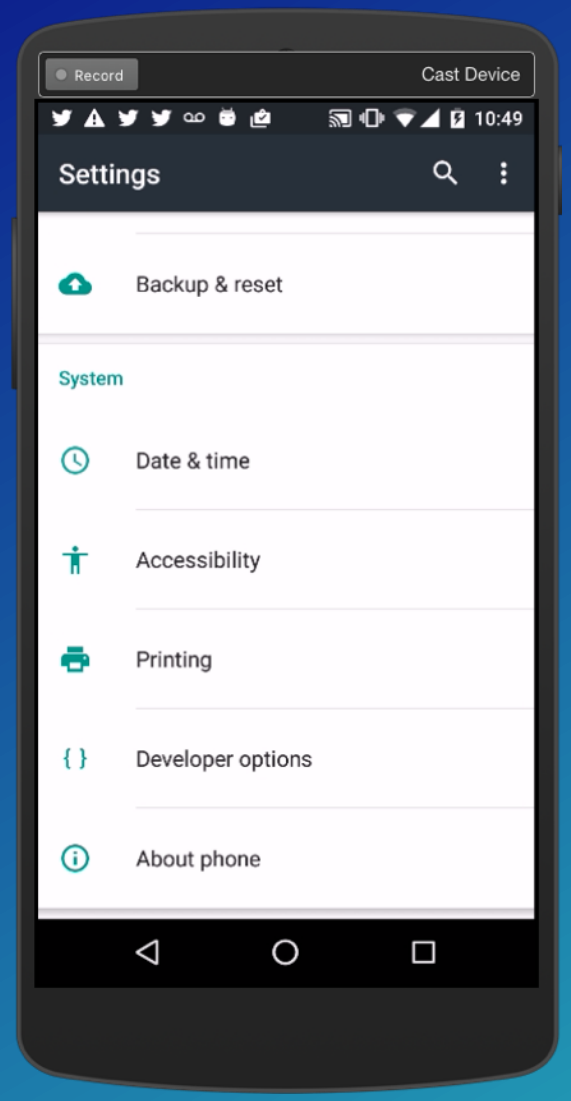
Enable iOS remote web inspection

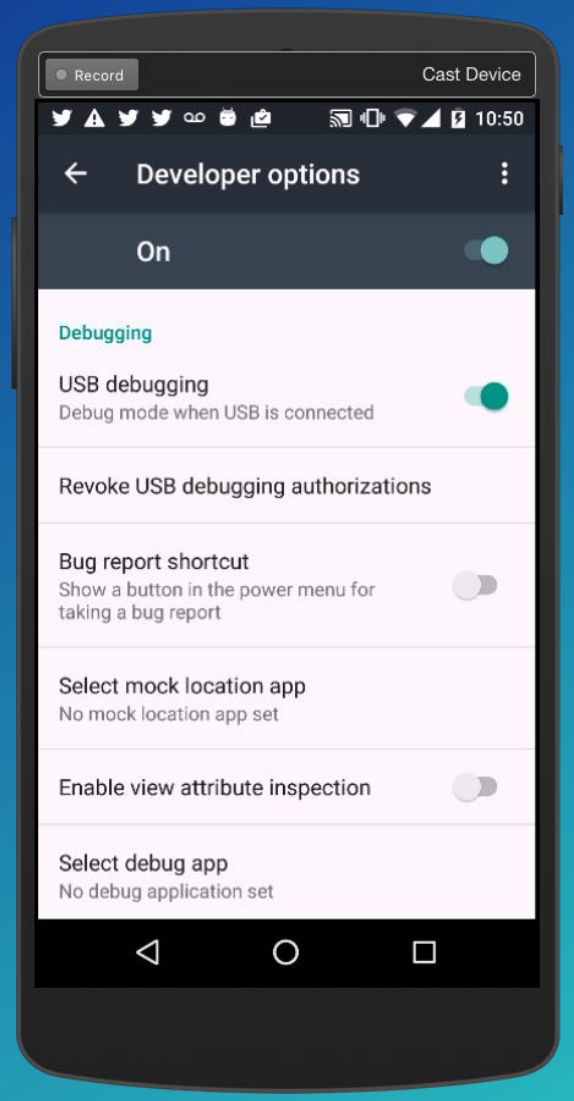


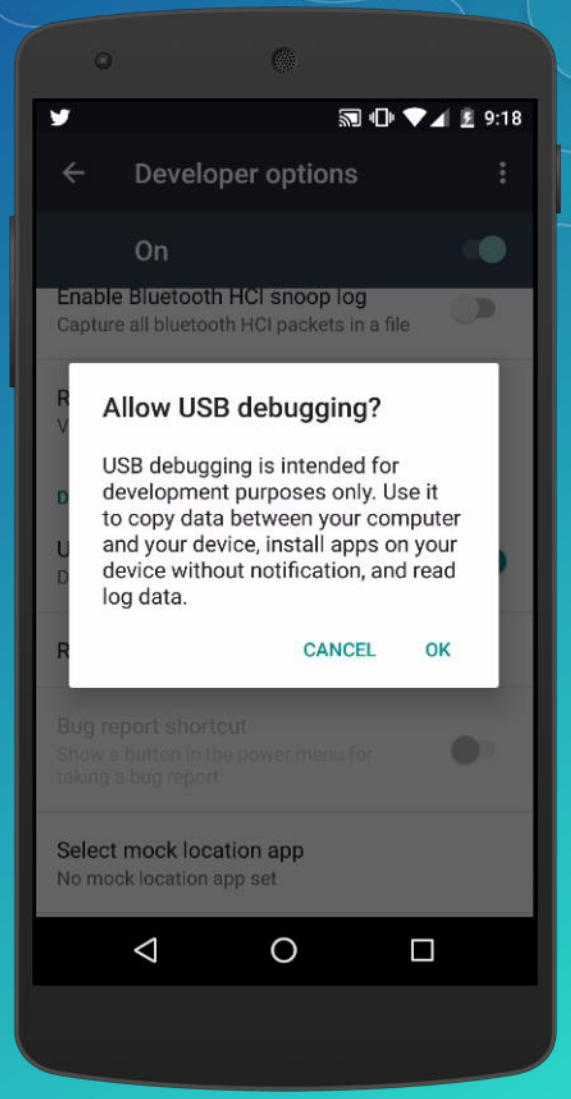




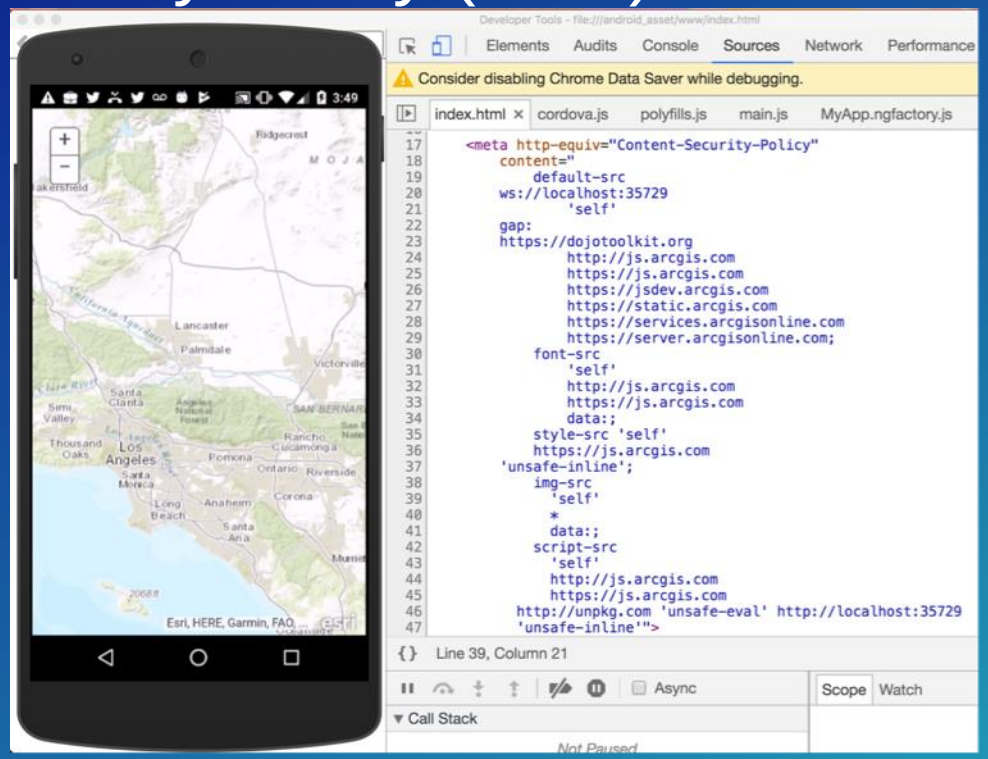
Enable Android remote web inspection







Content Security Policy (CSP)



Debugging Mobile

Demo

Working with GPS

Built-in GPS

Don’t use for field data collection!

