



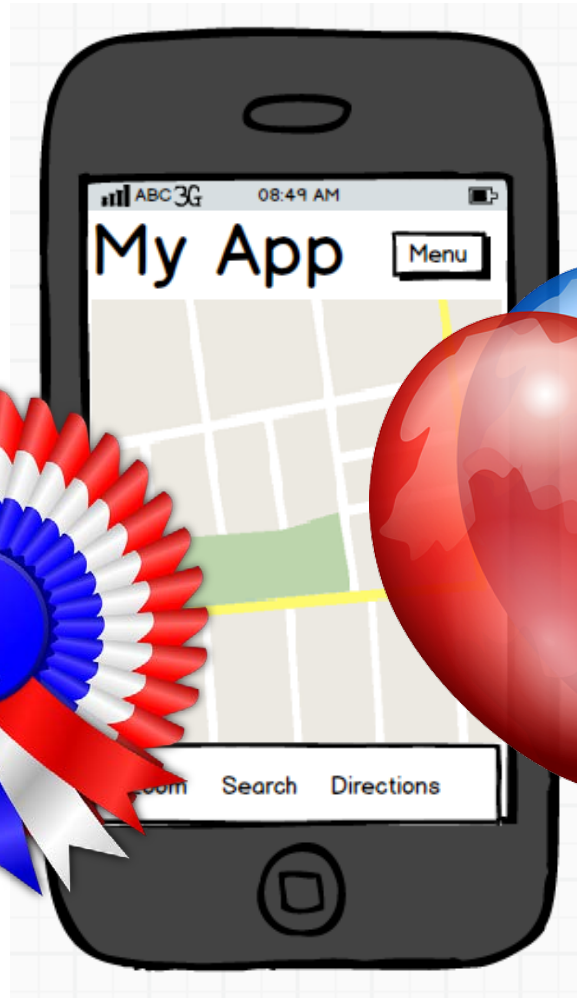
# ArcGIS API for JavaScript Building Mobile Web Apps

Andy Gup, Esri US

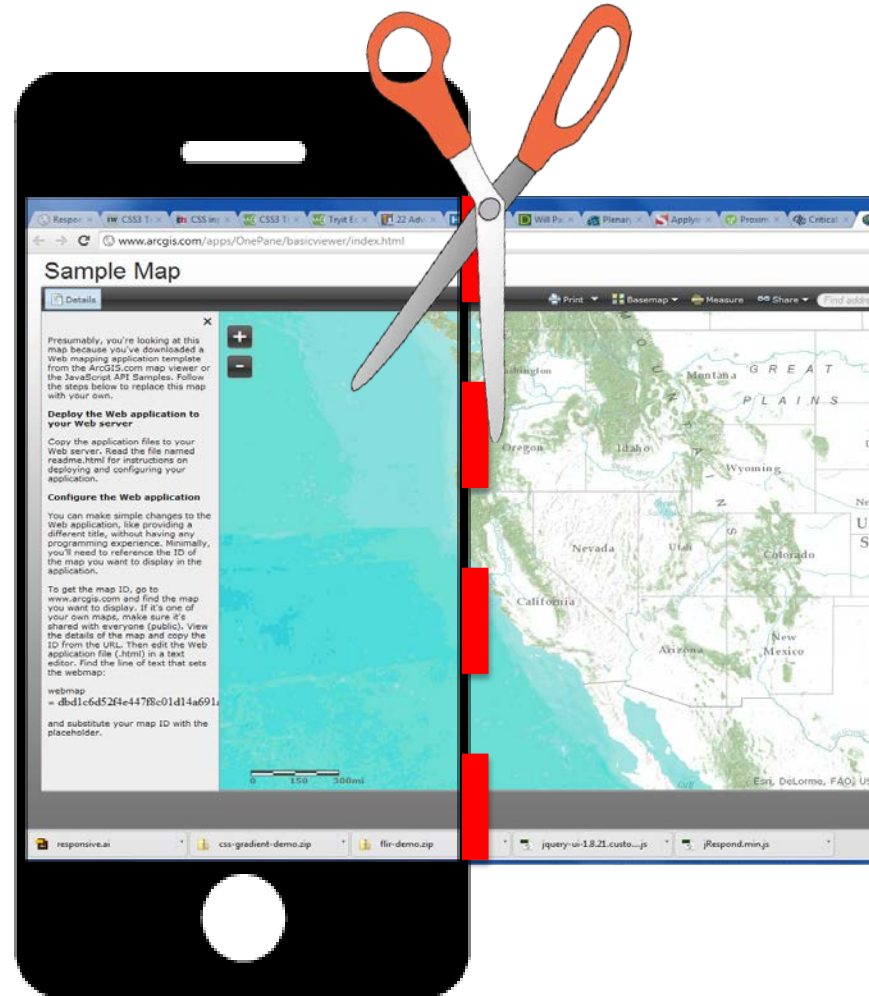
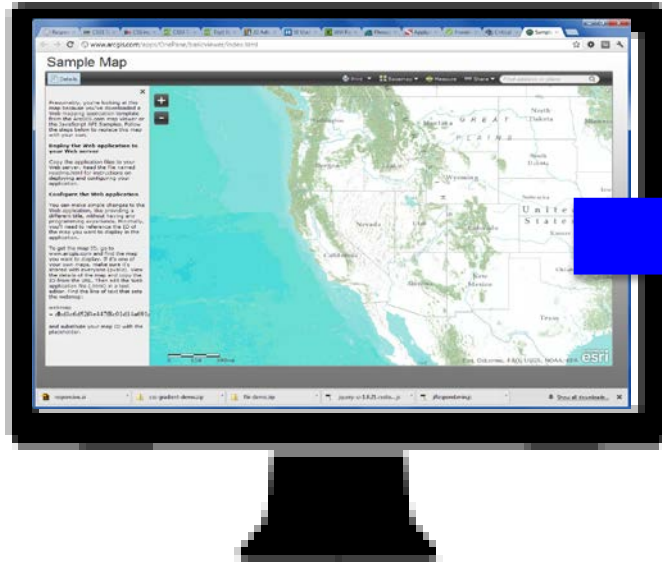
# Agenda



