Developing Apps with ArcGIS Runtime SDK for Android

Dan O'Neill and Gunther Heppner

Technical Workshop

Introductions

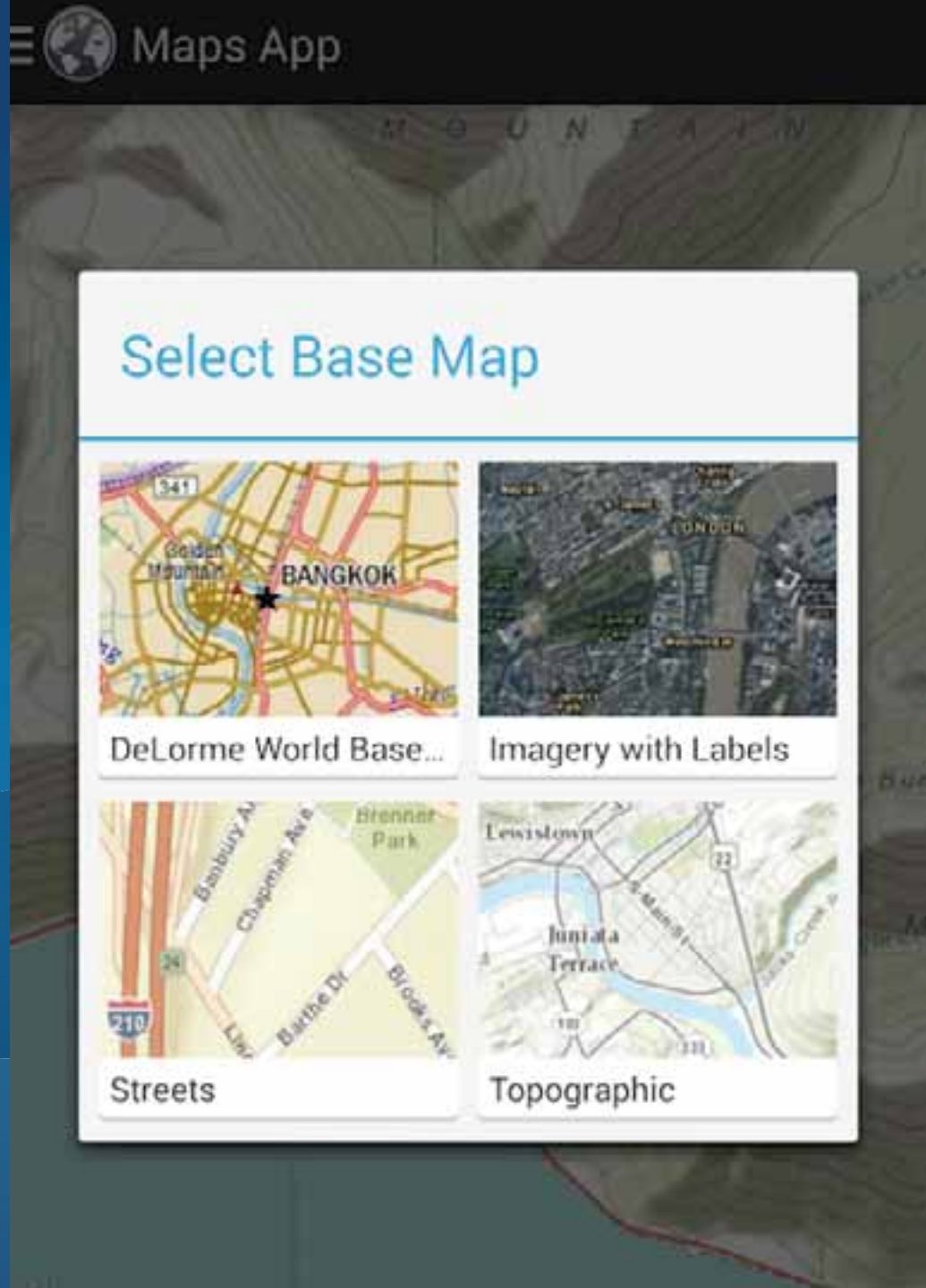
- What we do
  - Edinburgh – Gunther Heppner - https://github.com/gunt0001
  - Alaska – Dan O'Neill - @jdoneill - https://github.com/doneill
- What you do
- Session Surveys

Agenda

- Maps App
  - ArcGIS Online Subscription
  - Portal API Patterns
    - ArcGIS Basemaps
    - Licensing API
  - Analysis Functions
    - Routing and Geocoding
    - Measure Tool
- Offline Developer Patterns
  - Offline Basemaps
  - Custom Tile Layers

