

DevSummit DC

February 11, 2015 | Washington, DC



ArcGIS Runtime SDKs: Building Android Apps

Andy Gup

&

Gary Sheppard

Agenda

- Introduction
- Runtime SDK
 - Tools and features
- Android Studio
- Maps & Layers
- Tasks
- Editing
- Summary



Who are we?

Andy Gup

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<https://github.com/garys-esri>

Android SDK Features

Certified to work with Android Studio

Distributed via Maven

Maps

Editing

Routing

Data collection

Geoprocessing

Offline

And much more!

Intro to Android Studio

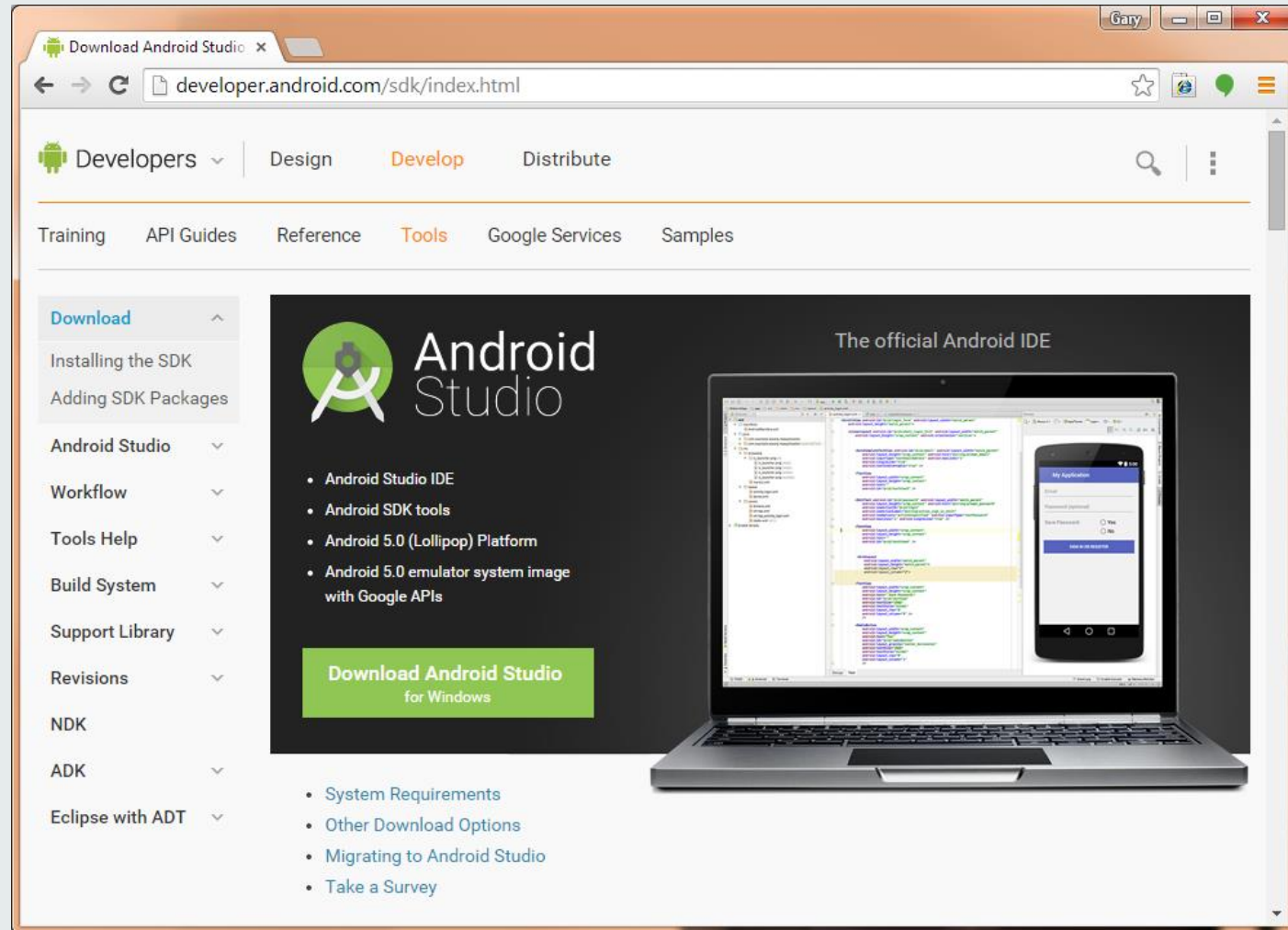
Gary Sheppard

Android IDE Support

- Eclipse
 - ArcGIS Runtime 10.2.4 and older
- Android Studio
 - ArcGIS Runtime 10.2.5 and newer

Android Studio

<http://developer.android.com/sdk/index.html>



The screenshot shows a web browser window displaying the Android Studio download page. The browser's address bar shows the URL `developer.android.com/sdk/index.html`. The page features a navigation menu with categories like "Design", "Develop", and "Distribute". A sidebar on the left lists various resources such as "Download", "Installing the SDK", and "Android Studio". The main content area is titled "The official Android IDE" and includes a large green button labeled "Download Android Studio for Windows". Below this, there are several bullet points listing related topics and a list of links for "System Requirements", "Other Download Options", "Migrating to Android Studio", and "Take a Survey". The background of the main content area features the Android Studio logo and a laptop displaying the IDE interface.