**Think  
Mobile  
First!**

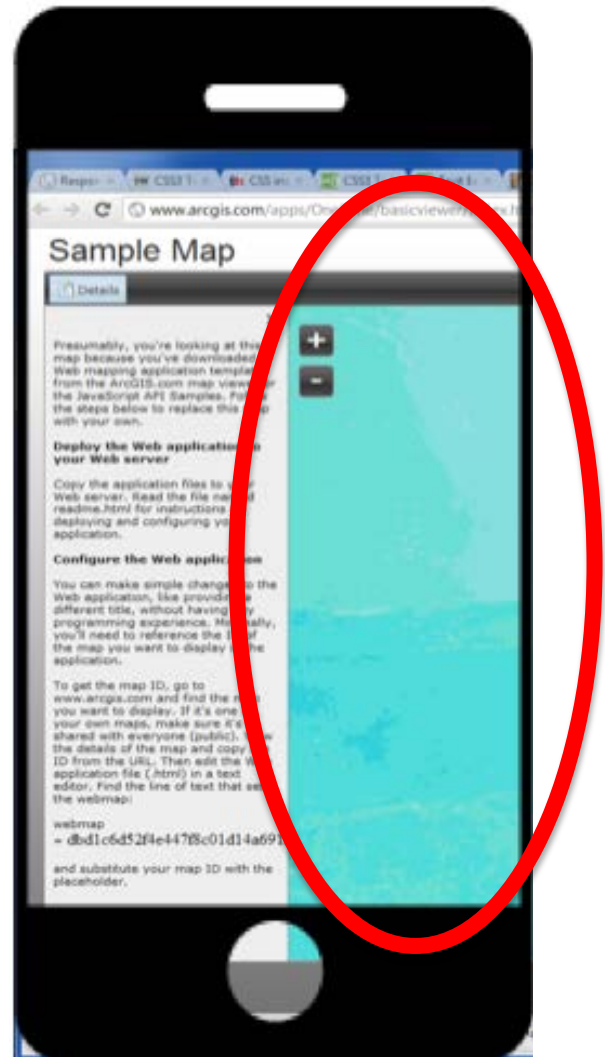


# Default Behavior



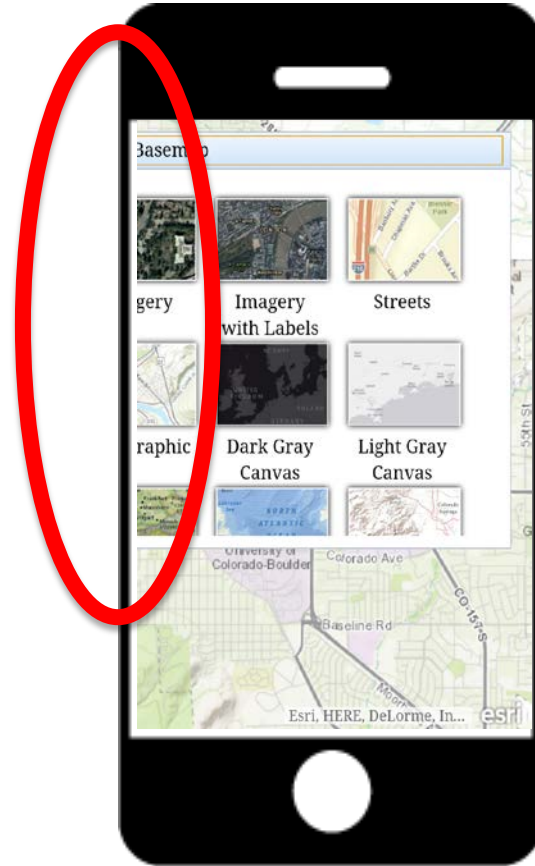
# Default Behavior

## Desktop app on Mobile



# Default Behavior

## Desktop app on Mobile



# Default Behavior

## Desktop app on Mobile



# Default Behavior

Desktop app on Mobile

Sluggish

UI Jank

Missing UI pieces

Poor UX





# Apps specifically built for mobile

Field data collection

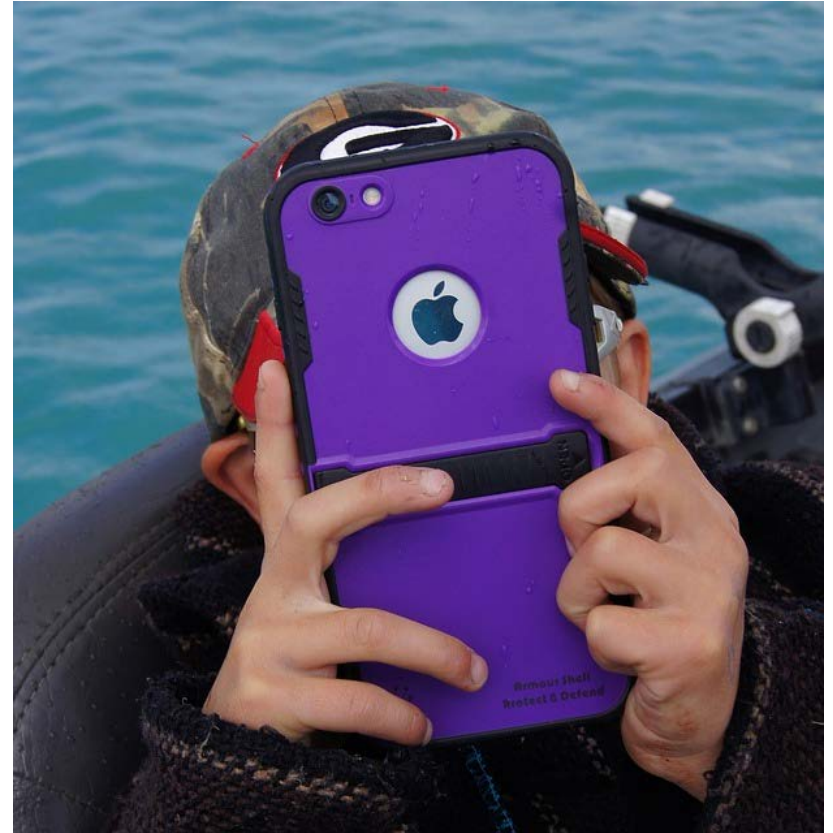
Deploy to Store

Citizen 411

Finder apps

Games

...Many more!



Demo

# Mobile devices are different

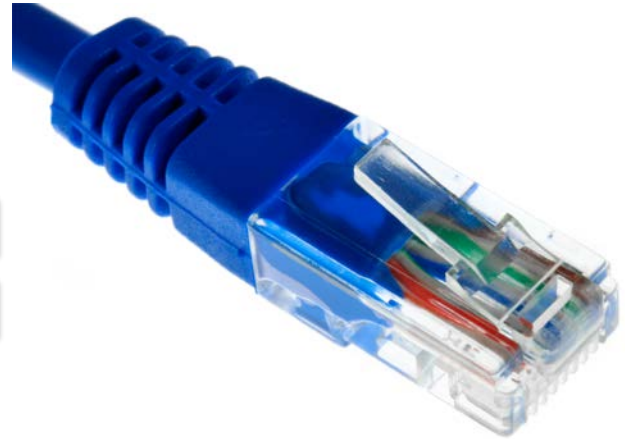
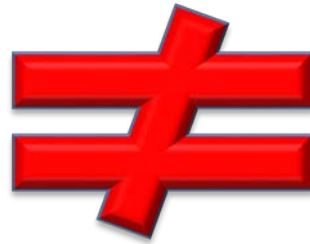
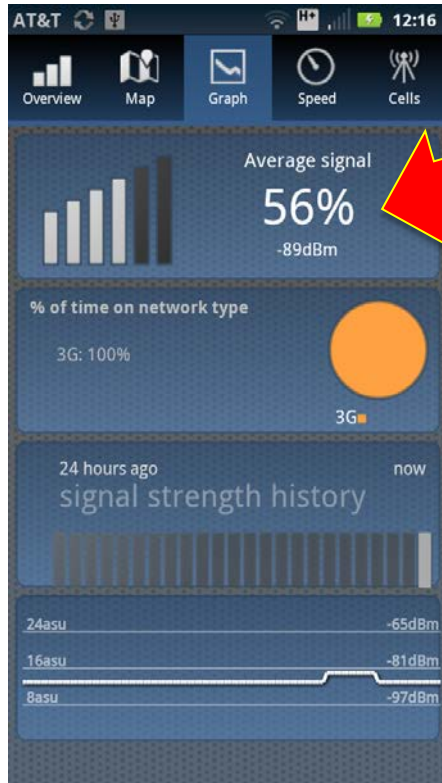
Device capabilities

Screen size

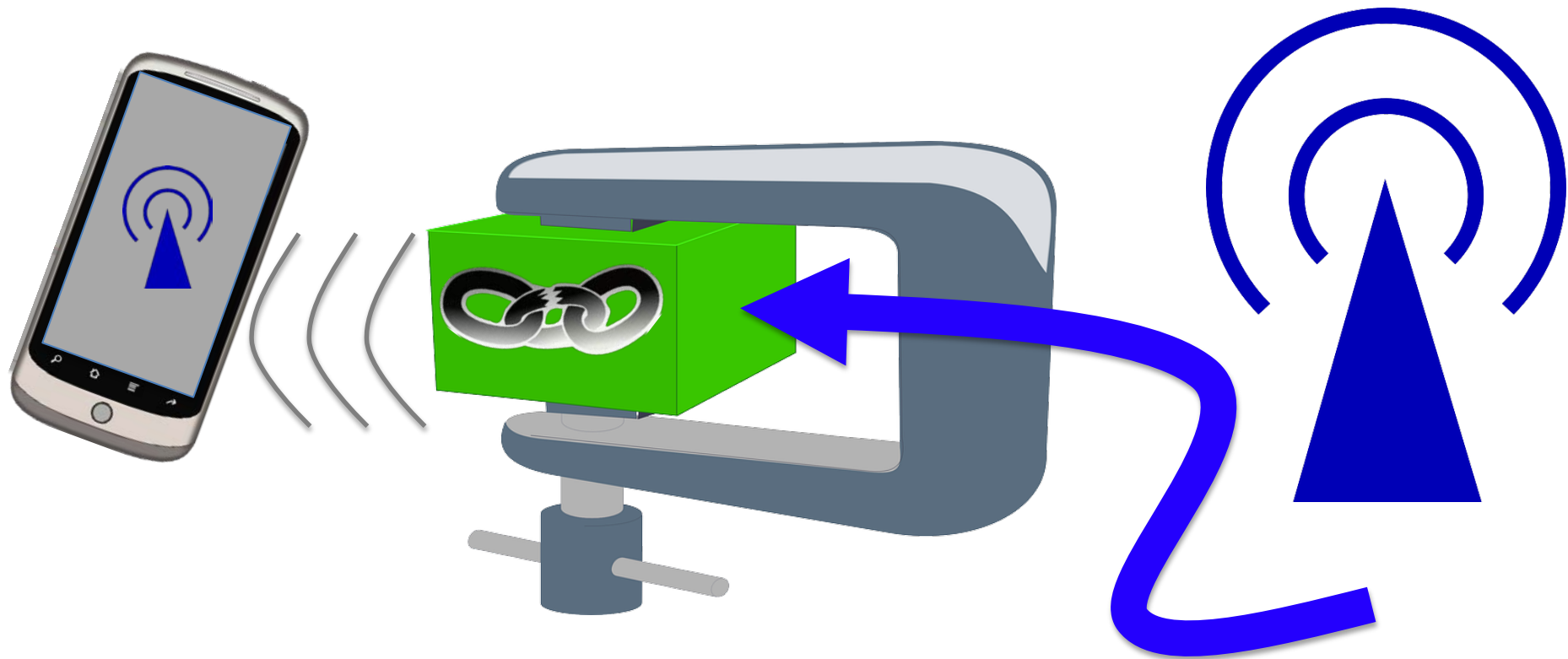
No mouse!