Maps App

Dan O’Neill

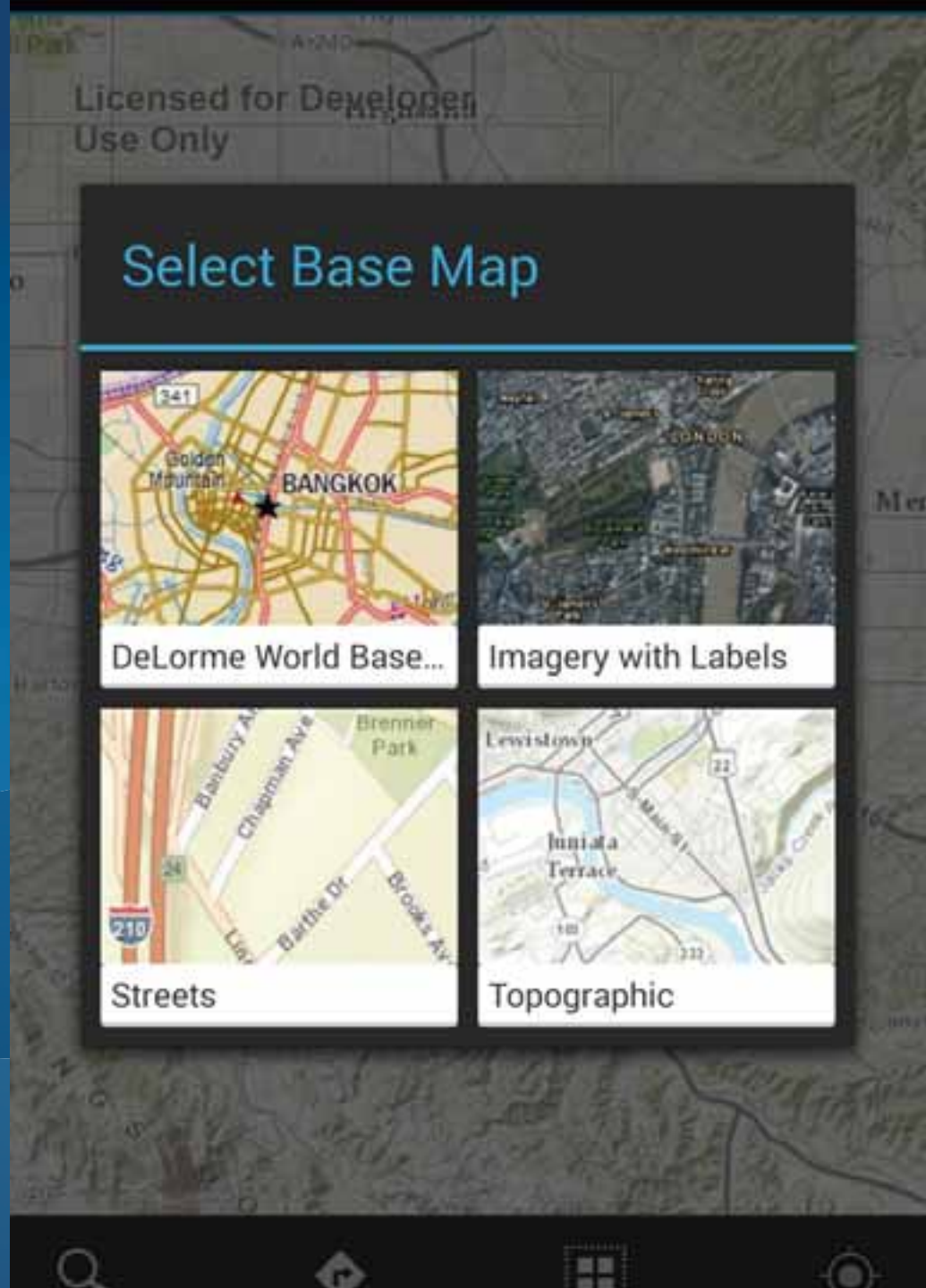


Maps App

- Modern Map Navigation Centric App
- Built with ArcGIS Runtime SDK for Android
- Access your ArcGIS Organizations custom Maps
- Features
  - Switching Basemaps
  - Searching for Places
  - Routing Navigation
  - Measure distances/areas