Download Android Studio x

developer.android.com/sdk/index.html

Developers | Design | **Develop** | Distribute

Training | API Guides | Reference | **Tools** | Google Services | Samples

Download ^

- Installing the SDK
- Adding SDK Packages

Android Studio v

Workflow v

Tools Help v

Build System v

Support Library v

Revisions v

NDK

ADK v

Eclipse with ADT v

The official Android IDE

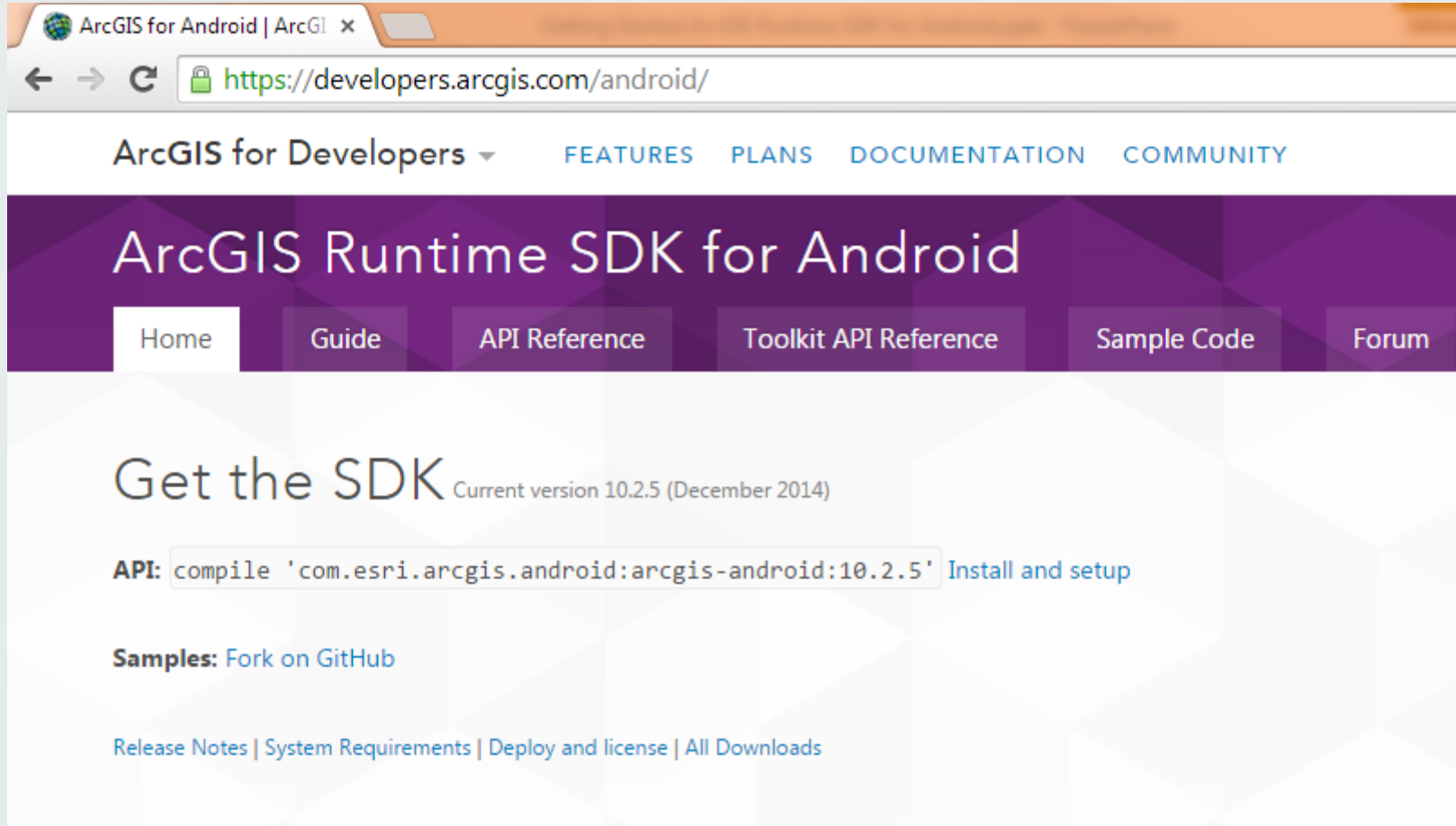
Download Android Studio
for Windows

- Android Studio IDE
- Android SDK tools
- Android 5.0 (Lollipop) Platform
- Android 5.0 emulator system image with Google APIs

- System Requirements
- Other Download Options
- Migrating to Android Studio
- Take a Survey

Access the ArcGIS Runtime SDK

<https://developers.arcgis.com/android/>



A screenshot of a web browser displaying the ArcGIS Runtime SDK for Android page. The browser's address bar shows the URL <https://developers.arcgis.com/android/>. The page features a navigation menu with links for [Home](#), [Guide](#), [API Reference](#), [Toolkit API Reference](#), [Sample Code](#), and [Forum](#). The main heading is "ArcGIS Runtime SDK for Android". Below this, it states "Get the SDK" and "Current version 10.2.5 (December 2014)". There is a code snippet for the API: `compile 'com.esri.arcgis.android:arcgis-android:10.2.5'` followed by a link to "Install and setup". A link for "Samples: Fork on GitHub" is also present. At the bottom, there are links for "Release Notes", "System Requirements", "Deploy and license", and "All Downloads".

ArcGIS for Developers ▾ FEATURES PLANS DOCUMENTATION COMMUNITY

ArcGIS Runtime SDK for Android

[Home](#) [Guide](#) [API Reference](#) [Toolkit API Reference](#) [Sample Code](#) [Forum](#)

