

2011 Esri Developer Summit

Palm Springs, CA

Introduction to ArcGIS API for Android

Will Crick

Code for the Home Insure app used in the sessions can be found here:

<http://www.arcgis.com/home/item.html?id=5be0f920be2348418e7dc4d1541b615c>



What will be covered today...

- Introduction
- Android background
- Starting development with ArcGIS for Android
- Development basics
 - Adding maps and data
 - Providing information
- The future...
- Q & A



Introduction

```
function onMapClick(e) {  
    var map = new esri.Map("map", {  
        basemap: "topographic",  
        layers: [esri.layers.ArcGISDynamicMapServiceLayer("http://services.esri.com/arcgis/rest/services/ESRI_Example_GeoJSON/MapServer?layers=0,1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39,40,41,42,43,44,45,46,47,48,49,50,51,52,53,54,55,56,57,58,59,60,61,62,63,64,65,66,67,68,69,70,71,72,73,74,75,76,77,78,79,80,81,82,83,84,85,86,87,88,89,90,91,92,93,94,95,96,97,98,99")],  
        extent: esri.Util.hullFromExtent([esri.Util.geometryFromExtent([100, 100, 1000, 1000])])  
    });  
    map.addLayer(new esri.layers.ArcGISDynamicMapServiceLayer("http://services.esri.com/arcgis/rest/services/ESRI_Example_GeoJSON/MapServer?layers=0,1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39,40,41,42,43,44,45,46,47,48,49,50,51,52,53,54,55,56,57,58,59,60,61,62,63,64,65,66,67,68,69,70,71,72,73,74,75,76,77,78,79,80,81,82,83,84,85,86,87,88,89,90,91,92,93,94,95,96,97,98,99"));  
    map.on("click", function(e) {  
        console.log("Clicked at: " + e.x + ", " + e.y);  
        function getDriverName(features) {  
            var features = features;  
            for (var f=0, feature = features[0]; f < features.length; f++) {  
                var feature = features[f];  
                if (feature.geometry.type === "Point") {  
                    var polysymbol = new esri.PolySymbol({  
                        color: "#FF0000",  
                        size: 1000000  
                    });  
                    do {  
                        Symbol = new esri.Symbol({  
                            type: "text",  
                            color: "#0000FF",  
                            font: "arial",  
                            size: 12,  
                            text: "Point",  
                            x: feature.geometry.x,  
                            y: feature.geometry.y  
                        });  
                        do {  
                            Symbol = new esri.Symbol({  
                                type: "text",  
                                color: "#0000FF",  
                                font: "arial",  
                                size: 12,  
                                text: "Point",  
                                x: feature.geometry.x,  
                                y: feature.geometry.y  
                            });  
                            do {  
                                Symbol = new esri.Symbol({  
                                    type: "text",  
                                    color: "#0000FF",  
                                    font: "arial",  
                                    size: 12,  
                                    text: "Point",  
                                    x: feature.geometry.x,  
                                    y: feature.geometry.y  
                                });  
                                do {  
                                    Symbol = new esri.Symbol({  
                                        type: "text",  
                                        color: "#0000FF",  
                                        font: "arial",  
                                        size: 12,  
                                        text: "Point",  
                                        x: feature.geometry.x,  
                                        y: feature.geometry.y  
                                    });  
                                    do {  
                                        Symbol = new esri.Symbol({  
                                            type: "text",  
                                            color: "#0000FF",  
                                            font: "arial",  
                                            size: 12,  
                                            text: "Point",  
                                            x: feature.geometry.x,  
                                            y: feature.geometry.y  
                                        });  
                                        do {  
                                            Symbol = new esri.Symbol({  
                                                type: "text",  
                                                color: "#0000FF",  
                                                font: "arial",  
                                                size: 12,  
                                                text: "Point",  
                                                x: feature.geometry.x,  
                                                y: feature.geometry.y  
                                            });  
                                            do {  
                                                Symbol = new esri.Symbol({  
                                                    type: "text",  
                                                    color: "#0000FF",  
                                                    font: "arial",  
                                                    size: 12,  
                                                    text: "Point",  
                                                    x: feature.geometry.x,  
                                                    y: feature.geometry.y  
                                                });  
                                            }  
                                        }  
                                    }  
                                }  
                            }  
                        }  
                    }  
                }  
            }  
        }  
    });  
}
```

About me, you and this session

- **Me...**
- **Session aims**
 - **Development focus**
 - **How to get started building apps**
- **You...**

ArcGIS for Android [short] History

ArcGIS for Mobile
ArcGIS for iOS
ArcGIS for Windows phone
ArcGIS for Android

ArcGIS for Android:
Public Beta Feb 2011
Next release Q2 2011 (not beta)



ArcGIS for Android brief functionality overview

- **SDK & Application**



- **Mapping**

- Layers: Tiled, Dynamic, Graphic, Feature



- **Tasks**

- Identify, Query, Locator, Geoprocessor



- **Editing**

- Template-based, similar to other web APIs
- Connected, through feature layer



Why Android?