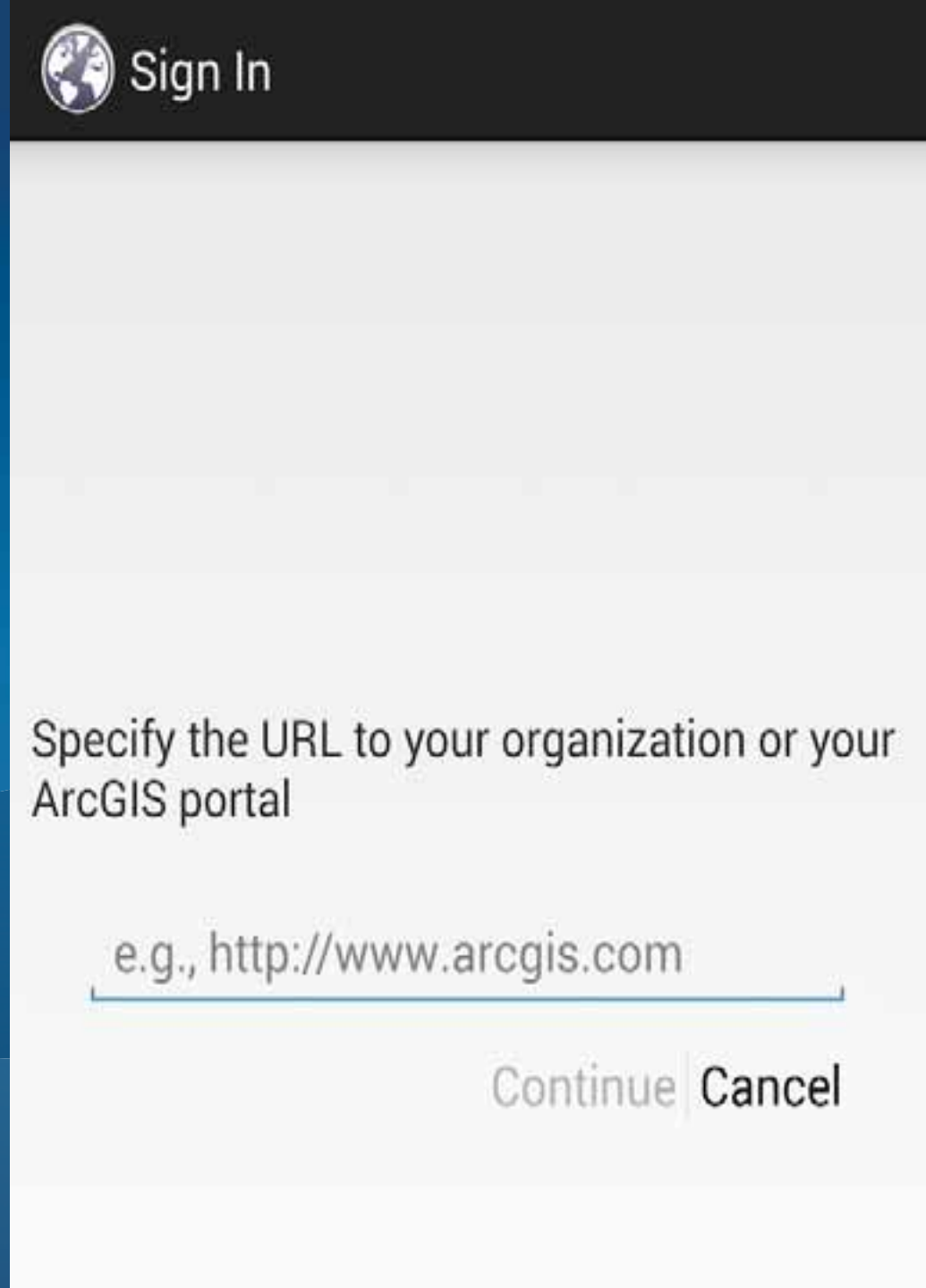
Map App Demo

Dan O'Neill & Gunther Heppner



ArcGIS Online Subscription

Gunther Heppner



ArcGIS Online Subscription

Get access an organization's geospatial content and services, including:

- **web maps**
- **basemaps**
- **groups**
- **utility services (geocoding, printing)**
- **ability to search an organization's content**

ArcGIS Online Subscription

Access to an organizational subscription requires:

- **sign in via OAuth2 using the SDK's OAuthView**
  - **requires a client id that identifies the application**
- **use the SDK's Portal API to access and search content**