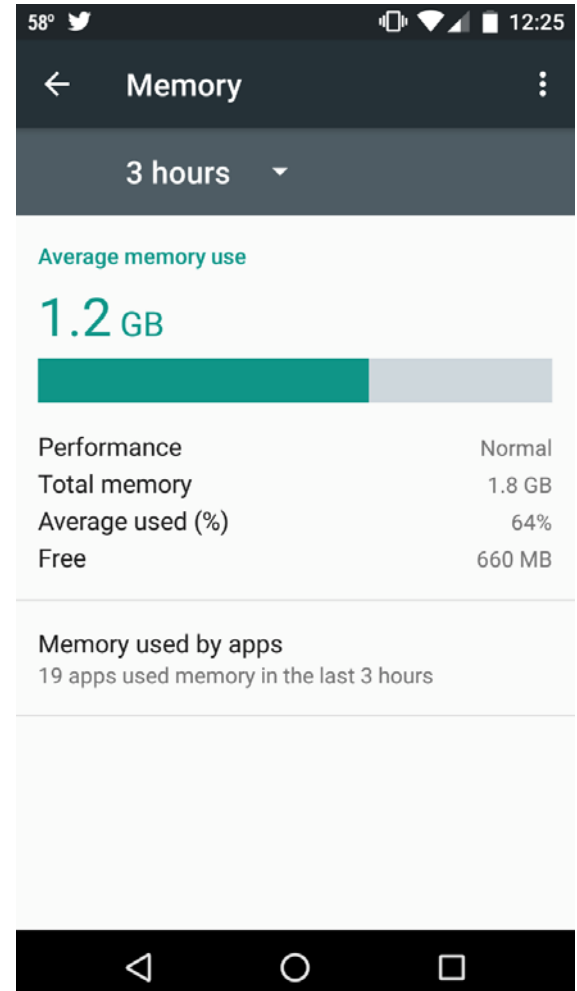
# Mobile devices are different



# Bandwidth constrained



# Memory constrained



# Memory constrained

Nexus 6P (top of the line)

32 GB phone

Snapdragon 810 processor

**But only...3 GB RAM!!**



User Experience == very different

Touch

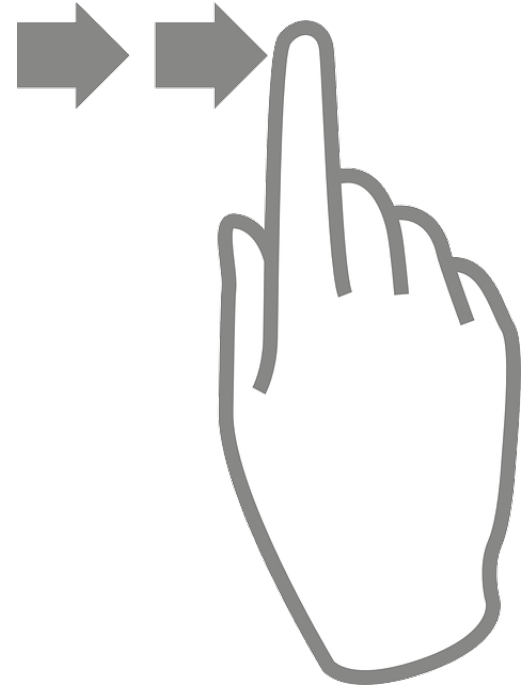
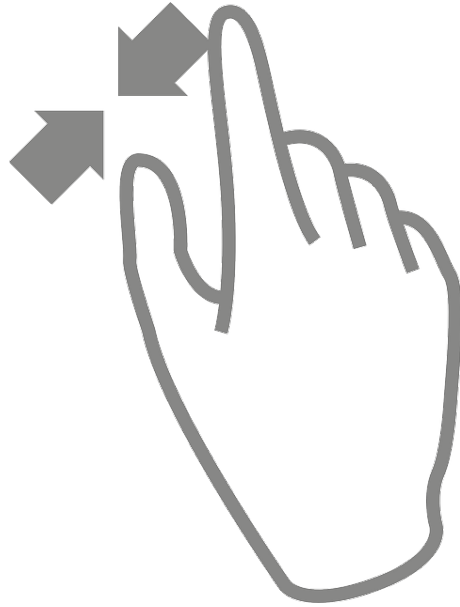
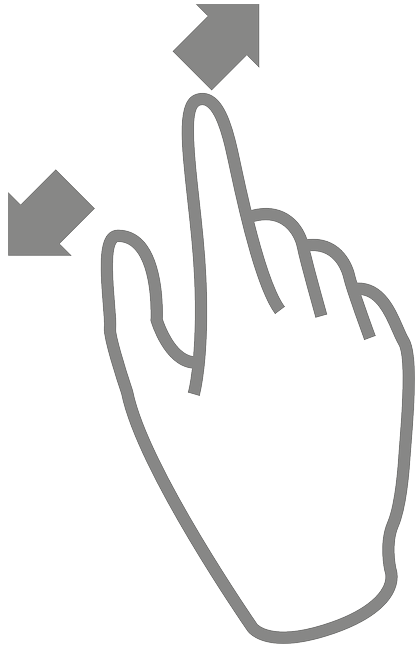
Orientation

Onscreen keyboard

Voice



User Experience == very different



# Design patterns == very different

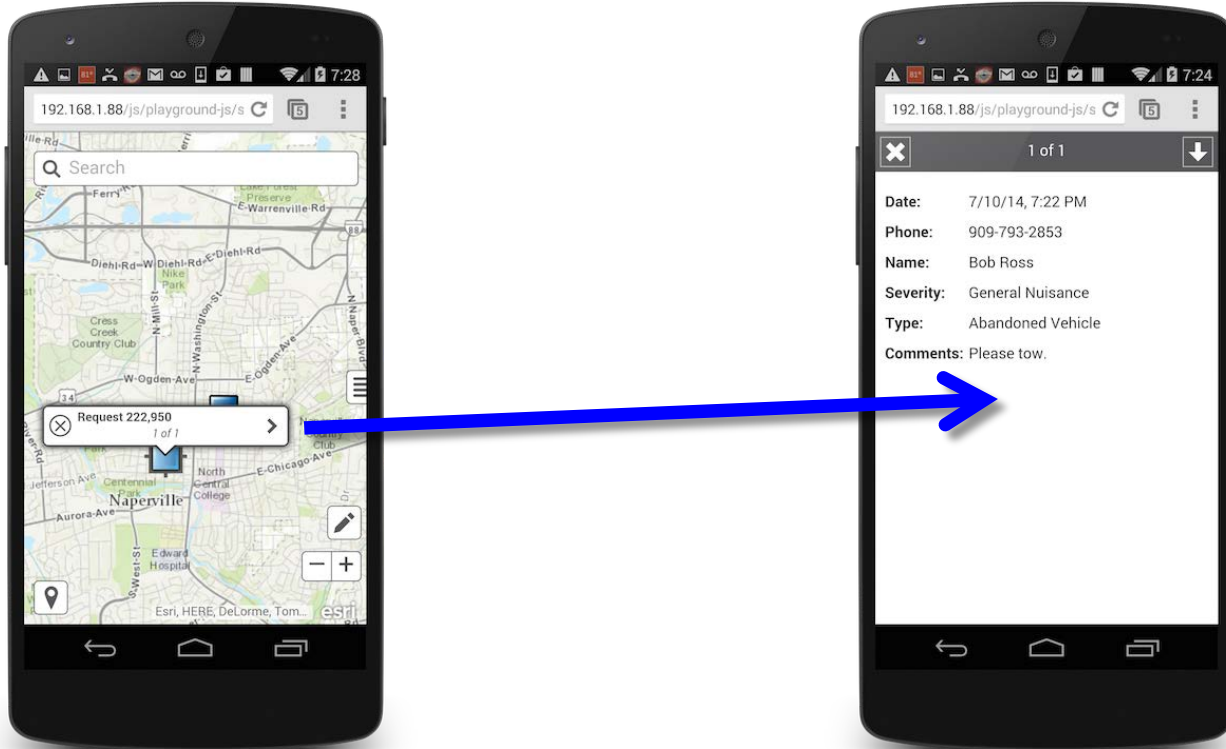
Smaller screens

Screen orientation can rotate

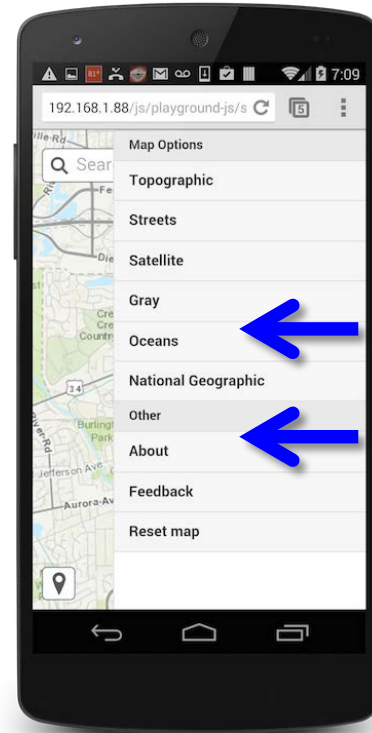
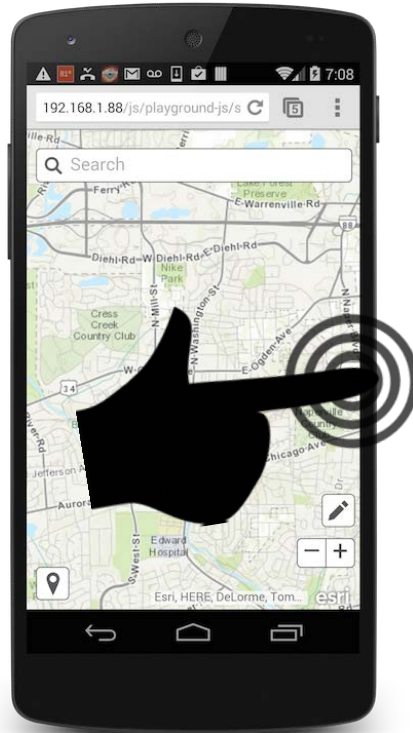
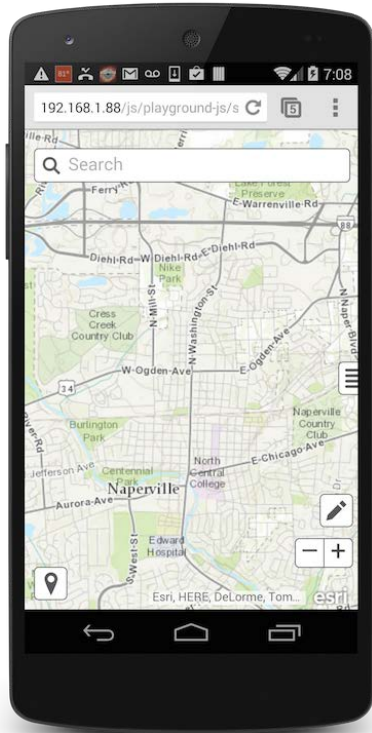
Mobile popups and overlays