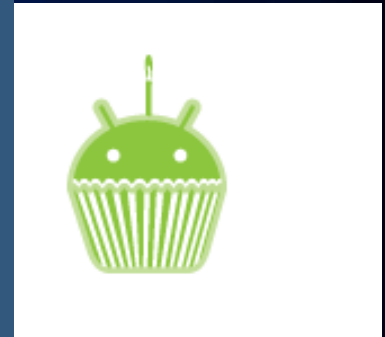
- Native app or web app?
- **Esri supports both**
- It depends on...
 - Your users & their devices
 - Required features/functions
 - Your technology constraints
 - Your skills



Android Background

```
function onMapReady() {  
    map = new com.google.android.gms.maps.  
        MapFragment().newInstance();  
    fragmentManager.beginTransaction().addLayer(map, "map", 0).commit();  
}  
function getDriverId() {  
    var features = results; // results from  
    for (var f=0; f<features.length; f++) {  
        var feature = features[f];  
        var polySymbol = new com.google.android.gms.maps.  
            Polygons.Symbol(f.feature.geometry.coordinates);  
        do {  
            polySymbol.setColor(0, 0, 0, 0.5);  
            feature.addSymbol(polySymbol);  
        } while (polySymbol.getColor() != 0);  
    }  
}  
new dojo.Color(0, 0, 0, 0.5).getColor().color;  
} else {  
    var polySymbol = new com.google.android.gms.maps.  
        Polygons.Symbol(f.feature.geometry.coordinates);  
    polySymbol.setColor(0, 0, 0, 0.5);  
    feature.addSymbol(polySymbol);  
}
```


Who is this Android?

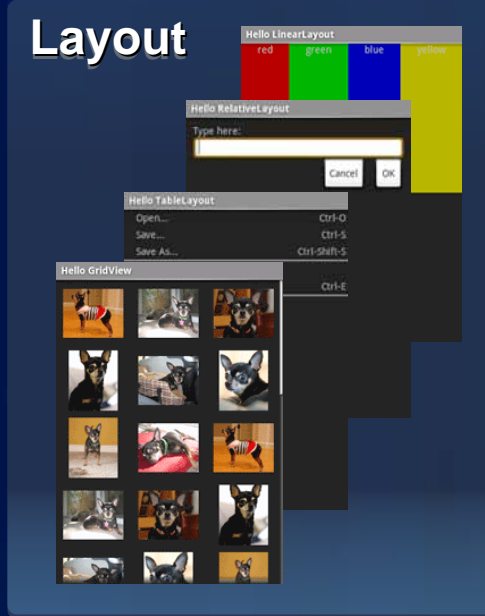
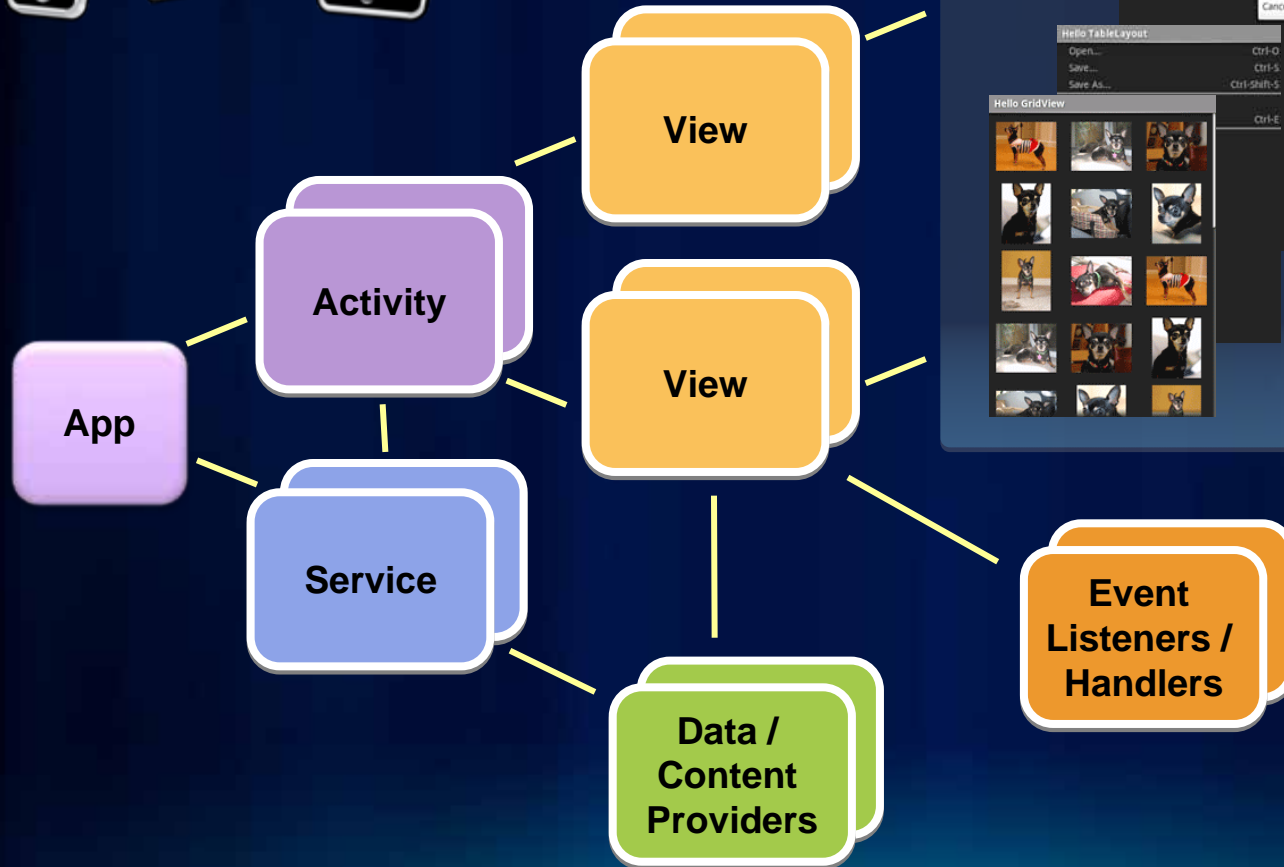