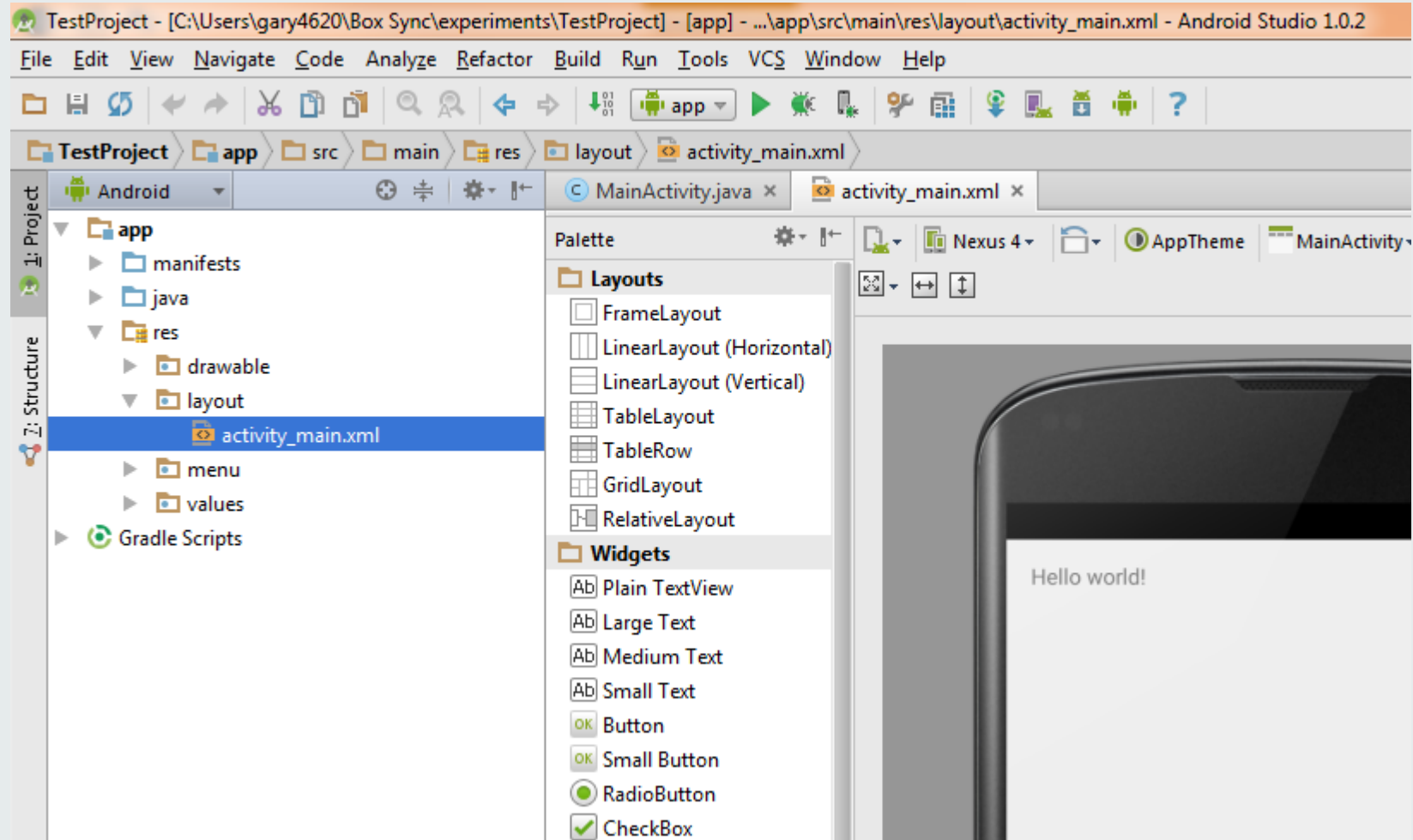
Get the SDK Current version 10.2.5 (December 2014)

API: `compile 'com.esri.arcgis.android:arcgis-android:10.2.5'` [Install and setup](#)

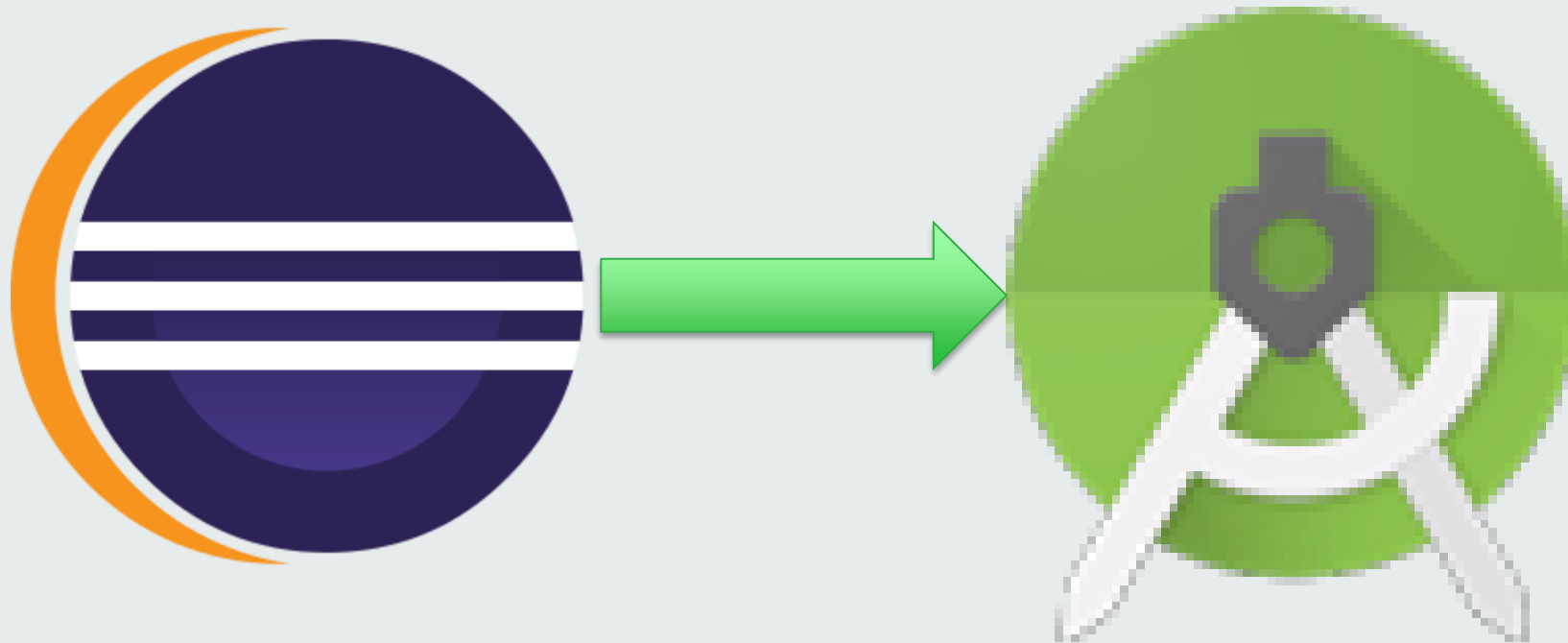
Samples: [Fork on GitHub](#)