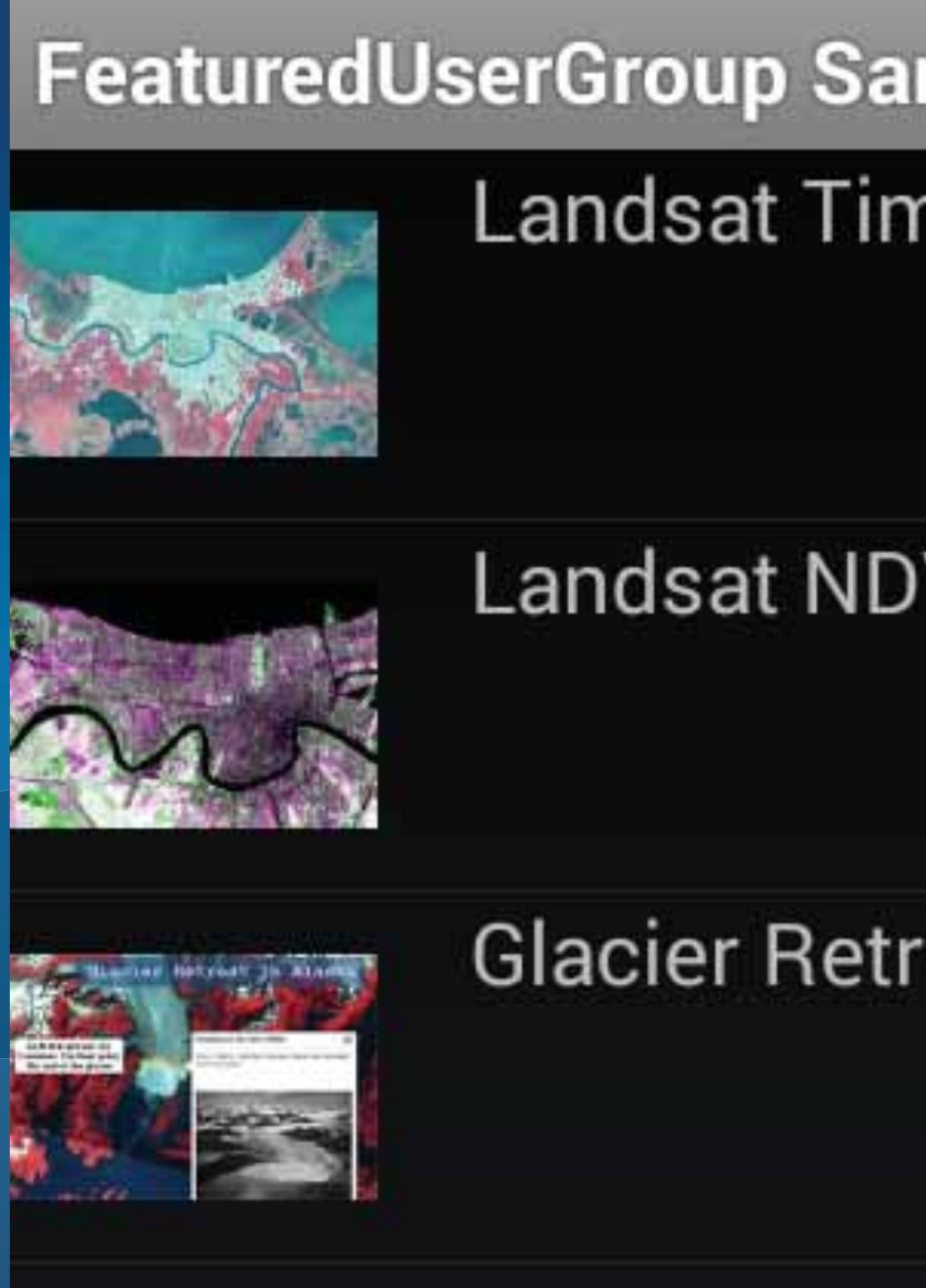
OAuth2 Demo

Gunther Heppner

```
// create an OAuthView and show it
OAuthView oAuthView = new OAuthView(th
    new CallbackListener<UserCredentia

      @Override
      public void onCallback(final Use
        if (credentials != null) {
          Portal portal = new Portal(m
          PortalInfo portalInfo = null

          try {
            // fetch the portal info a
            portalInfo = portal.fetchP
            portal.fetchUser();
          } catch (Exception e) {
            onError(e);
          }

          // hold on to the initialize
          AccountManager.getInstance()

          // enable standard license l
          if (portalInfo != null) {
            ArcGISRuntime.License.setL
          }

          // we are done signing in
          finish();
        }
      }
```

Portal API Patterns

Dan O'Neill



Portal Patterns – API Classes

- Portal
  - Provides the connection information to the portal (Uri, Token).
- PortalInfo
  - Includes information such as the name, logo, featured items and supported protocols (http vs https) for this portal.
- PortalGroup
  - Represents a group in a portal.
- PortalItem
  - Represents an item stored in a portal.
- PortalQueryParams
  - Creates query parameters suitable for finding content contained in a portal
- PortalQueryResult
  - Contains the results of queries performed on a portal