Android development workflow

Start here!

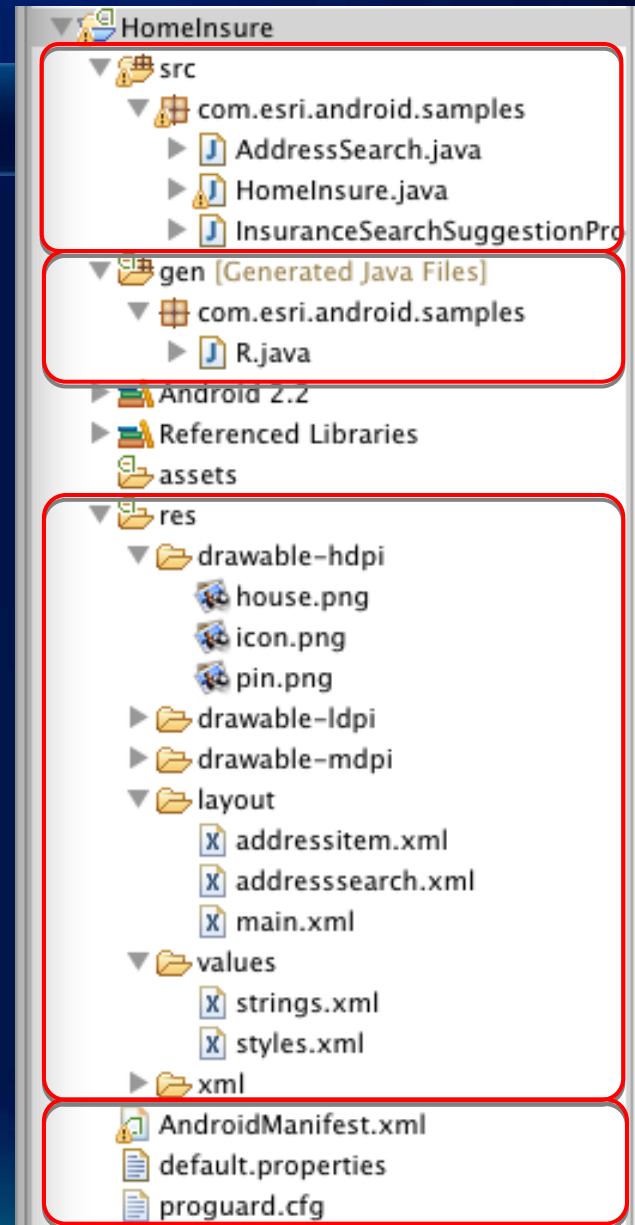


Android components



An Android project

- **/src**
 - Your code
- **/gen**
 - Built classes
- **/res**
 - Your resources
 - Images
 - Styles xml
 - Layout xml
- **AndroidManifest.xml**
 - Application configuration