[Release Notes](#) | [System Requirements](#) | [Deploy and license](#) | [All Downloads](#)

Demo: Creating an ArcGIS Project in Android Studio



Demo: Migrating from Eclipse to Android Studio



ArcGIS Runtime Developer Samples

The screenshot shows a web browser window displaying the GitHub repository page for 'Esri/arcgis-runtime-samples-android'. The browser's address bar shows the URL 'https://github.com/Esri/arcgis-runtime-samples-android'. The repository page includes a search bar, navigation links (Explore, Gist, Blog, Help), and user information for 'garys-esri'. The repository name 'Esri / arcgis-runtime-samples-android' is prominently displayed, along with statistics: 22 Watchers, 12 Stars, and 2 Contributors. Below this, a summary bar indicates 355 commits, 1 branch, 4 releases, and 2 contributors. A section for 'Merge pull request #26 from Esri/update-readme' is visible, showing a list of files added by 'doneill' 15 days ago. The files listed are: AddCSV2GraphicsLayer, AttributeEditor, Basemaps, BasicLicense, ClassBreaksRenderer, and ClosestFacilities, all with the description 'initial add of measure sample' and a date of '27 days ago'. On the right side, there are links for Code, Issues, Pull Request, Wiki, Pulse, and Graphs. At the bottom, the HTTPS clone URL is provided as 'https://github.c...'. The browser's status bar at the bottom shows the URL 'https://github.com/Esri/arcgis-runtime-samples-android'.

Esri/arcgis-runtime-samp

GitHub, Inc. [US] https://github.com/Esri/arcgis-runtime-samples-android

This repository Search Explore Gist Blog Help garys-esri

Esri / arcgis-runtime-samples-android Watch 22 Star 12

ArcGIS Runtime SDK for Android Samples

355 commits 1 branch 4 releases 2 contributors

branch: master arcgis-runtime-samples-android / +

Merge pull request #26 from Esri/update-readme

doneill authored 15 days ago latest commit d07d2e1238

AddCSV2GraphicsLayer	initial add of measure sample	27 days ago
AttributeEditor	initial add of measure sample	27 days ago
Basemaps	initial add of measure sample	27 days ago
BasicLicense	initial add of measure sample	27 days ago
ClassBreaksRenderer	initial add of measure sample	27 days ago
ClosestFacilities	initial add of measure sample	27 days ago

Code

Issues

Pull Request

Wiki

Pulse

Graphs

HTTPS clone URL

https://github.c

You can clone with H or Subversion.


https://github.com/Esri/arcgis-runtime-samples-android

Working with Maps & Layers

Andy Gup

Default Map

```
public class HelloWorld extends Activity {  
  
    MapView map = null;  
  
    /** Called when the activity is first created. */  
    public void onCreate(Bundle savedInstanceState) {  
        super.onCreate(savedInstanceState);  
        setContentView(R.layout.main);  
        map = (MapView) findViewById(R.id.map);  
    }  
}
```



R.id.map == res/layout/main.xml

```
<com.esri.android.map.MapView  
    android:id="@+id/map"  
    android:layout_width="fill_parent"  
    android:layout_height="fill_parent"  
    mapoptions.MapType="Topo"  
    mapoptions.center="34.056215, -117.195668"  
    mapoptions.ZoomLevel="16" />
```

Best practice: When the app is **minimized**

```
@Override  
protected void onPause() {  
    mMapView.pause();  
}
```

Best practice: When the app is re-opened

```
@Override  
protected void onResume() {  
    mMapView.unpause();  
}
```


Adding layers to your map

Web Maps

Tiled Map Service

Dynamic Maps Service

Feature Layer

Graphics Layer

Image Layer



Adding a Custom Tiled Map Layer

```
map = new MapView(this);  
map.addLayer(new ArcGISTiledMapServiceLayer(  
    "http://mapservice/ArcGIS/rest/services/..."));  
setContentView(map);
```

Adding a Custom ArcGIS.com Map


Activity_main.xml

```
< com.esri.android.map.MapView  
xmlns:android="http://schemas.android.com/apk/res/android"  
android:layout_width="fill_parent"  
android:layout_height="fill_parent"  
url="web_map_URL_goes_here" />
```