Touch-based navigation

# Design patterns == very different



# Design patterns == very different



# Mobile in 4 Steps





# Step #1

## Organize your data

# Get your data in order, first!

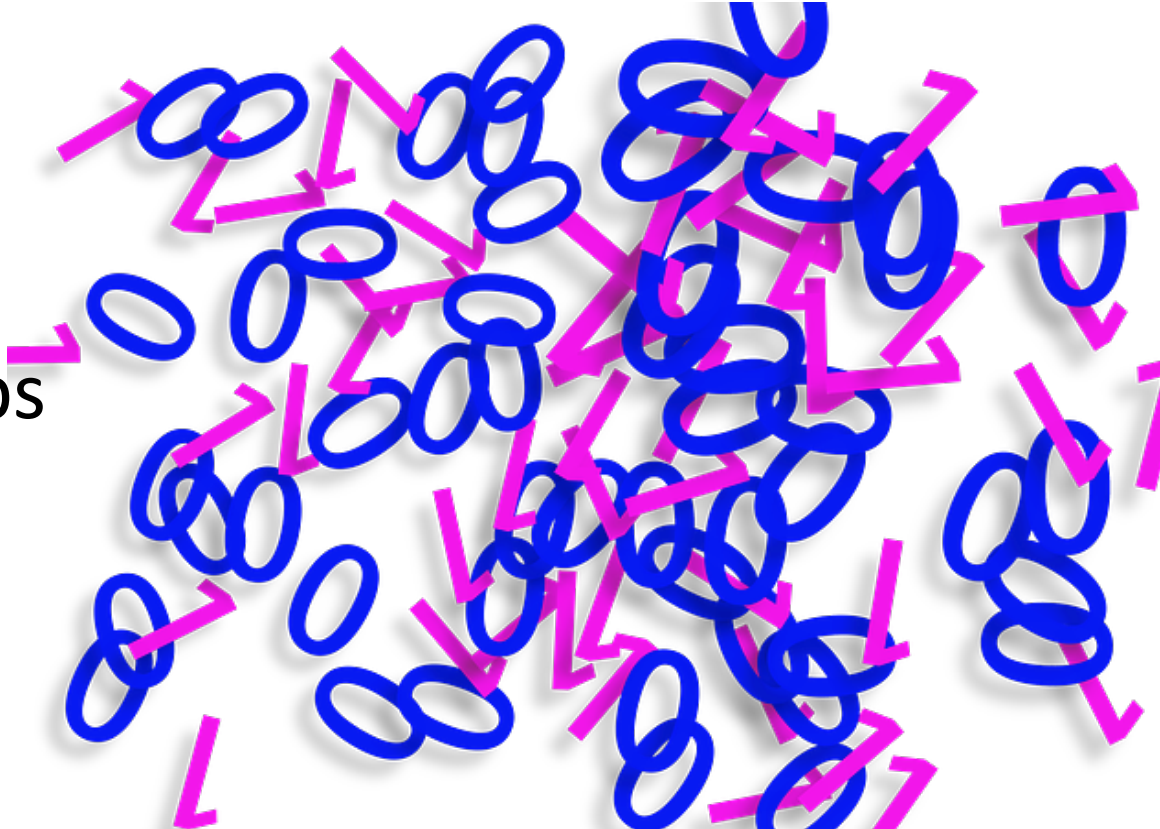
Develop a schema

Design tables

Define relationships

Clean the data

Test, test, test

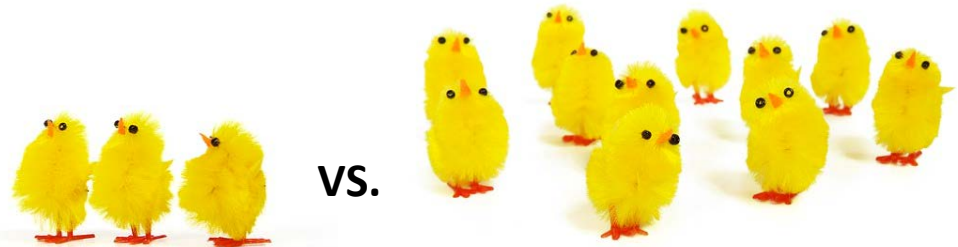


# HTTP Request/Response Performance

Test Service response payload size

Simplify geometries!

Remove unneeded attributes





# HTTP Request/Response Performance

The screenshot shows the Chrome DevTools Network tab with the 'Timing' sub-tab selected. The selected request is 'execute?f=json&env%3Aou...'. The timing breakdown is as follows:

Phase	Duration
Connection Setup	TIME
Queueing	0.29 ms
Stalled	0.41 ms
Request/Response	TIME
Request sent	0.06 ms
Waiting (TTFB)	1.59 s
Content Download	1.91 ms
Explanation	1.59 s

At the bottom of the network list, it shows '30 requests | 545 KB transf...'.

DEMO

# HTTP Request/Response Performance

Enable webserver [gzip compression](#)

Use ArcGIS JavaScript Optimizer

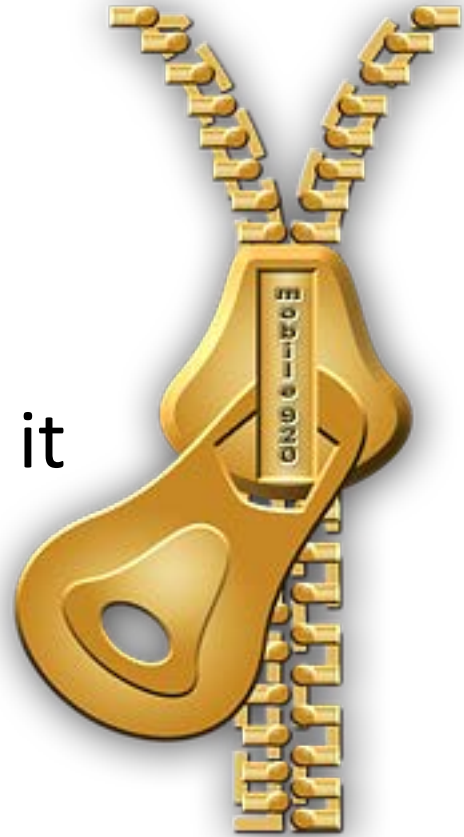
Minimize, concatenate your .js and .css

# gzip compression

All modern browsers support it

All modern browsers will request it

Server needs to be configured









# gzip\*

Library	Size	Compressed size	Compression ratio
jquery-1.11.0.js	276 KB	82 KB	70%
jquery-1.11.0.min.js	94 KB	33 KB	65%
angular-1.2.15.js	729 KB	182 KB	75%
angular-1.2.15.min.js	101 KB	37 KB	63%
bootstrap-3.1.1.css	118 KB	18 KB	85%
bootstrap-3.1.1.min.css	98 KB	17 KB	83%
foundation-5.css	186 KB	22 KB	88%
foundation-5.min.css	146 KB	18 KB	88%

\*Source: [Google](#)

# Content-Encoding: gzip

Filter  Hide data URLs **All** XHR JS CSS Img Media Font D

Name Path	× Headers Preview Response Timing
 jquery-2.1.3.min.js code.jquery.com	<b>▼ General</b> Request URL: http://code.jquery.com/jquery-2.1.3.min.js Request Method: GET Status Code: <span style="color: green;">●</span> 200 OK Remote Address: 94.31.29.53:80
 bootstrap.min.js maxcdn.bootstrapcdn.c...	
 init.js js.arcgis.com/3.14	<b>▼ Response Headers</b> <a href="#">view source</a> Access-Control-Allow-Origin: * Cache-Control: public Cache-Control: max-age=315360000 Connection: keep-alive Content-Encoding: gzip  Content-Type: application/javascript; charset=utf-8
 jsapi_en-us.js js.arcgis.com/3.14/esri...	
 svg.js js.arcgis.com/3.14/doj...	