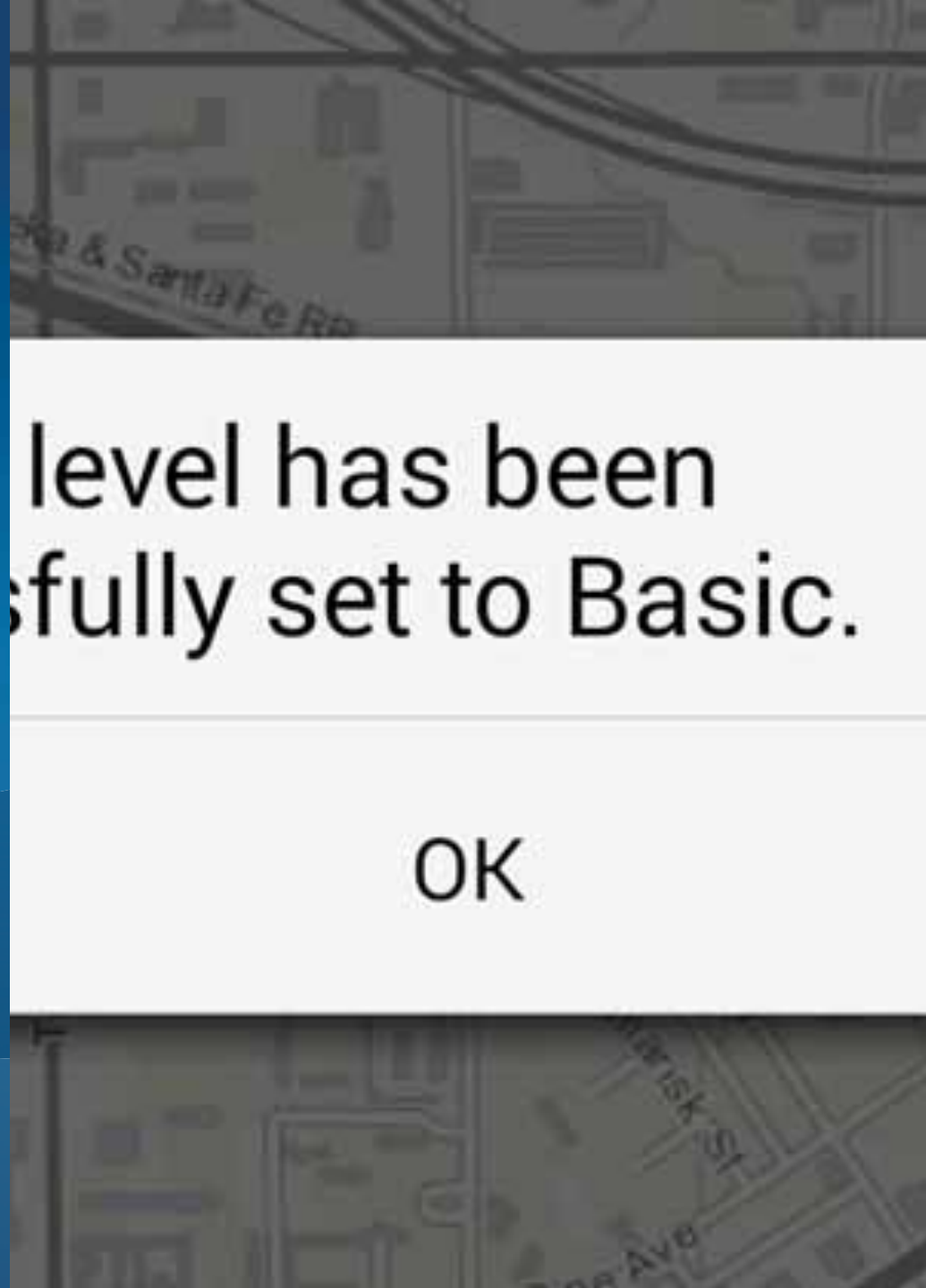
Portal Code Demo

Gunther Heppner

```
private void fetchBasemapItems() throws Exception {
  // Create a Portal object
  String url = getString(R.string.portal_url);
  Portal portal = new Portal(url, null);

  // Create a PortalQueryParams to query for items in
  PortalQueryParams queryParams = new PortalQueryPara
  queryParams.setCanSearchPublic(true);
  queryParams.setSortField("name").setSortOrder(Porta
  queryParams.setQuery(createQueryString());

  // Find items that match the query
  PortalQueryResultSet<PortalItem> queryResultSet = p
  if (isCancelled()) {
    return;
  }

  // Loop through query results
  for (PortalItem item : queryResultSet.getResults()
    // Fetch item thumbnail from server
    byte[] data = item.fetchThumbnail();
    if (isCancelled()) {
      return;
    }
    if (data != null) {
      // Decode thumbnail and add this item to list f
      Bitmap bitmap = BitmapFactory.decodeByteArray(d
      BasemapItem portalItemData = new BasemapItem(it
      Log.i(TAG, "Item id = " + item.getTitle());
      mBasemapItemList.add(portalItemData);
    }
  }
}
```

Licensing

Gunther Heppner

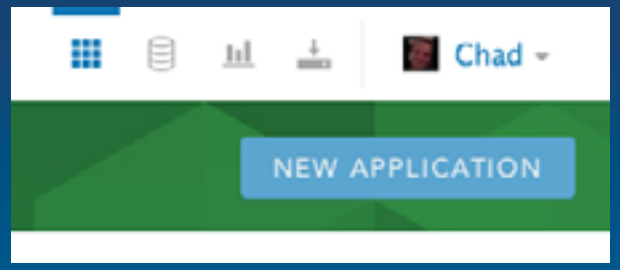


Runtime Licensing

License levels and functionality

License Level	Available functionality
Developer (development and testing only)	All functionality (watermarks and debug messages will be generated, nag screens with local server*)
Basic	Connected - all functionality Offline - map viewing only
Standard	Connected and offline - all functionality, includes: • Local locators (geocoding) • Local routing • Local geodatabase editing • Local geodatabase sync operations