Adding a Feature Layer

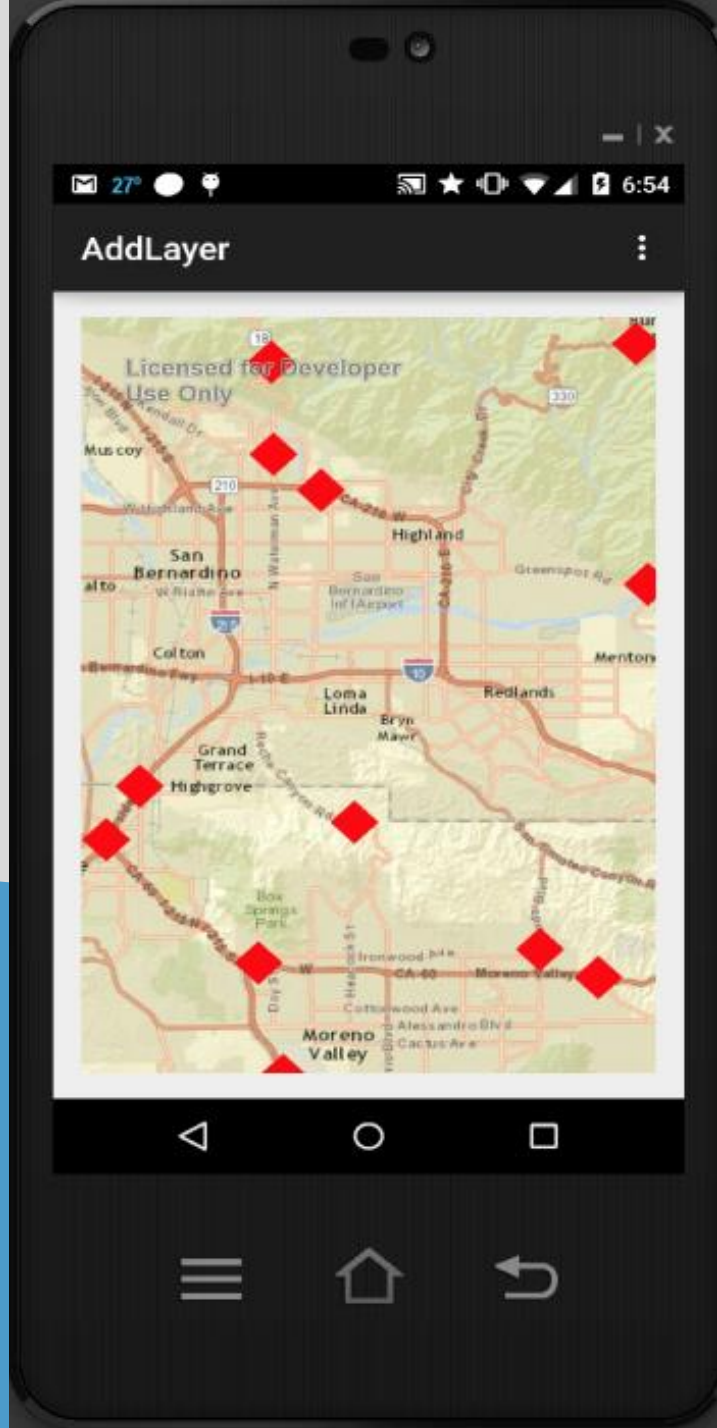
@Override

```
protected void onCreate(Bundle savedInstanceState) {  
    super.onCreate(savedInstanceState);  
    setContentView(R.layout.activity_main);  
  
    // Retrieve the map and initial extent from XML layout  
    mMapView = (MapView) findViewById(R.id.map);  
  
    mFeatureLayer = new ArcGISFeatureLayer("http://myGISServerURL...");  
    mMapView.setOnStatusChangeListener(new OnStatusChangeListener() {  
  
        public void onStatusChanged(Object source, OnStatusChangeListener.STATUS status) {  
            if (OnStatusChangeListener.STATUS.INITIALIZED == status) {  
                mMapView.addLayer(mFeatureLayer);  
            }  
        }  
    });  
}
```



Adding a renderer to a Feature Layer

```
mMapView.setOnStatusChangeListener(new OnStatusChangeListener() {  
  
    public void onStatusChanged(Object source, OnStatusChangeListener.STATUS status) {  
        if (OnStatusChangeListener.STATUS.INITIALIZED == status) {  
  
            // Override default symbol with a SimpleRenderer  
            SimpleMarkerSymbol sms = new SimpleMarkerSymbol(  
                Color.RED,  
                30,  
                SimpleMarkerSymbol.STYLE.DIAMOND);  
            SimpleRenderer simpleRenderer = new SimpleRenderer(sms);  
            mFeatureLayer.setRenderer(simpleRenderer);  
  
            mMapView.addLayer(mFeatureLayer);  
        }  
    }  
});
```



Demo Feature Layer

Events and Debugging

Gary Sheppard

Listening for **MapView** events

```
// Always set these before adding layer
```

```
OnStatusChangeListener.STATUS.INITIALIZED
```

```
OnStatusChangeListener.STATUS.INITIALIZATION_FAILED
```

```
OnStatusChangeListener.STATUS.LAYER_LOADED
```


```
OnStatusChangeListener.STATUS.LAYER_LOADING_FAILED
```


Listening for **MapView** events

Available after MapView/Layer initialized

- **Spatial Reference of map**
- **Center of map**
- **Tile information of a tiled layer**

Listening for **MapView** events

```
map.setOnStatusChangeListener(new OnStatusChangeListener() {  
    private static final long serialVersionUID = 1L;  
  
    public void onStatusChanged(Object source, STATUS status) {  
        if (OnStatusChangeListener.STATUS.INITIALIZED == status)  
        {  
             layerButton.setEnabled(true);  
        }  
        if (OnStatusChangeListener.STATUS.INITIALIZATION_FAILED  
            == status) {  
            //Let user know there was a problem  
        }  
    }  
}
```

Listening for **Layer** events

```
    tiledLayer.setOnStatusChangeListener(new OnStatusChangeListener() {  
        private static final long serialVersionUID = 1L;  
  
        public void onStatusChanged(Object source, STATUS status) {  
            if (OnStatusChangeListener.STATUS.INITIALIZED == status)  
            {  
                //TODO  
            }  
            if (OnStatusChangeListener.STATUS.INITIALIZATION_FAILED  
                == status && source == tiledLayer) {  
                //Let user know there was a problem  
            }  
        }  
    }  
}
```

Listening for **Layer** events

LogCat Console Search

Saved Filters + - [icon]

All messages (no filters) (1)
GPSTester
com.esri.samples.mapevent

listener

	Tag	Text
	samples.mapevent	Test
	samples.mapevent	Test
	samples.mapevent	Test
		BaseMap Layer OnStatusChangeListener = INITIALIZED
		Map OnStatusChangeListener = INITIALIZED
		Map OnStatusChangeListener = LAYER_LOADED