Starting development with ArcGIS for Android

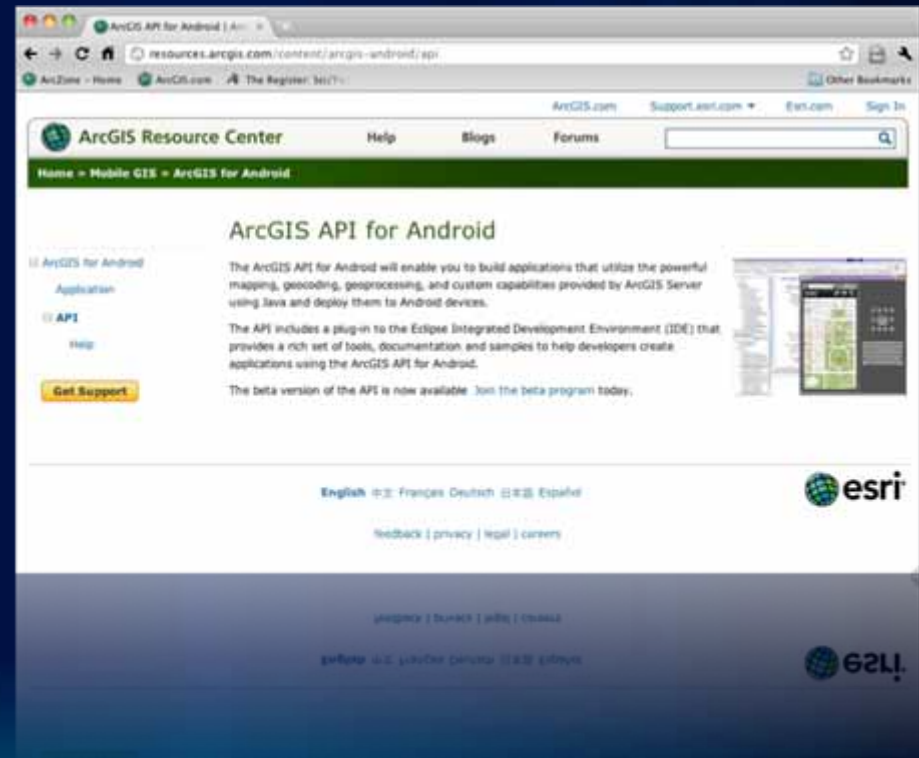
```
function onMapClick() {  
    var map = new esri.Map(  
        "F1", {  
            basemap: "satellite",  
            mapService: "http://services.esri.com/arcgis/rest/services/ESRI_Indonesia/Map",  
            map.addLayer({  
                title: "Indonesia",  
                url: "http://services.esri.com/arcgis/rest/services/ESRI_Indonesia/Map",  
                type: "Image",  
                opacity: 0.5  
            });  
        });  
    map.on("click", function(evt) {  
        console.log("Clicked at: " + evt.x + ", " + evt.y);  
    });  
}
```

```
function getDriverFeatures() {  
    var features = results;  
    for (var f=0, fLen=features.length; f<fLen; f++) {  
        var feature = features[f];  
        if (feature.geometry.type === "Point") {  
            var polysymbol = new esri.PolySymbol({  
                color: "#FF0000",  
                size: 1000000  
            });  
            do {  
                do.o.Color = "#FF0000";  
                polysymbol.setColor(do.o.Color);  
                feature.setSymbol(polysymbol);  
            } while (do.o.Color !== "#FF0000");  
            else {  
                var polysymbol = new esri.PolySymbol({  
                    color: "#FF0000",  
                    size: 1000000  
                });  
                feature.setSymbol(polysymbol);  
            }  
        }  
    }  
}
```

```
new dojo.Color("0, 0, 0, 0.5");  
polysymbol.setColor(new dojo.Color("0, 0, 0, 0.5"));  
feature.setSymbol(polysymbol);  
} while (do.o.Color !== "#FF0000");  
} else {  
    var polysymbol = new esri.PolySymbol({  
        color: "#FF0000",  
        size: 1000000  
    });  
    feature.setSymbol(polysymbol);  
}
```


What do you need?

- Eclipse – 3.5 or 3.6
- Android SDK – 2.1, 2.2, 2.3
- **ArcGIS for Android SDK**
 - API
 - Eclipse plugin
 - Samples
 - Doc



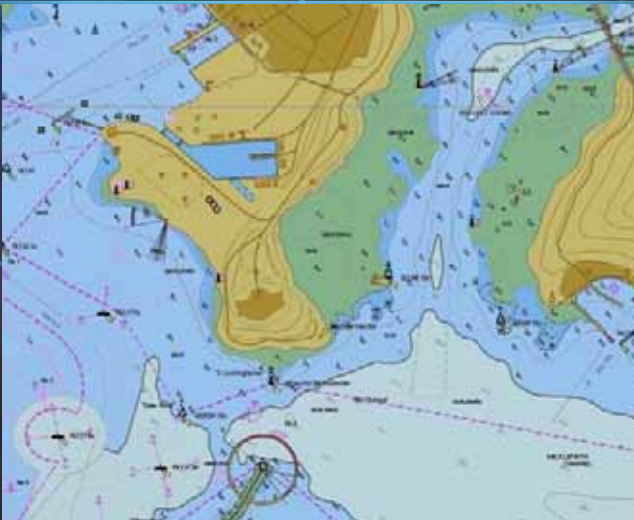
ArcGIS for Android Application

- **Same scope as the ArcGIS app for iOS**
 - Android Market (Q2 2011)
- **Discover maps from ArcGIS Servers & ArcGIS.com**
- **Display and navigate maps**
- **Tools**
 - Search
 - Identify locations and features
 - Measure lines and areas
 - Editing