# Step #2

Sketch, mockup, design

# Top 3 Use Cases

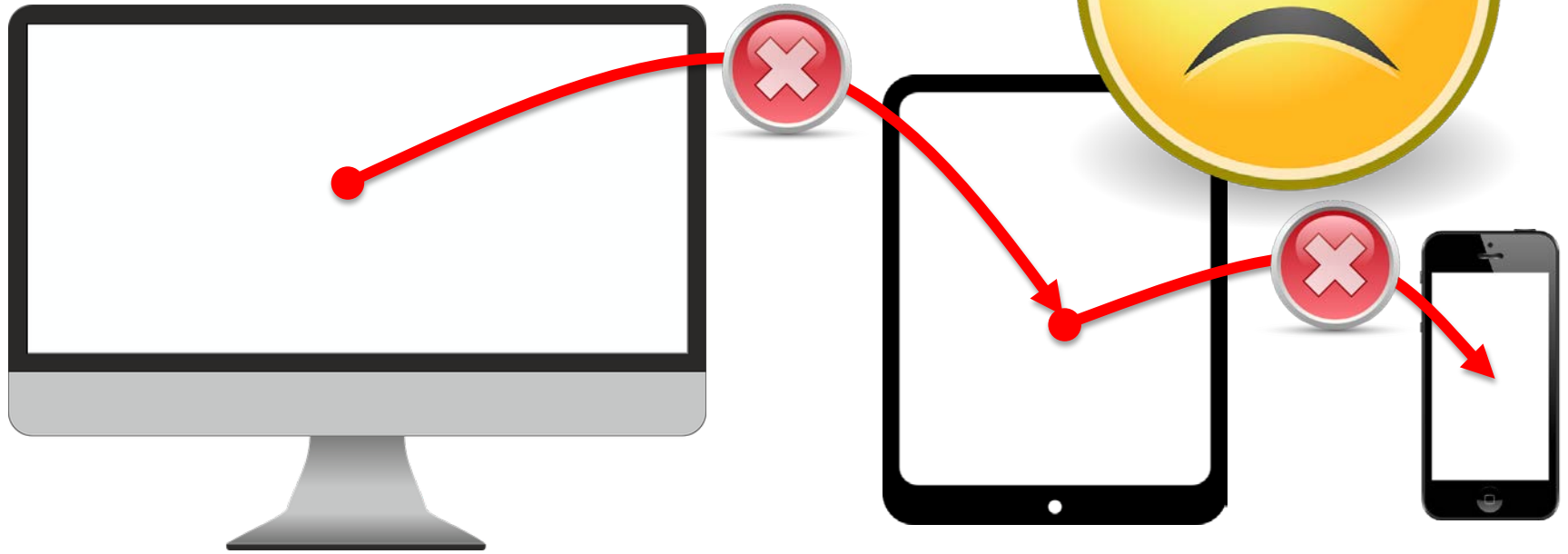


# Think Mobile First!





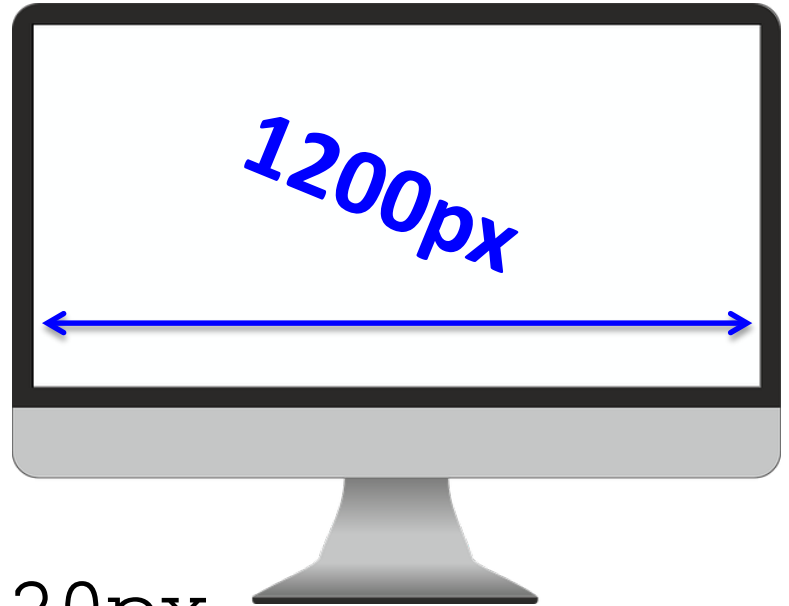
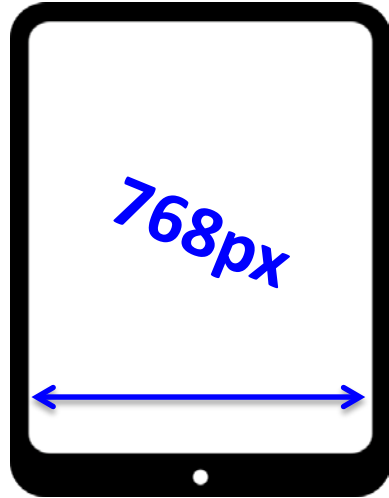
# Not Desktop First!



Site shouldn't look the same on all devices

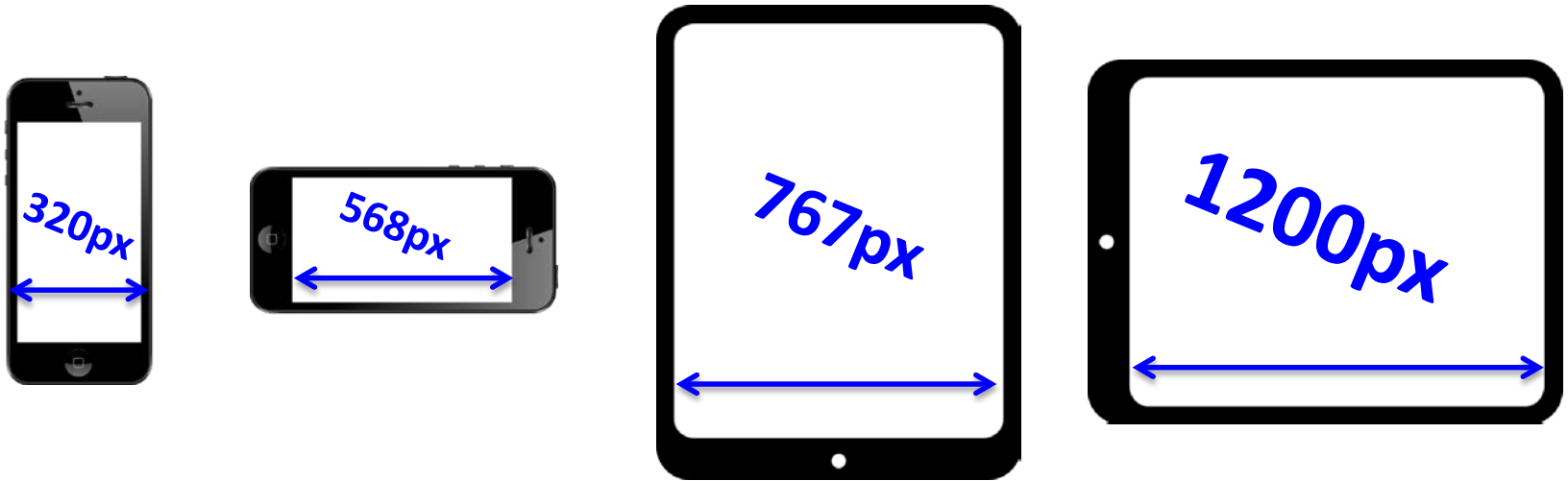


# Create at least 3 viewports



`min-device-width: 320px`

# Consider additional viewports



`min-device-width: 320px`

# Consider additional viewports

Depending on your end-users

[Many different CSS media query configurations](#)

# CSS Media Queries

```
@media only screen and (max-device-width:480px) {  
  
    /* Custom css styles */  
    body {  
        font-size: 0.5em;  
    }  
  
    #titleArea {  
        display: none;  
    }  
}
```

# Consistent Hierarchy





# Step #3

Implement UI framework



# Many UI frameworks

Bootstrap

jQuery

Dojo

... ?



Earlier Tech Session:  
Choosing the Best JavaScript Framework



**Bootstrap**

# Bootstrap Framework

1. Fluid Grid System
2. CSS Media Queries
3. HTML5, CSS & JavaScript

# Fluid Grid System

- Layout adapts to different screen sizes
- Based on percentages
- 12 column / 960px

Demo

[Bootstrap Fluid Grid](#)

Get bootstrap-map-js

[github.com/Esri/bootstrap-map-js](https://github.com/Esri/bootstrap-map-js)

# Bootstrap Fluid Grid CSS

```
<div class="col-xs-12 col-sm-8">
```

**Define Column**



**Device Size**

**Number of  
Columns**

# Hello World

```
<!DOCTYPE html>
<html>
  <head>
    <title>Bootstrap 101 Template</title>
    <meta name="viewport" content="width=device-width,
      initial-scale=1.0, maximum-scale=1.0, user-scalable=no">
    <link rel="stylesheet" type="text/css"
      href="//js.arcgis.com/3.13/esri/css/esri.css">
    <link rel="stylesheet" type="text/css"
      href="https://esri.github.io/bootstrap-map-js/src/css/bootstrapmap.css">
    <style type="text/css">
      #mapDiv {
        min-height: 100px;
        max-height: 1000px;
      }
    </style>
  </head>
  <body>

    <div class="container">
      <div id="mapDiv">Hello World</div>
    </div>

  </body>
</html>
```