Map touch events - **MapOnTouchListener**

Public Methods	
boolean	<code>onDoubleTap</code> (MotionEvent point) Notified when a single-pointer-double-tap gesture occurs.
boolean	<code>onDragPointerMove</code> (MotionEvent from, MotionEvent to) Notified when a part of a single touch drag gesture event occurs.
boolean	<code>onDragPointerUp</code> (MotionEvent from, MotionEvent to) Notified when a part of a single-touch-drag gesture event occurs.
void	<code>onLongPress</code> (MotionEvent point) Notified when a long-press gesture occurs.
void	<code>onMultiPointersSingleTap</code> (MotionEvent event) Notified when a two-pointers-single-tap gesture occurs.
boolean	<code>onPinchPointersDown</code> (MotionEvent event) Notified when a part of a pinch gesture occurs.
boolean	<code>onPinchPointersMove</code> (MotionEvent event) Notified when a part of a pinch gesture occurs.
boolean	<code>onPinchPointersUp</code> (MotionEvent event) Notified when a part of a pinch gesture occurs.
boolean	<code>onSingleTap</code> (MotionEvent point) Notified when a single-pointer-single-tap gesture occurs.
boolean	<code>onTouch</code> (View v, MotionEvent event) Called when a touch event is dispatched to a view.

Listening for map touch events

```
map.setOnSingleTapListener(new OnSingleTapListener() {  
  
    private static final long serialVersionUID = 1L;  
  
    public void onSingleTap(float x, float y) {  
        Point point = map.toMapPoint(x, y);  
        final Graphic graphic = new Graphic(point, _pictureSymbol);  
        graphicsLayer.addGraphic(graphic);  
    }  
});
```

Listening for custom touch events

```
class MyTouchListener extends MapOnTouchListener {  
    public MyTouchListener(Context arg0, MapView arg1) {  
        super(arg0, arg1);  
    }  
  
    public boolean onDragPointerMove(MotionEvent from, MotionEvent to) {  
        . . .  
        . . .  
        return super.onDragPointerUp(from, to);  
    }  
}
```

Switching between touch listeners

```
/**
 * Sets the DEFAULT MapOnTouchListener
 */
public void setDefaultTouchListener() {
    MapOnTouchListener ml =
        new MapOnTouchListener(getContext(), map);
    map.setOnTouchListener(ml);
}

/**
 * Set the MyTouchListener to override various user touch events.
 */
public void setDrawTouchListener() {
    _myTouchListener = new MyTouchListener(getContext(), map);
    map.setOnTouchListener(_myTouchListener);
}

/**
 * Remove DEFAULT MapOnTouchListener
 */
map.setOnTouchListener(null)
```




Listeners Demo

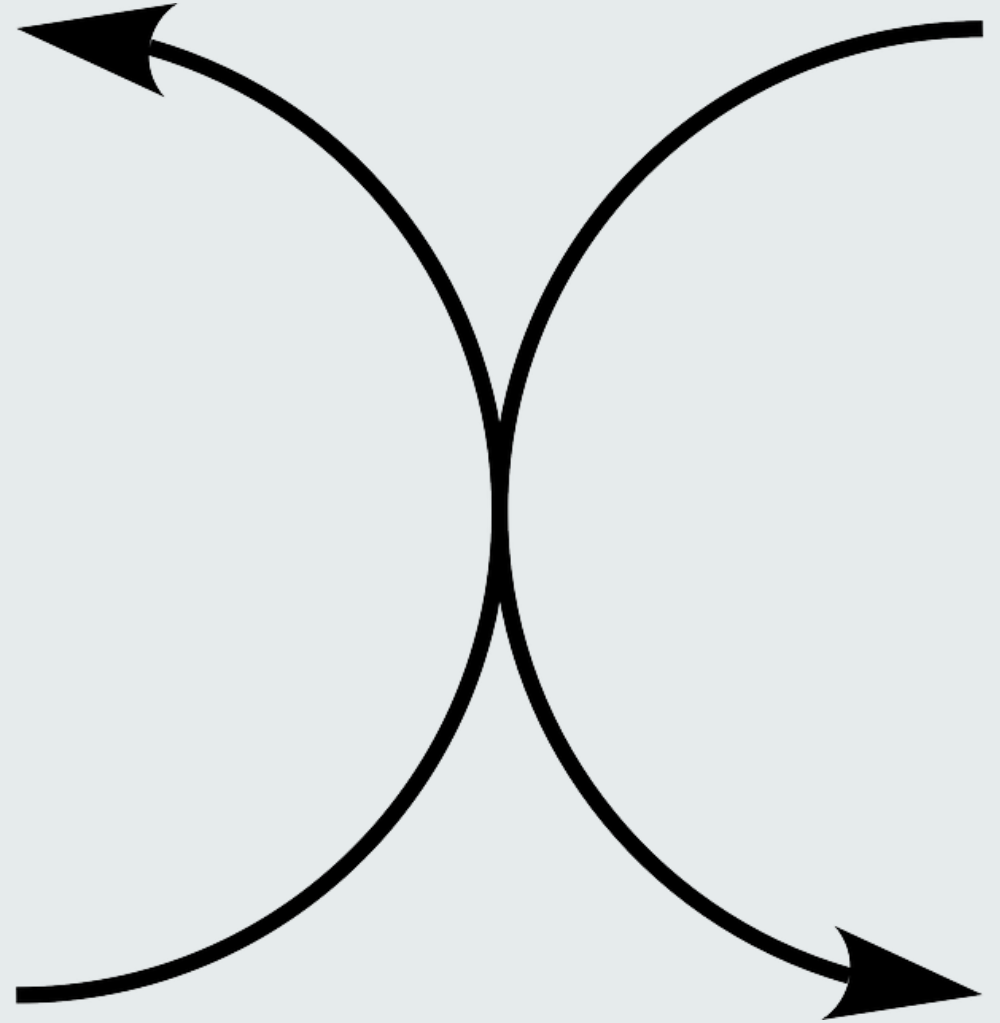
Working with Tasks

Andy Gup

Tasks

All ArcGIS Tasks are [AsyncTask](#)