What is in the SDK demo

Will Crick





Development Basics

```
function onMapReady() {  
  map = new google.maps.Map(  
    document.getElementById('map'),  
    {  
      center: new google.maps.LatLng(37.5, -122.5),  
      zoom: 15,  
      mapTypeId: google.maps.MapTypeId.SATELLITE  
    }  
  );  
  map.addLayer(new google.maps.Marker({  
    position: new google.maps.LatLng(37.5, -122.5),  
    map: map  
  }));  
}
```

```
function getDriverId(features) {  
  var features = features;  
  for (var f=0, feature = features[0];  
       f < features.length; f++)  
    if (feature.geometry.type === 'Point')  
      return feature.id;  
}
```

```
do {  
  Symbol = Symbol(0, 0, 0, 0, 0);  
  polySymbol = new google.maps.PolySymbol({  
    color: Symbol,  
    radius: 5  
  });  
  feature.setSymbol(polySymbol);  
} while (true);
```

```
new dojo.Color(0, 0, 0, 0, 0);  
polySymbol = new google.maps.PolySymbol({  
  color: Symbol,  
  radius: 5  
});  
feature.setSymbol(polySymbol);
```

```
new dojo.Color(0, 0, 0, 0, 0);  
polySymbol = new google.maps.PolySymbol({  
  color: Symbol,  
  radius: 5  
});  
feature.setSymbol(polySymbol);
```

```
new dojo.Color(0, 0, 0, 0, 0);  
polySymbol = new google.maps.PolySymbol({  
  color: Symbol,  
  radius: 5  
});  
feature.setSymbol(polySymbol);
```

```
new dojo.Color(0, 0, 0, 0, 0);  
polySymbol = new google.maps.PolySymbol({  
  color: Symbol,  
  radius: 5  
});  
feature.setSymbol(polySymbol);
```


Adding data and maps

- **MapView class**
 - **THE map**
 - **Android View class**
- **Map services**
 - **ArcGIS Server**
 - **Map Services (tiled and dynamic)**
 - **Feature Services**
 - **ArcGIS.com**
 - **WebMaps**
 - **Bing**



MapView class

- **Use in Android Layout**
 - Set size and position
 - Display attributes (depends on container)
- **Default behavior**
 - Touch events – zoom, pan
- **Custom behavior**
 - Add event listeners and handlers
- **Initialization**
 - Check map is loaded
 - More in advanced session



How to add map layers in xml

```
<com.esri.android.map.MapView
    xmlns:android="http://schemas.android.com/apk/res/android"          android:id="@+id/map"
    android:layout_width="fill_parent"  android:layout_height="fill_parent"
    initExtent="-13631799.97888788 4545982.2729670685 13630011.658698952
    4547213.547551089">

    <com.esri.android.map.ags.ArcGISStyledMapServiceLayer
        url="http://services.arcgisonline.com/ArcGIS/rest/services/
        World_Topo_Map/MapServer" />

    <com.esri.android.map.ags.ArcGISDynamicMapServiceLayer
        url="http://mobilesampleserver.arcgisonline.com/ArcGIS/rest/
        services/SanFranFireInfo/MapServer" />

    <com.esri.android.map.GraphicsLayer
        android:id="@+id/graphics" />

    <com.esri.android.map.ags.ArcGISFeatureLayer
        url="http://mobilesampleserver.arcgisonline.com/ArcGIS/rest/
        services/HaightAshburyHydrantsFs/FeatureServer"
        mode="snapshot" />
```

How to add map layers in code

- Dynamic map layer

```
ArcGISDynamicMapServiceLayer sanFranFireInfo = new  
    ArcGISDynamicMapServiceLayer(this, url);  
  
map.addLayer(sanFranFireInfo);
```

- FeatureLayer

```
ArcGISFeatureLayer.Options();  
sanFranHydrantsOptions.mode = ArcGISFeatureLayer.MODE.SNAPSHOT;  
  
ArcGISFeatureLayer sanFranHydrants = new ArcGISFeatureLayer(this,  
    url, sanFranHydrantsOptions);  
  
map.addLayer(sanFranHydrants);
```

DeKalb County Board

Fulton County Dept. of Health and Wellness/District 3, Unit 2, Office

Adding data and maps demo





Providing information with Layers and Tasks

```
function onMapReady() {  
  map = new google.maps.Map(document.getElementById("map"), {  
    center: new google.maps.LatLng(38.9, -77.0),  
    mapTypeId: google.maps.MapTypeId.SATELLITE,  
    zoom: 13  
  });  
  var gmap = new google.maps.Geocoder;  
  map.addLayer(new google.maps.Marker({  
    position: new google.maps.LatLng(38.9, -77.0),  
    map: map  
  }));  
  google.maps.event.addListener(map, "click", function(e) {  
    var pos = new google.maps.LatLng(e.latLng.lat(), e.latLng.lng());  
    gmap.geocode({latLng: pos}, function(results, status) {  
      if (status === google.maps.GeocoderStatus.OK) {  
        for (var i = 0, len = results.length; i < len; i++) {  
          var polySymbol = new google.maps.Symbol({  
            color: "red",  
            fillOpacity: 0.2,  
            stroke: "white",  
            strokeWidth: 2,  
            size: 2000, // size in square pixels  
            text: results[i].address_line_1  
          });  
          map.addLayer(new google.maps.OverlayView({  
            map: map,  
            position: pos,  
            zIndex: 2000 // above labels  
          }));  
          new google.maps.OverlayView({  
            map: map,  
            position: pos,  
            content: new SymbolPolygonsLayer({  
              symbols: [polySymbol]  
            })  
          });  
        }  
      }  
    });  
  });  
}
```


Providing information to users

- **Convert data into information**
- **Workflow**
 - **Collect input**
 - **Get data from map layers / esri Tasks**
 - **Display information**