# Add package path

```
<script type="text/javascript">  
  var package_path = "https://esri.github.io/bootstrap-map-js/src/js";  
  var dojoConfig = {  
    packages: [{  
      name: "application",  
      location: package_path  
    }]  
  };  
</script>
```

# Add jQuery & bootstrap.js

```
<body>
```

```
  <div class="container">
```

```
    <div id="mapDiv"></div>
```

```
  </div>
```

```
  <script src="http://code.jquery.com/jquery-1.11.1.min.js"></script>
```

```
  <script src="//maxcdn.bootstrapcdn.com/bootstrap/3.3.2/js/bootstrap.min.js"></script>
```

```
</body>
```

# Add JS API and BootstrapMap

```
<script src="https://js.arcgis.com/3.13compact"></script>
<script>
  require(["esri/map", "application/bootstrapmap", "dojo/domReady!"],
    function(Map, BootstrapMap) {
      // Get a reference to the ArcGIS Map class
      var map = BootstrapMap.create("mapDiv", {
        basemap:"national-geographic",
        center:[-122.45,37.77],
        zoom:12
      });
    });
</script>
```





# Step #4

## Display and Rendering Data

# Simplify features - Generalize

**maxAllowableOffset**

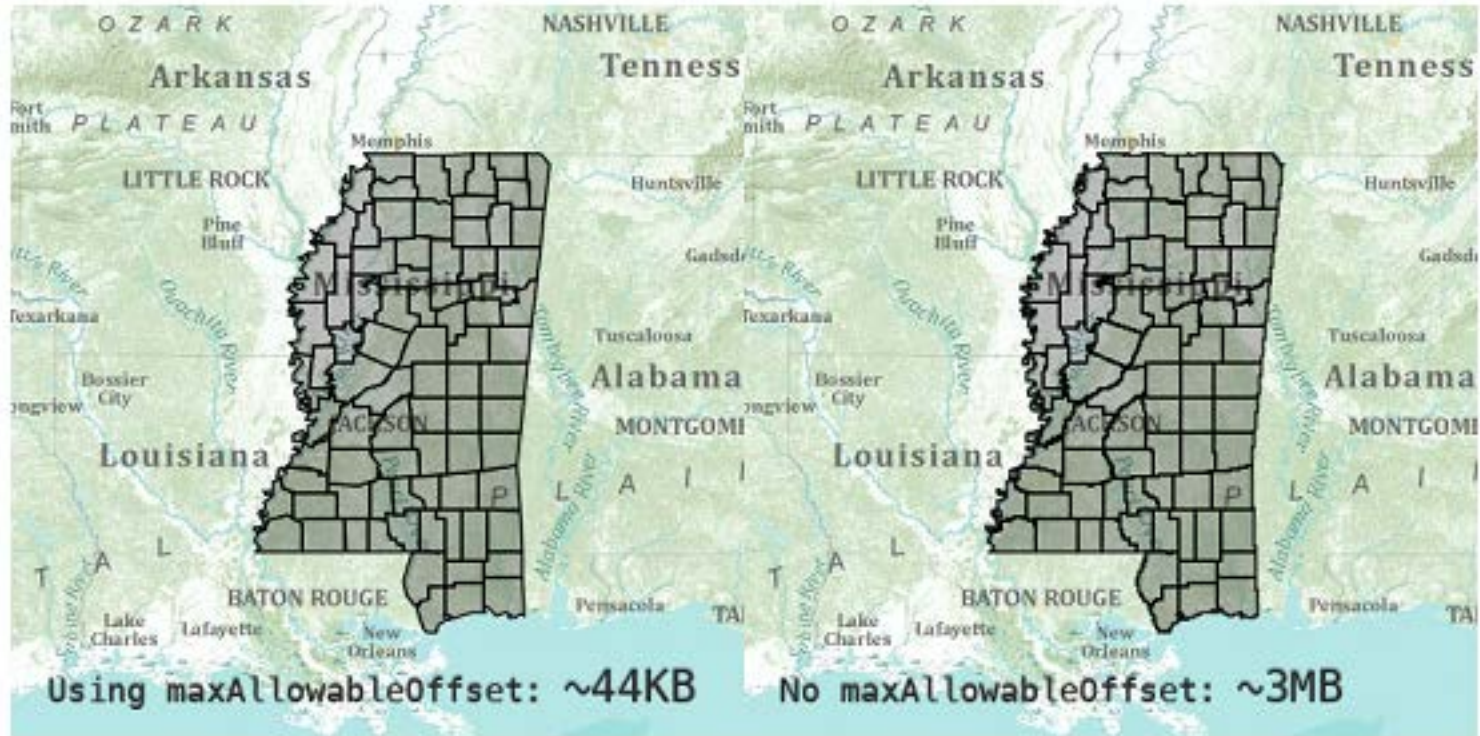
ArcGIS Online feature services use it



# Simplify features - Generalize

```
require(["esri/Map", "esri/layers/FeatureLayer", ... ], function(Map, FeatureLayer, ... ) {  
  app.fl = new FeatureLayer("http://layer/url/0", {  
    mode: esri.layers.FeatureLayer.MODE_ONDEMAND,  
    maxAllowableOffset: calcOffset() ←  
  });  
  
  on(map, 'onZoomEnd', function() {  
    app.maxOffset = calcOffset();  
    app.fl.setMaxAllowableOffset(app.maxOffset); ←  
  });  
  
  function calcOffset() {  
    return (map.extent.getWidth() / map.width);  
  }  
});
```

# Simplify features - Generalize

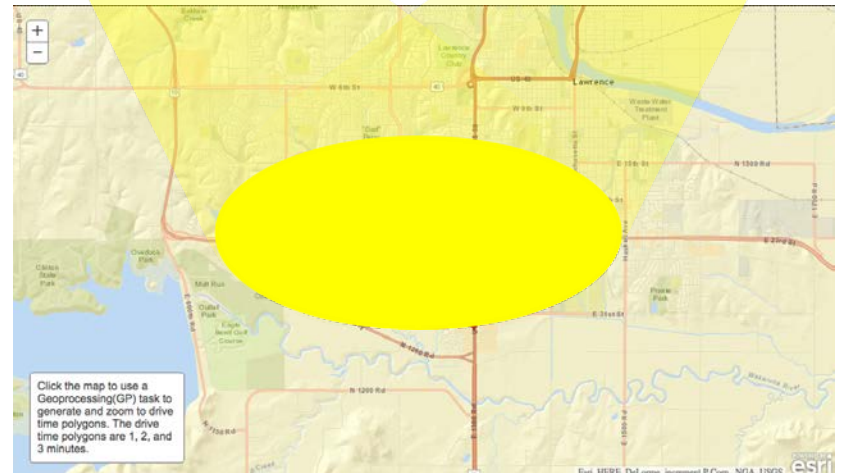




# Query MODE\_ONDEMAND



**Zoom-in** to reduce number of features



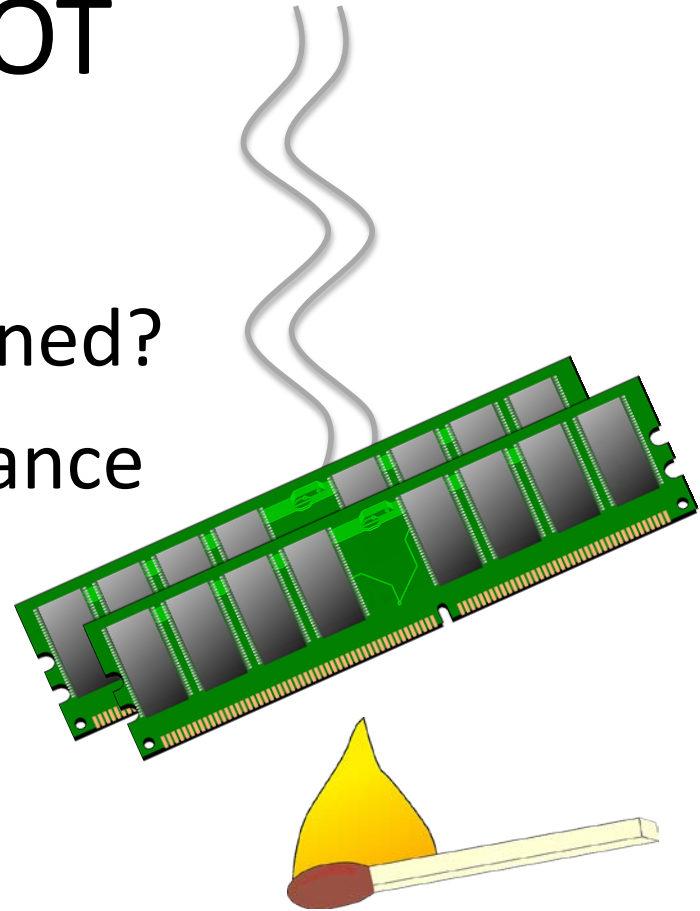
# Query MODE\_SNAPSHOT

Number of features being returned?

Test request/response performance

Features have to be **rendered**

Be aware of memory usage



# Step #5

Build → test



# Build > test > repeat

Unit testing

Performance testing

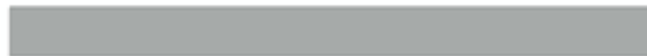
Network interrupt testing

Test on actual devices

Test on different operating systems

Many, many test platforms!