- Geocode
- GeoProcessing
- Routing
- Identify
- Query



Geoprocessing Example – Step 1

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

    GPPParameter[] outParams = null;

    @Override
    protected void onPostExecute(GPPParameter[] result) {
        //TODO
    }

    @Override
    protected GPPParameter[] doInBackground(
        ArrayList<GPPParameter>... params1) {
        //TODO
    }
}
```

Geoprocessing Example – Step 2

@Override

```
protected GPPParameter[] doInBackground(  
    ArrayList<GPPParameter>... params1) {  
  
    gp = new Geoprocessor(_gpEndPoint);  
    gp.setOutSR(map.getSpatialReference());  
  
    try {  
        GPResultResource rr = gp.execute(params1[0]);  
        outParams = rr.getOutputParameters();  
    } catch (Exception e) {  
        e.printStackTrace();  
    }  
    return outParams;  
}
```

Geoprocessing Example – Step 3

```
@Override
protected void onPostExecute(GPParameter[] result) {
    if (result == null)
        return;
    for (int i = 0; i < outParams.length; i++) {
        if (result[i] instanceof GPFeatureRecordSetLayer) {

            GPFeatureRecordSetLayer fsl =
                (GPFeatureRecordSetLayer) result[i];

            for (Graphic feature : fsl.getGraphics()) {
                Graphic g = new Graphic(feature.getGeometry(),
                    new SimpleFillSymbol(Color.CYAN)
                );

                gLayer.addGraphic(g);
            }
        }
    }
}
```

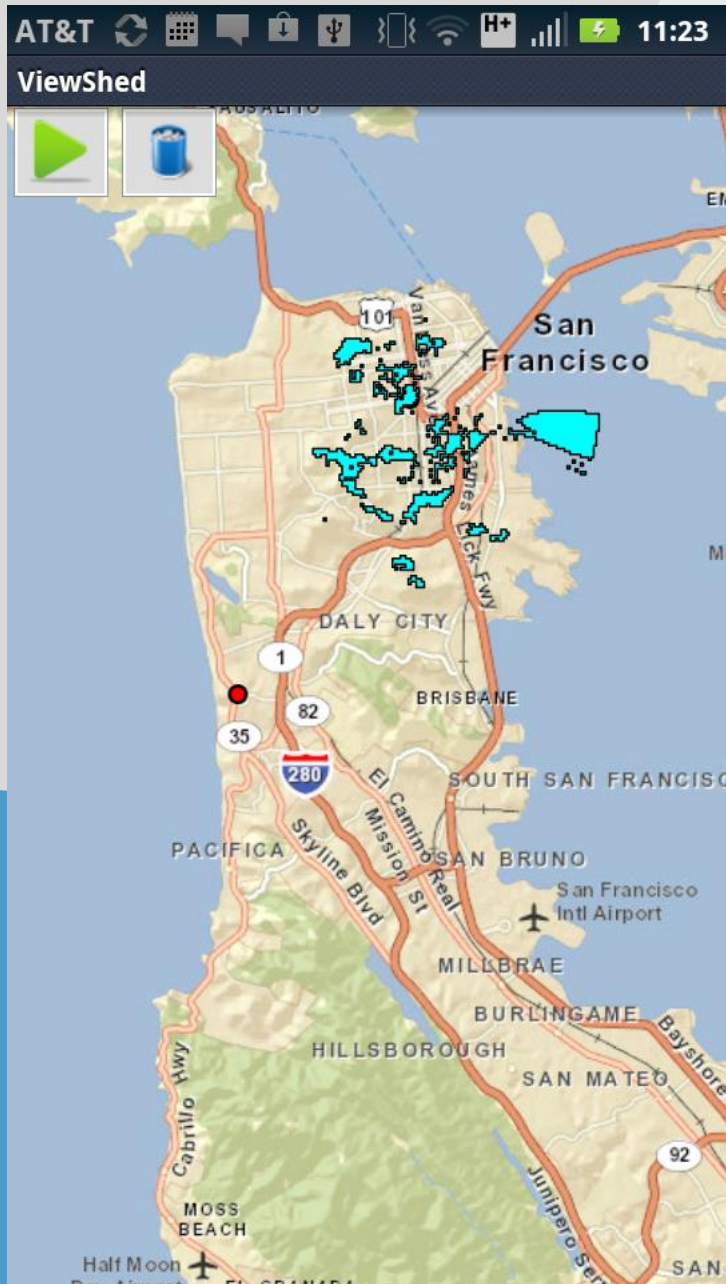
Geoprocessing Example – Step 4

```
GPFeatureRecordSetLayer gpf = new GPFeatureRecordSetLayer("xyz");  
gpf.setSpatialReference(map.getSpatialReference());  
gpf.setGeometryType(Geometry.Type.Point);
```

```
// 1st input parameter - Add the point selected by the user  
Graphic f = new Graphic(mappoint, new SimpleMarkerSymbol(...));  
gpf.addGraphic(f);
```

```
// Add params  
params = new ArrayList<GPParameter>();  
params.add(gpf);
```

```
new ViewshedQuery().execute(params);
```



Geoprocessing Demo

Working with Editing

Gary Sheppard

Editing Feature Layers

`ArcGISFeatureLayer.applyEdits()`

- Asynchronous
- Create new feature
- Delete features
- Edit existing geometries
- Edit attributes

Editing Feature Layers - Online

Immediate over-the-air sync (requires internet!)

Adding

Deleting

Updating

Editing Feature Layers – data integrity

Features must confirm to layer specification

- Geometry type
- Accuracy
- Topology rules



Editing Feature Layers