Collecting input

- **Touch events**
- **MapView event listeners**
 - `setOnSingleTapListener()`
 - ... (zoom, pinch, pan, longPress)
 - `setOnExtentChangeListener()`
- **Android Views**
 - **Buttons, Spinners ...**
 - **Events**
 - `onClick()`, `onTouch()`
 - **Search**
 - **Android default action**



Getting data: 1) From map layers

- Feature & Graphic layer methods
- Feature layer queries
 - `selectFeatures()`
 - `queryFeatures()`
 - `queryIds()`
 - `queryAttachmentInfo()`
 - All use `CallbackListener<FeatureSet>()`

```
Query query = new Query();
query.setWhere(whereClause);
sanFranHydrants.selectFeatures(query, SELECTION_METHOD.NEW, new
    CallbackListener<FeatureSet>() {
        public void onCallback(FeatureSet queryResults) {
            ...
        }
    })
```

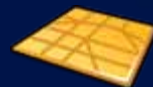
Getting data: 1) From map layers cont...

- **Graphics Layer**
 - **Not asynchronous**
 - **Always client side**
 - **Feature layer is a graphics layer!**

```
Graphic[] graphics = sanFranHydrants.getGraphics(x, y, 30);
```

Getting data: 2) From Tasks

- **Asynchronous**
- **Types of Tasks**
 - **QueryTask**
 - Works with a layer
 - **IdentifyTask**
 - Works with a Map
 - **Locators**
 - ArcGIS Server
 - Bing
 - **Geoprocessor**
 - ArcGIS Server services
 - Not NA Server yet



Options for running tasks to get data

- **As an AsyncTask**
 - Long running task
 - In different thread
 - Results published to the UI thread
- **TaskListener**
 - Tasks only (not locators/GP)
- **ExecutorService**
 - Tasks only (Callable<V>)
- **Android service**
- **Threads**



Demo apps GP AsyncTask – doInBackground()

```
class HydrantQuery extends
    AsyncTask<ArrayList<GPPParameter>, Void, GPPParameter[]> {

    @Override
    protected GPPParameter[] doInBackground(
        ArrayList<GPPParameter>... params1) {

        gp = new GeoProcessor(getString(R.string.geocodeService1));
        gp.setOutSR(map.getSpatialReference().getID());

        GPPParameter[] outParams = null;

        try {
            GPResultResource gpr = gp.execute(params1[0]);
            outParams = gpr.getOutputParameters();
        } catch (Exception e) {
            e.printStackTrace();
        }

        return outParams;
    }
}
```

Demo apps GP AsyncTask – onPostExecute()

- Process the results...

```
@Override
protected void onPostExecute(GPParameter[] outParams) {

    if (outParams == null) {
        uiHandler.sendMessage(CANCEL_LOADING_WINDOW);
        return;
    } else {
        for (int i = 0; i < outParams.length; i++) {
            if (outParams[i] instanceof GPFeatureRecordSetLayer) {

                GPFeatureRecordSetLayer fsl =
                    (GPFeatureRecordSetLayer) outParams[i];

                if (fsl.getParamName().equals("Routes")) {
                    ...
                }
            }
        }
    }
}
```

Showing information

- **ArcGIS for Android**
 - Callout, graphics
 - Info templates – ArcGIS.com popups
- **Android**
 - View, dialog, toast....
 - Many more

Showing information - in a callout

- **Map callout**
 - **One callout per map**
 - **Set style**
 - **Set content**
 - **Text or android View/ViewGroup**

```
TextView msg = new TextView(this);  
msg.setBackgroundColor(Color.BLACK);  
msg.setText(address);  
msg.setTextSize(12);  
msg.setTextColor(Color.WHITE);  
Callout callout = map.getCallout();  
callout.setAnchor(Callout.ANCHOR_POSITION_FLOATING);  
callout.setStyle(R.xml.calloutstyle);  
callout.refresh();  
callout.show(addressPoint, msg);
```

Showing information - as Graphics

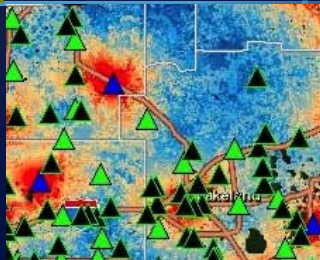
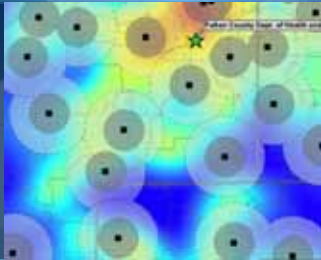
- **Graphic**
 - **Attributes**
 - **Geometry**
 - **Symbol**

```
Graphic g = new Graphic();
Graphic nearestRoute = fsl.getGraphics().get(0);
g.setGeometry(nearestRoute.getGeometry());
SimpleLineSymbol symb = new SimpleLineSymbol(
    Color.DKGRAY, 2);
symb.setAlpha(170);
symb.setAntiAlias(true);
g.setSymbol(symb);
graphicsLayer.addGraphic(g);
```


DeKalb County Board

Fulton County Dept. of Health and Wellness/District 3, Unit 3, G

Home Insure app demo



The future

- **Next release**
 - Q2 2011
 - Includes
 - More layer types (bing/image server)
 - Secure services
- **Beyond**
 - Follow ArcGIS.com features...
 - Popups
 - Map notes
 - Disconnected workflows