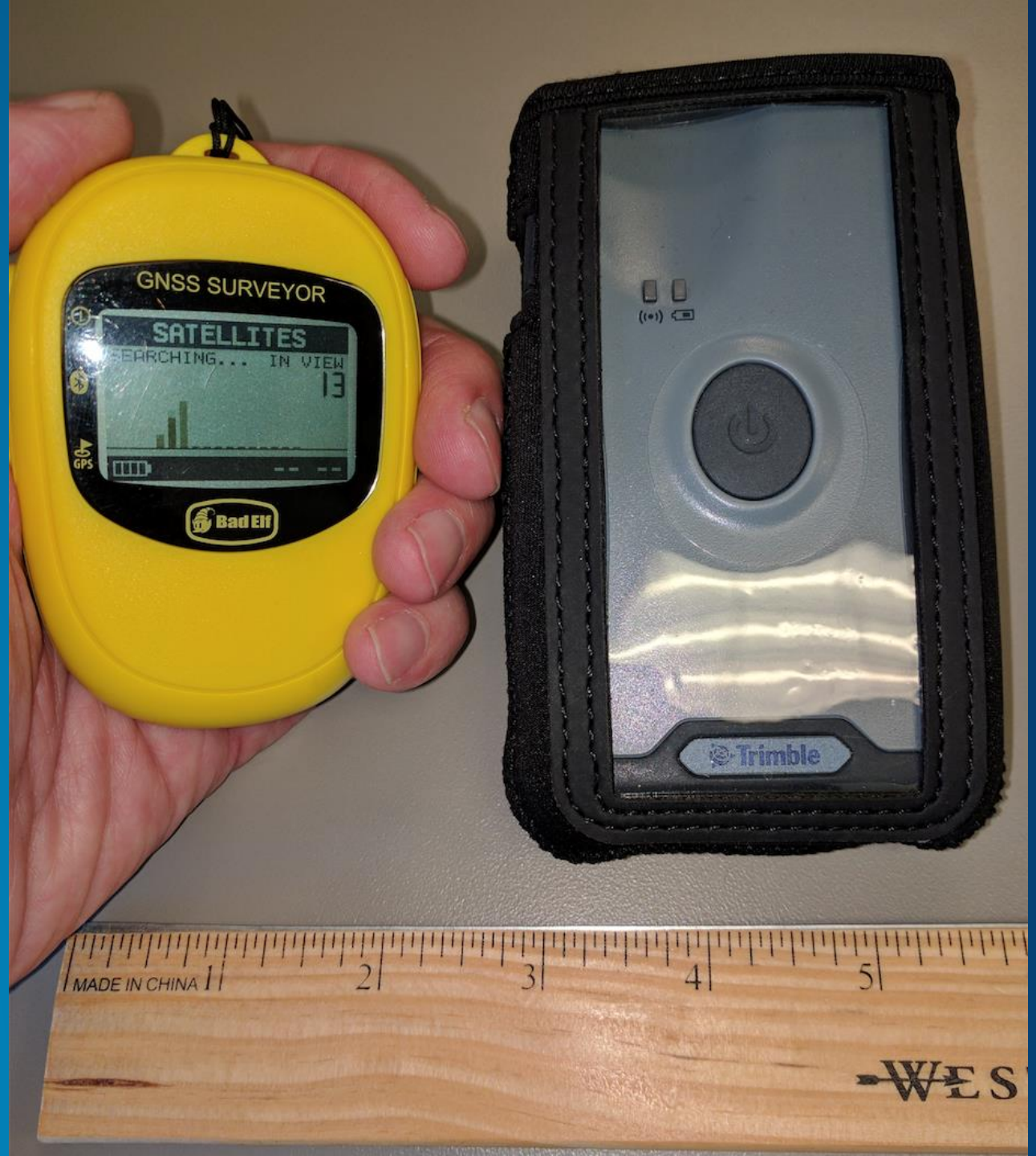
Okay to use for approximate location

github.com/Esri/html5-geolocation-tool-js

High-accuracy GPS

Bluetooth enabled

Bad Elf GNSS (left)
Trimble R1 (right)