```
featureLayer.applyEdits(new Graphic[] { graphic },
    null, null, new CallbackListener<FeatureEditResult[][]>() {

    public void onError(Throwable error) {
        // TODO implement error code
    }

    public void onCallback(FeatureEditResult[][] editResult) {
        //update UI
    }
});
```

AT&T 2:21

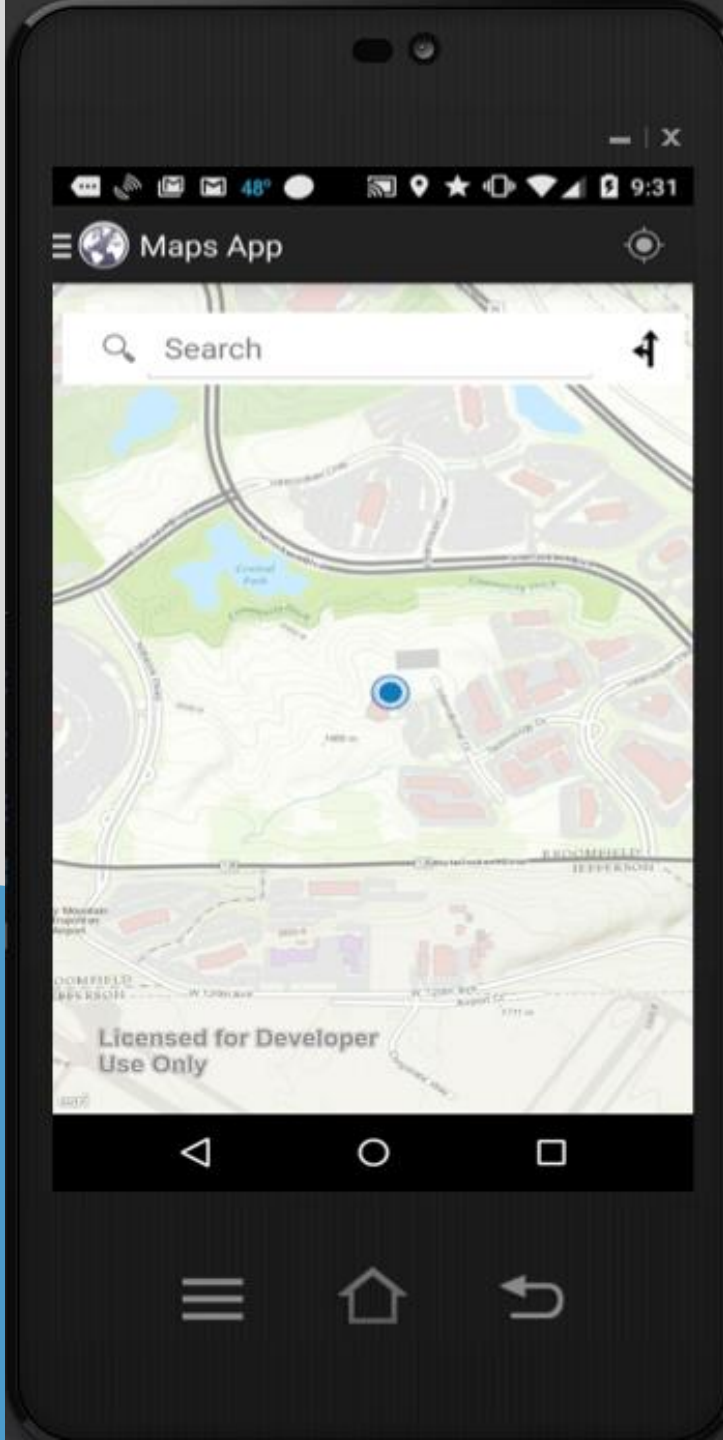
Edit Attributes

Apply Discard

Field Name	PRIDE
Field Date	GAS
Poly Date	10/30/07 6:00 PM
Last Gas Well	21.02
Status	Abandoned
Max Gas Well	7.0
Last Oil Production	0.0
Average Depth	0.0
Last Gas Production	155.0

Editing Demo

Miscellaneous goodies



Demo Maps-app-template

Resources

Maps-app Template:

<https://github.com/Esri/maps-app-android>

SDK Samples:

<https://github.com/Esri/arcgis-runtime-demos-android>

Blog Posts on Migrating to Android Studio:

<http://bit.ly/1AwaZpa>

<http://bit.ly/1DJn34j>



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Bonus Slides

GPS Location

```
_locDisplayMgr = map.getLocationDisplayManager();  
_locDisplayMgr.setLocationListener(new LocationListener() {  
    //TODO  
});  
_locDisplayMgr.start();
```

GPS/Location **Start**

Map and layers must be loaded

Then auto center and/or draw GPS graphic

Configure LocationDisplayManager

```
boolean _mapLoaded = false;

LocationDisplayManager ldm = map.getLocationDisplayManager();
ldm.setAutoPanMode(AutoPanMode.OFF);
ldm.setLocationListener(new LocationListener() {
    public void onLocationChanged(Location loc) {
        if(_mapLoaded == true){
            //Do something
        }
    }
})

map.setOnStatusChangeListener(new OnStatusChangeListener() {
    public void onStatusChanged(Object source, STATUS status) {
        if (status == STATUS.INITIALIZED) {
            _mapLoaded = true;
        }
    }
})
}
```

Listen for LocationService Updates

```
//ldm is LocationDisplayManager()
ldm.setLocationListener(new LocationListener() {
    public void onLocationChanged(Location loc) {
        if(loc != null){
            if(loc.hasAccuracy() && mapLoaded == true){
                //TODO Handle update
            }
        }
    }
})
```

LocationService Life Cycle

```
@Override
protected void onPause() {
    super.onPause();
    locationManager.stop();
}

@Override
protected void onResume() {
    super.onResume();
    if (map.isLoaded() == true) {
        locationManager.start();
    }
}
```








Understanding our world.