Further information

- **Code for the Home Insure app used in the sessions can be found on ArcGIS.com here:**
- <http://www.arcgis.com/home/item.html?id=5be0f920be2348418e7dc4d1541b615c>
- <http://resources.arcgis.com/content/arcgis-android/api>
- arcgis4android@esri.com

- **Web Courses to be available in 2011**
 - Getting Started with the ArcGIS API for Android
 - Creating Data Collection Applications using the ArcGIS API

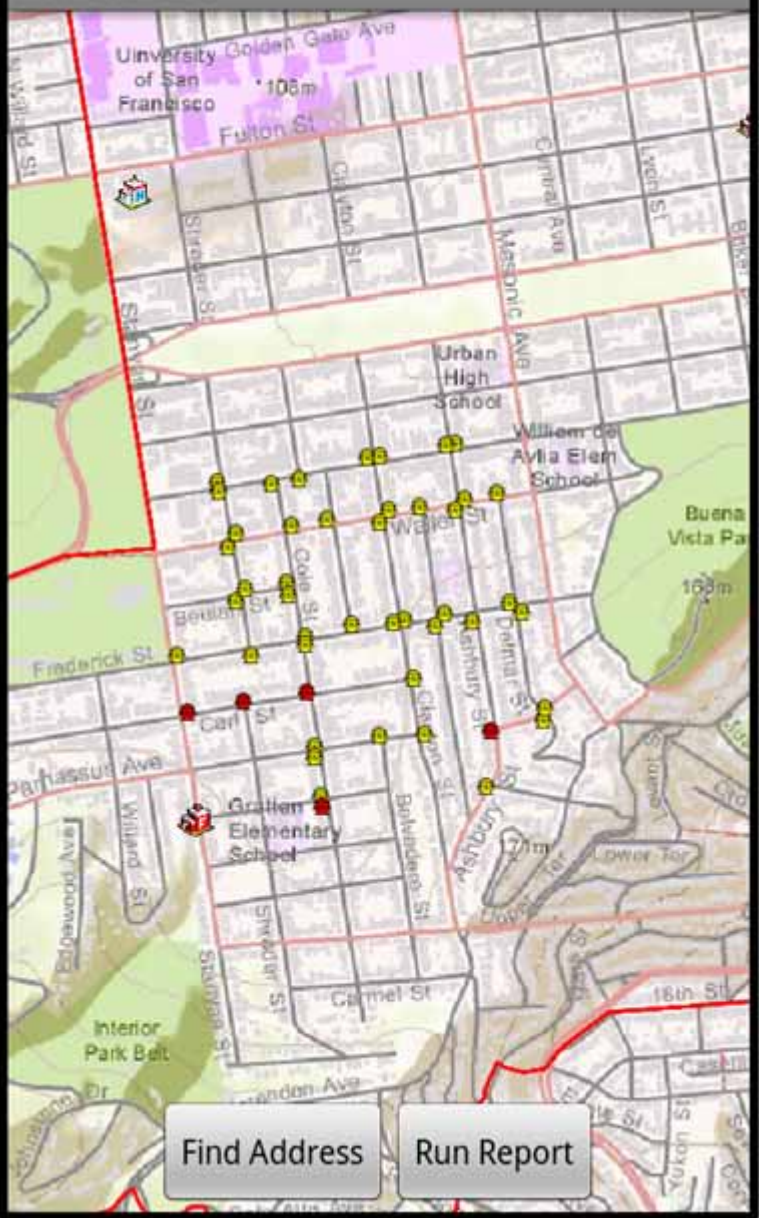
- **Please fill out the session review form!**

Questions...

- Over to you...