# Testing

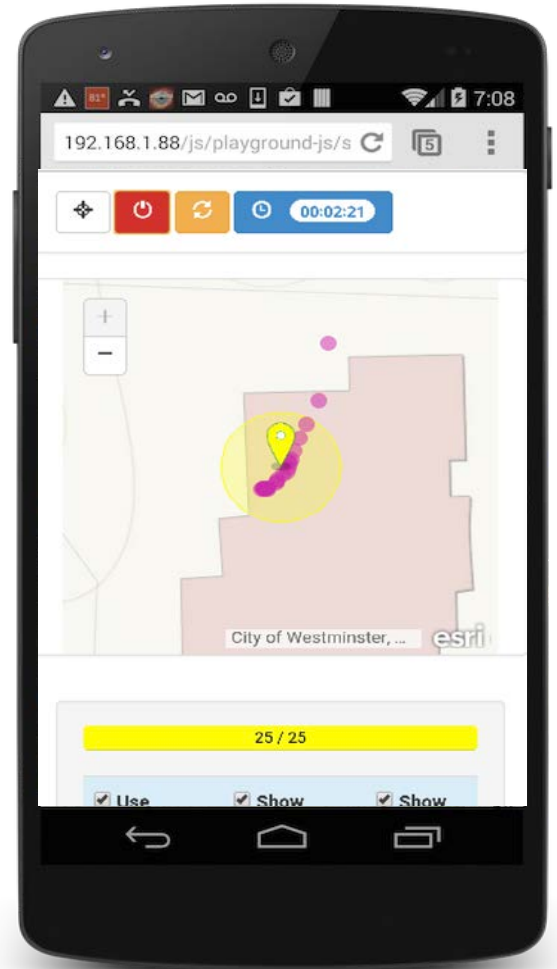


# Geolocation



# Geolocation

[github.com/Esri/html5-geolocation-tool-js](https://github.com/Esri/html5-geolocation-tool-js)



# Geolocation

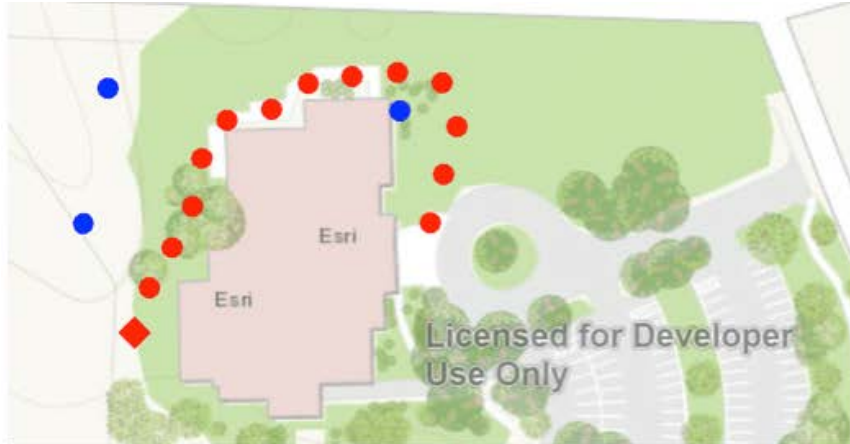
Works online and offline

Approximate location only!

Always requires user opt-in

Same exact API for PhoneGap





### Network Provider

Timestamp: 09/04/2015 04:19:45.478-0600

1st update elapsed time: N/A

Since last update: 00:15:271

Lat/Lon: 39.9202607, -105.1160536

DMSS: 39:55:12.93852, -105:6:57.79296

Accuracy: 87.5110 meters

### GPS Provider

Timestamp: 11/29/20148719 01:33:20.000-0700

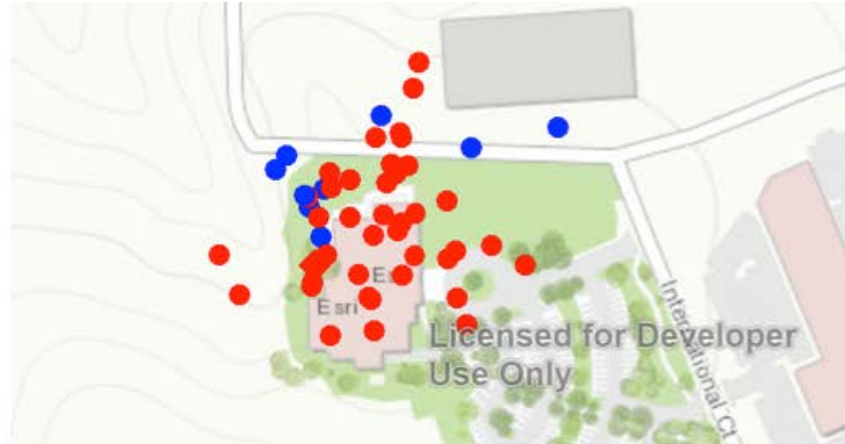
1st update elapsed time: 00:00:666

Since last update: 00:09:31

Lat/Lon: 39.91973364958267, -105.1168031758188

DMSS: 39:55:11.04114, -105:7:0.49143

Accuracy: .7994 meters



### Network Provider

Timestamp: 09/04/2015 04:06:57.699-0600

1st update elapsed time: N/A

Since last update: 00:19:960

Lat/Lon: 39.9202732, -105.1162038

DMSS: 39:55:12.98352, -105:6:58.33368

Accuracy: 71.8590 meters

### GPS Provider

Timestamp: 09/04/2015 04:07:10.901-0600

1st update elapsed time: 01:42:543

Since last update: 00:02:07

Lat/Lon: 39.91951249, -105.11666514

DMSS: 39:55:10.24496, -105:6:59.9945

Accuracy: 37.0000 meters

# Resources

<http://www.andygup.net/web-mobile/>

<https://github.com/Esri/html5-geolocation-tool-js>

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

<https://github.com/Esri/jquery-mobile-map-js>

A close-up photograph of a hand holding a small white card. The hand is positioned on the right side of the frame, with fingers gripping the card. The card is white with a thin black border and contains contact information. The background is a plain, light-colored surface.

Andy Gup

[agup@esri.co](mailto:agup@esri.com)

[m](http://m)

andygup.net

@agup



esri®

Bonus slides!



# How-to Build a Multiple-view app

# Multiple-View Design

- Framework for single page apps with multiple views
- Similar to native look, feel and behavior
- Cross-browser

# Get jquery-mobile-map-js

<https://github.com/Esri/jquery-mobile-map-js>



# Desktop vs. Device

Missouri Department of **Health & Senior Services**

Jay Nixon, Governor  
Gall Vasterling, Acting Director

Search Health

Healthy Living | Senior & Disability Services | Licensing & Regulations | Disaster & Emergency Planning | Data & Statistics | Online Services

## Local WIC Providers

Home » Healthy Living » Healthy Families » WIC » Local WIC Providers

- MOWINS
- WIC Updates
- WIC Foods
- Food Package Training Materials (2009)
- Breastfeeding, Fit WIC and Nutrition
- Resources & Publications
- Forms
- Data & Statistical Reports
- Training
- WIC Participant Eligibility
- Locations
- Policies and Procedures
- Related Links
- Frequently Asked Questions
- WIC Vendors Home
- WIC Families Home
- Non-Discrimination Statement
- WIC Clinic Posters **New!**
- 2014 State Plan **New!**

This page is intended for use by the staff of local WIC provider agencies. If you are a WIC








## Healthy Living

- Environmental Factors
- Chronic Diseases
- Communicable Diseases
- Healthy Families
- Organ/Tissue Donation and Registry
- Women, Infants & Children (WIC)
- Genetic Disease & Early Childhood
- Food Programs
- Wellness & Prevention
- Local Public Health Agencies

gis.dhss.mo.gov/Website/mobileWIC/WIC.html


### Find WIC Services

-  WIC offices and satellite >
-  Stores that accept WIC >
-  Enter a starting address >
-  Use my current location >
-  Change Search Distance >

#### Current Location

1561 W 3rd Ave  
Broomfield, CO 80020

Location accurate within 24000 meters of the address listed. Last Updated: 11/1/2013 10:05:06 AM