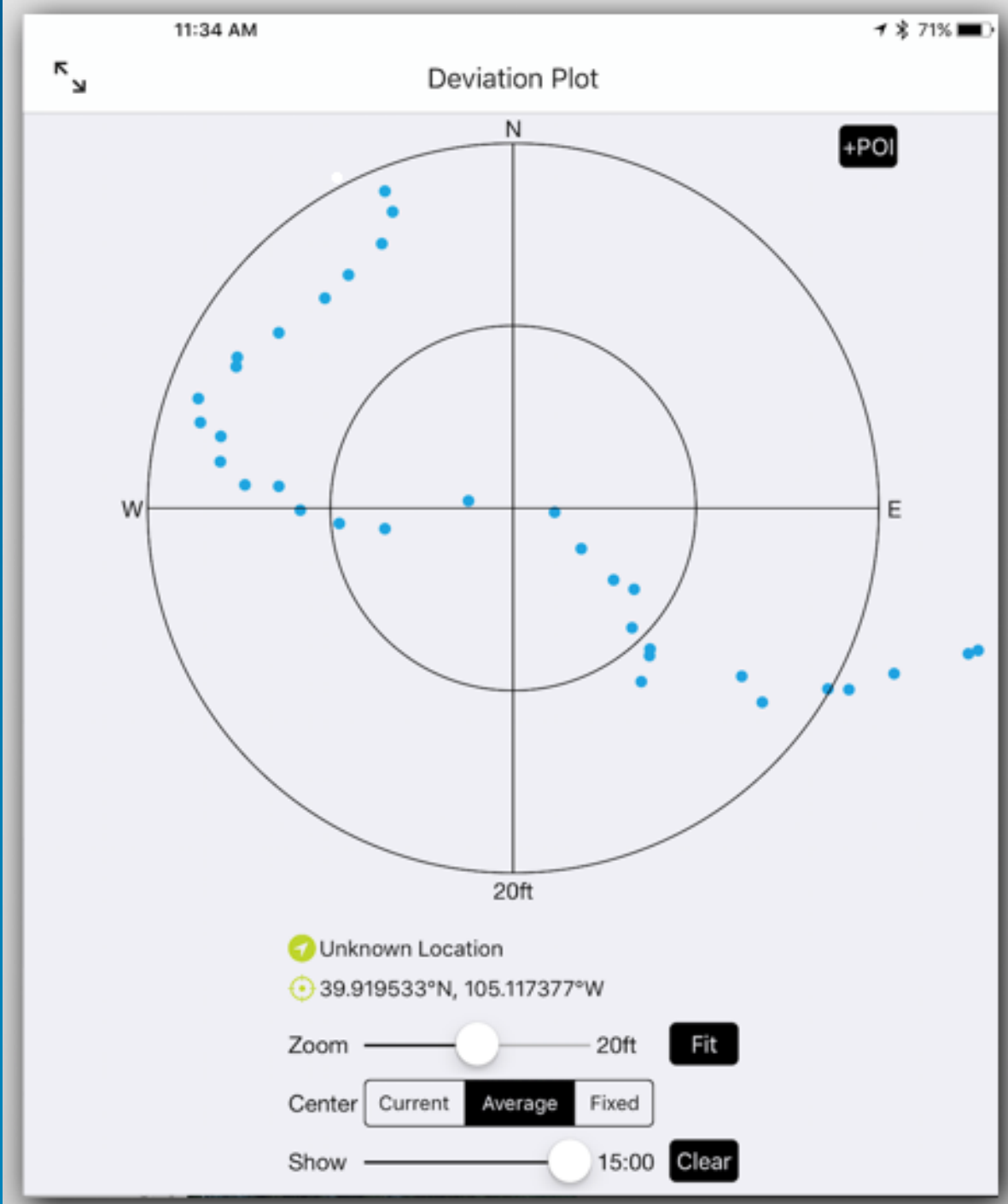
High-accuracy GPS and Web Mapping Apps

Best approach is Hybrid => Cordova, Ionic
Also consider ArcGIS Runtimes

NOTE: Regular browser Geolocation API may provide incorrect data

GPS Drift

Stationary device



Cordova plugin for high-accuracy on Android

Works with high-accuracy GPS via bluetooth
Separates GPS locations from Network locations

https://github.com/Esri/cordova-plugin-advanced-geolocation

esri

THE SCIENCE OF WHERE