How to license your app at the basic level



- http://developers.arcgis.com
- Under Application section, create a New Application (or select existing)
- Click on Runtime SDK Licensing
- Copy the Client ID and use it to set your clientID
  - ArcGISRuntime.*setClientID("0x7W");*

Licensing – Basic API

```
@Override
protected void onCreate(Bundle savedInstanceState) {
  super.onCreate(savedInstanceState);


  LicenseResult licenseResult = ArcGISRuntime.setClientId(CLIENT_ID);

  LicenseLevel licenseLevel = ArcGISRuntime.License.getLicenseLevel();
```

How to license your app at the standard level

- You have 2 options:

1. Use an organization account (ArcGIS Online or Portal for ArcGIS)
   - Requires users of your app to log in with their account

2. Use a license string obtained from Customer Service or your international distributor
   - License burnt into the app
   - Extensions can also be added with this option

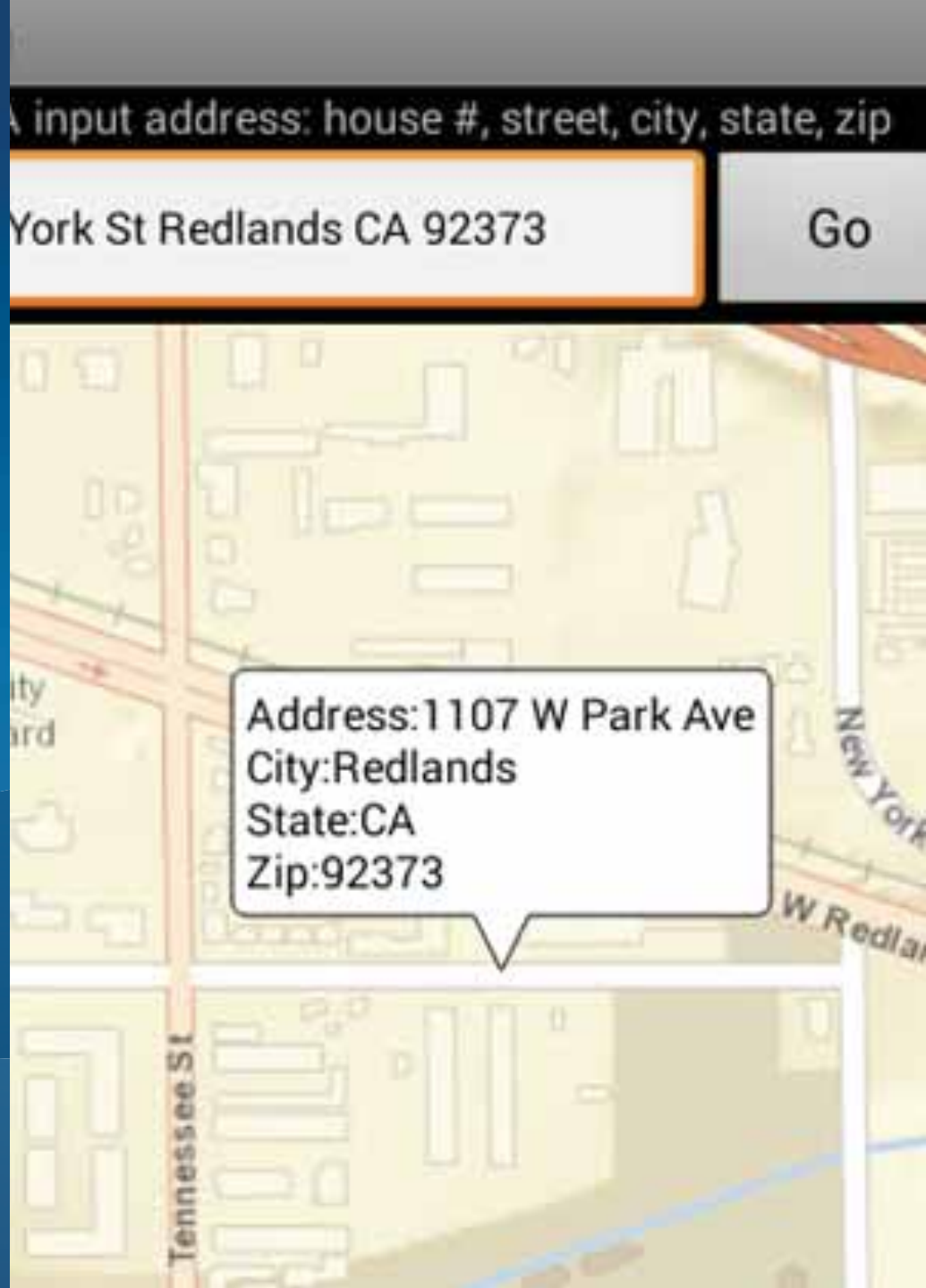
For more info speak to sales or product management

Licensing – Standard Portal Pattern

```
Portal portal = new Portal(PORTAL_URL, credentials);
PortalInfo portalInfo = null;

portalInfo = portal.fetchPortalInfo();

LicenseInfo licenseInfo = portalInfo.getLicenseInfo();

LicenseResult licenseResult = ArcGISRuntime.License.setLicense(licenseInfo);
LicenseLevel licenseLevel = ArcGISRuntime.License.getLicenseLevel();
```

Analysis

Dan O'Neill



Why analyze?