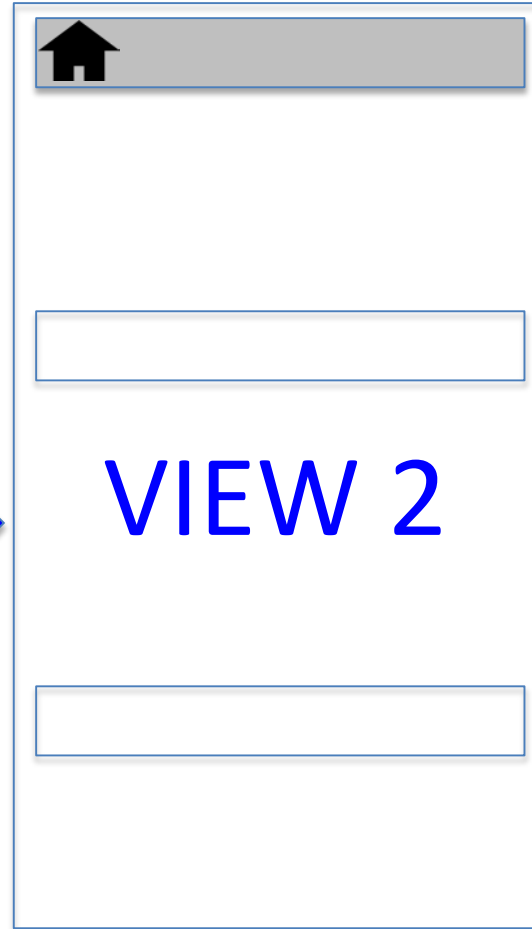
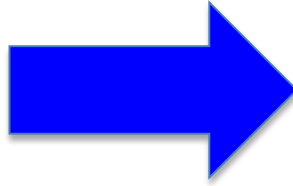
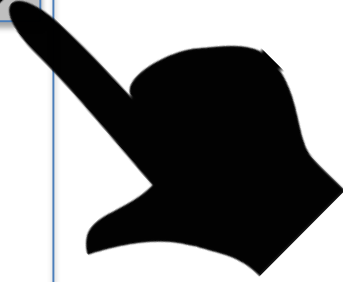
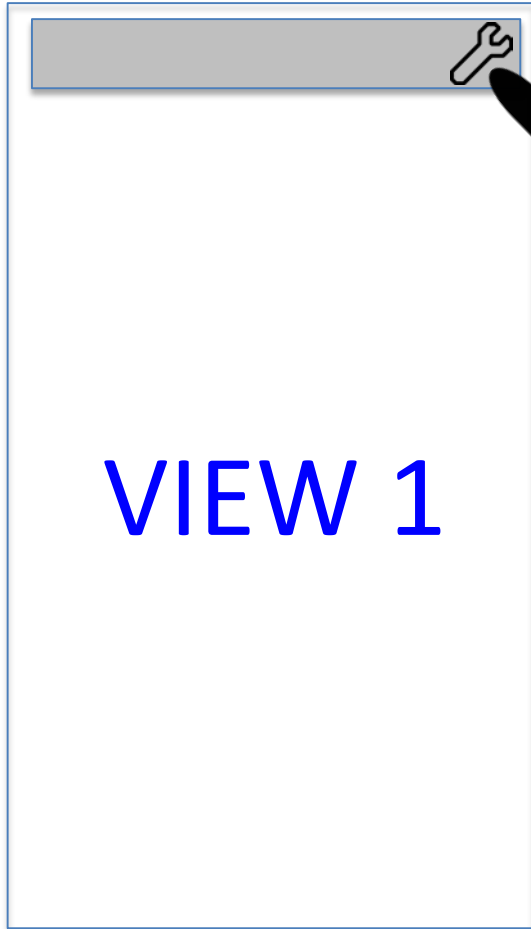


Missouri WIC Program

# Desktop vs. Device

The desktop website features a dark red header with the Stanford University logo and a search bar. Below the header is a navigation menu with categories: ABOUT STANFORD, ADMISSION, ACADEMICS, RESEARCH, and LIFE ON CAMPUS. The main content area is divided into several sections: a large featured article titled "Virtual do-gooders" with a photo of a person using VR; a "GATEWAYS FOR..." section with links to Students, Faculty & Staff, Alumni, Parents, Visitors, and Neighbors; a "TOP DESTINATIONS" section with a photo of a campus path; and a "SCHOOLS & DEPARTMENTS" section with links to Business, Earth Sciences, Education, Engineering, Humanities & Sciences, Law, Medicine, and Departments (A-Z). There are also sections for "EVENTS" (listing "Bada Boom, Bada Bing! CCRMA Open House") and "UNIVERSITY NEWS" (listing "Language of love" and "Baby talk").

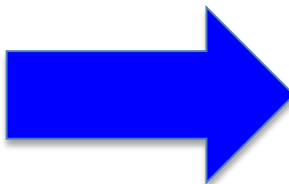
The mobile website features a dark red header with the Stanford University logo. Below the header is a navigation menu with categories: News, Events, Athletics, Maps & Directions, Contact & Directory, Links, and Full Site. The mobile site is designed for touch navigation, with large, clear buttons and a simplified layout compared to the desktop version.



HTML5 Geolocation

Altitude: 1589.50m	39.7511, -105.0019	
Speed: N/A	Mon May 06 2013 10:42:10 GMT-0600 (MDT)	
Heading: N/A	Accuracy: 5.00m	Geo: OFF

Map showing current location near Union Station. A red pin is placed on the map, and several yellow location markers are visible. The map includes street names like Wewatta St, Wynkoop St, and Union Station.



Settings

Geolocation:  Off

High Accuracy:  On

**Current Position**

maxAge (ms):  
60000

timeout (ms):  
60000

Restart Geo

**Watch Position**

maxAge (ms):  
60000

timeout (ms):

# One HTML page

# Multiple Views

```
<html>
```

```
<div data-role="page" id="page1">
```

```
</div>
```

```
<div data-role="page" id="page2">
```

```
</div>
```

```
</html>
```

# Add Some CSS

```
<meta http-equiv="Content-Type" content="text/html; charset=utf-8">
<meta name="viewport" content="initial-scale=1, maximum-scale=1,user-scalable=no"/>

<title>Two Page jQuery Mobile Map</title>

<link rel="stylesheet" type="text/css" href="css/themes/black-theme.min.css"/>
<link rel="stylesheet" type="text/css" href="css/themes/jquery.mobile.icons.min.css"/>
<link rel="stylesheet" href="//js.arcgis.com/3.13/esri/css/esri.css">
<link rel="stylesheet" href="//code.jquery.com/mobile/1.4.0/jquery.mobile-1.4.0.min.css" />
```

```
<style type="text/css">
  html,body,div[data-role="page"] {
    height: 100%;
    width: 100%;
    margin: 0px;
    padding: 0px;
    overflow: hidden !important;
  }
  .ui-header{
    margin: 0px !important;
    padding: 0px !important;
    float: left;
  }
  .ui-content{
    height: 100%;
    width: 100%;
    margin: 0px;
    padding: 0px;
  }
  .settings{
    margin-left: auto;
    margin-right: auto;
    text-align:center;
    width: 100%;
  }
  #mapDiv {
    position: absolute;
    background-color: #EEEEDD;
    height: 100%;
    width: 100%;
    padding: 0px;
    z-index: 0;
    left: 0px;
  }
</style>
```

# Add a little more CSS



# Add 2 pages

```
<div data-role="page" id="home">
  <div data-theme="b" data-role="header" data-position="fixed">
    <h3>Map!</h3>
    <a href="#settings" data-role="button" data-transition="slide"
      data-icon="gear" class="ui-btn-right" data-iconpos="notext">Settings</a>
  </div>
  <div data-role="content">
    <div id="mapDiv"></div>
  </div>
</div>
<div data-role="page" id="settings">
  <div data-role="header" data-theme="b" data-position="fixed">
    <h1>Settings</h1>
    <a href="#home" data-role="button" data-rel="back"
      data-icon="home" class="ui-btn-icon-left" data-iconpos="notext"></a>
  </div>
  <div data-role="content">
    Hello - This is just a placeholder
  </div>
</div>
```



# Add jQuery & bootstrap.js

```
<body>
```

```
  <div class="container">
```

```
    <div id="mapDiv"></div>
```

```
  </div>
```

```
  <script src="http://code.jquery.com/jquery-1.11.1.min.js"></script>
```

```
  <script src="//maxcdn.bootstrapcdn.com/bootstrap/3.3.2/js/bootstrap.min.js"></script>
```

```
</body>
```

# Add jQuery & ArcGIS JS API

```
<script type="text/javascript" src="//ajax.googleapis.com/ajax/libs/jquery/2.1.3/jquery.min.js">
</script>
<script type="text/javascript" src="//code.jquery.com/mobile/1.4.5/jquery.mobile-1.4.5.min.js">
</script>
<script src="//js.arcgis.com/3.13/"></script>
```

# Add the map

```
var map;
```

```
$( '#home' ).on( 'pageinit',function(event){  
    start();  
});
```

```
function start() {  
    require(["esri/map", "dojo/domReady!"], function(Map) {  
        map = new Map("mapDiv", {  
            basemap: "topo",  
            center: [-122.45, 37.75], // longitude, latitude  
            zoom: 13  
        });  
    });  
};
```

Map!



VIEW 1

Settings



Hello - This is just a placeholder

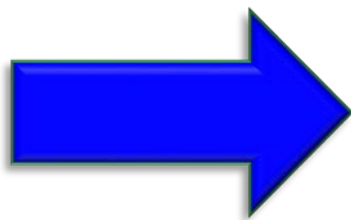
VIEW 2

 **jQuery**  
*mobile framework.*

**JS**



Phone**Gap**



# Web, hybrid or native?



# Web

**Web** = HTML, JavaScript, CSS skills

Cross-browser, cross-device

No special access needed to sensors

No special storage needs

# Hybrid

**Hybrid** = Native Chrome-less browser plus  
HTML, CSS, JavaScript

Example: PhoneGap/Cordova

Compiled as a native application

Accesses device via browser APIs & plug-ins



# Hybrid

JavaScript, CSS skills

Cross-browser, cross-device

Some special access needed to sensors

Some special storage needs

App Store and/or Google Play

# Native

**Native** = Objective C, Java or C#

Compiled to run on device OS

Accesses device directly via native API

# Native

Objective C, Java and/or C# skills

High-performance requirements

Special access needed to sensors

Special storage needs

Offline + related tables, domains and subtypes

# Native

Better memory management

Control over battery life

App Store and/or Google Play

# Additional Resources

- <http://zurb.com/word/mobile-first>
- <https://facebook.github.io/react-native/>
- <https://www.ampproject.org/>