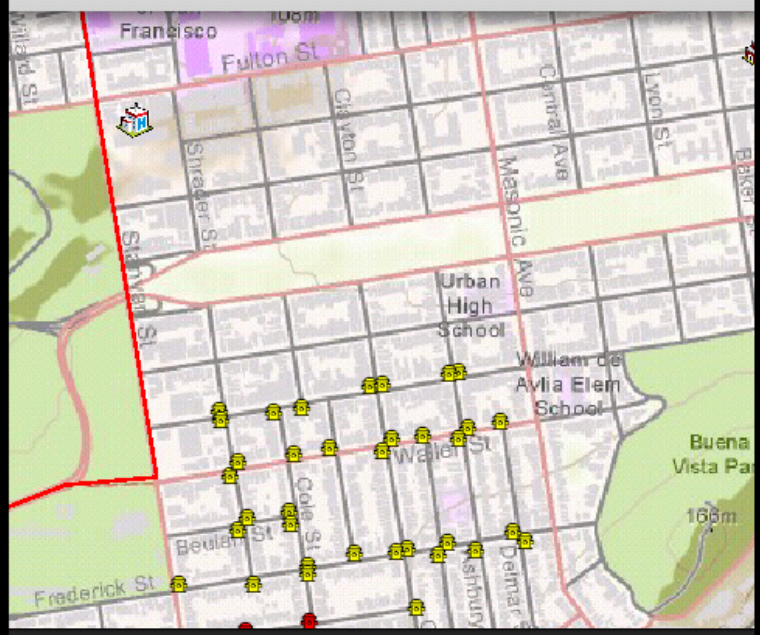
If things go wrong slides 😊

Home Insure



Find Address Run Report

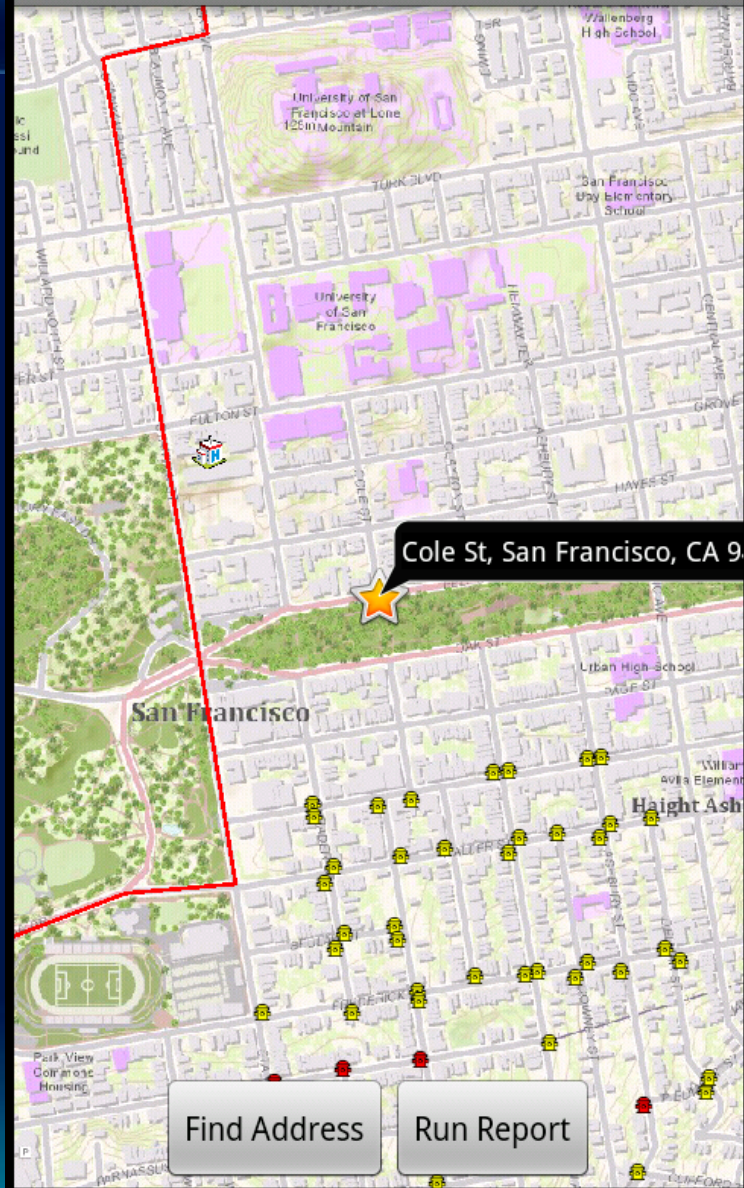
Search for an address



Home Insure

Cole St, San Francisco, CA 94117

Home Insure



Cole St, San Francisco, CA 94117

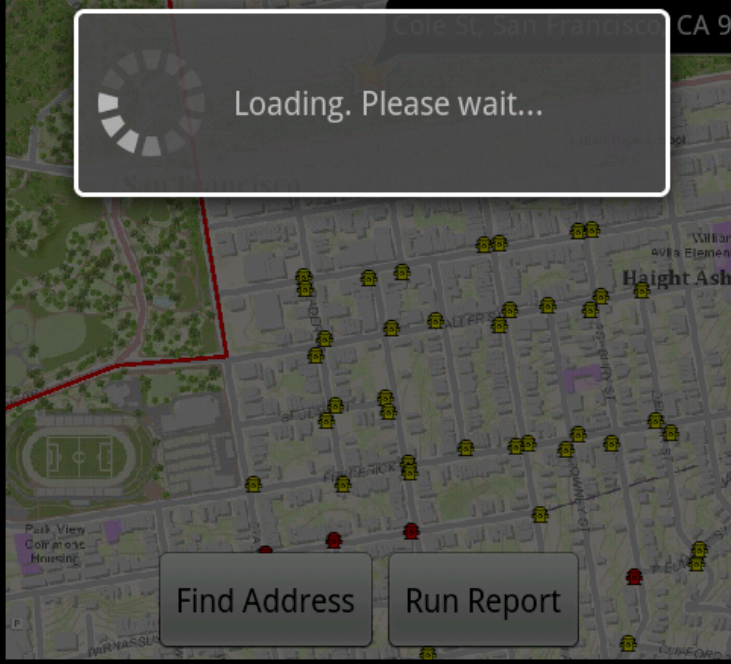
Find Address

Run Report

Home Insure



Loading. Please wait...



Find Address

Run Report

Home Insure



Your closest Hydrant is 676.33 metre

Find Address

Run Report



esri