- Convert data into information
- Adds value
  - Answers questions
  - More than just points on a map
- Services available in ArcGIS Online
  - Build into your apps

Geocoding Patterns – Fine Grain

- ArcGIS Geocoding service
  - Global coverage
- Locator uses this in default constructor
- Find method allows for address and POI search
- Point and radius parameters
  - Results in radius are promoted
  - Sorted by distance to point
  - Results outside radius still returned

Geocoding Pattern - Simplification

- ArcGIS Android Toolkit API
- Provides GeocodeHelper class
- Find address for given location
- Simplifies the workflow
  - No need to set parameters and get result from a Locator

Routing API - Workflow

- Create a Route Task
- Set up Route Task Parameters
- Set stops
- Calculate route
- Get results
- Display route on map
- Get directions and display to user

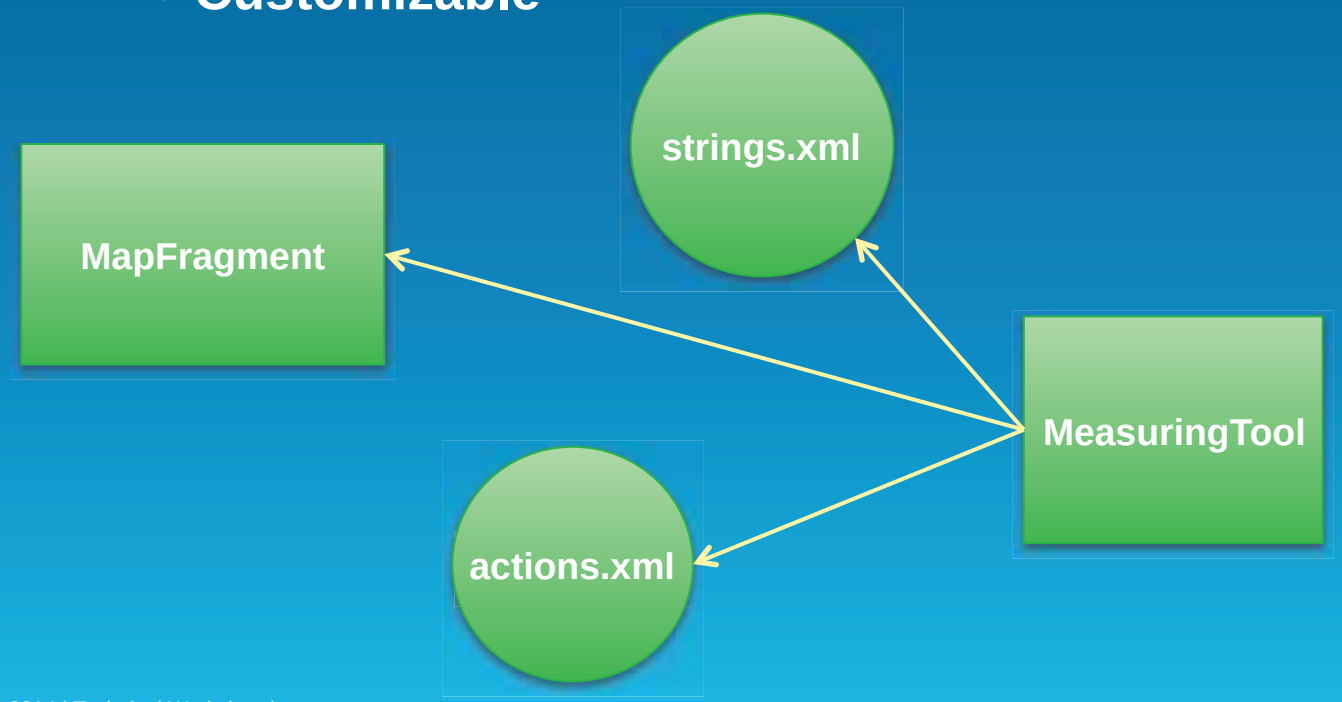
Routing – Geocoding Code Demo

Dan O'Neill

```
protected RouteResult doInBackground(List<LocatorFindPa
  // Perform routing request on background thread
  mException = null;

  // Define route objects
  List<LocatorGeocodeResult> geocodeStartResult = null;
  List<LocatorGeocodeResult> geocodeEndResult = null;
  Point startPoint = null;
  Point endPoint = null;
  RouteParameters routeParams = null;

  // Create a new locator to geocode start/end points
  Locator locator = Locator.createOnlineLocator();

  try {
    // Geocode start position, or use My Location (from
    LocatorFindParameters startParam = params[0].get(0)
    if (startParam.getText().equals(getString(R.string.
      startPoint = (Point) GeometryEngine.project(mLoca
    } else {
      geocodeStartResult = locator.find(startParam);
      startPoint = geocodeStartResult.get(0).getLocatio
      if (isCancelled()) {
        return null;
      }
    }

    // Geocode the destination
    LocatorFindParameters endParam = params[0].get(1);
    geocodeEndResult = locator.find(endParam);
    endPoint = geocodeEndResult.get(0).getLocation();
  } catch (Exception e) {
    mException = e;
    return null;
  }
```

Analysis – Measure Tool

- Measure Tool is self contained
- Easy to integrate into your own app
- Candidate for first tool in our App Toolkit
- Customizable



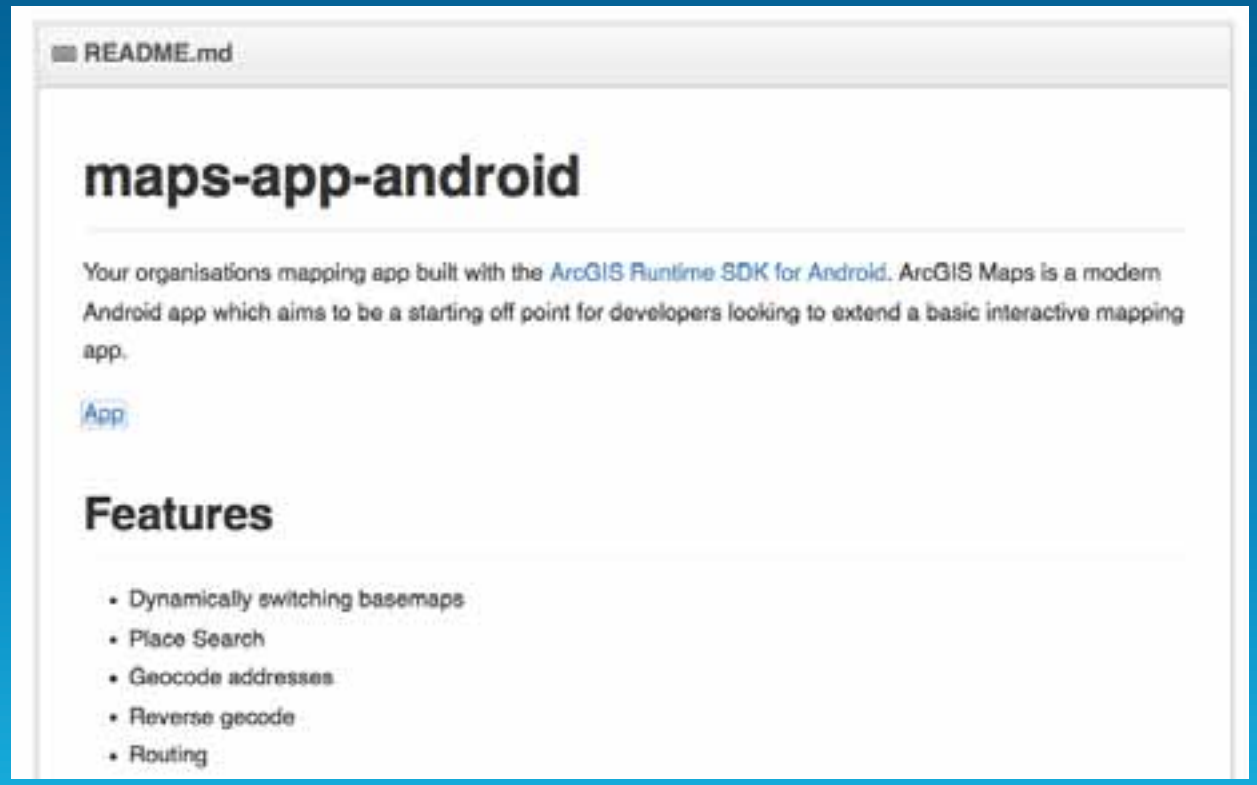
Measure Integration Code Demo

Dan O'Neill

```
item
    android:id="@+id/menu_search"
    android:actionLayout="@layout/search_layout"
    android:icon="@drawable/ic_menu_search"
    android:showAsAction="ifRoom|collapseActionView"
    android:title="@string/menu_search"/>
item
    android:id="@+id/route"
    android:icon="@drawable/action_route"
    android:showAsAction="ifRoom"
    android:title="@string/menu_route"/>
item
    android:id="@+id/basemaps"
    android:icon="@drawable/action_basemaps"
    android:showAsAction="ifRoom"
    android:title="@string/menu_basemaps"/>
item
    android:id="@+id/location"
    android:icon="@android:drawable/ic_menu_mylocation"
    android:showAsAction="ifRoom"
    android:title="@string/action_location"/>
item
    android:id="@+id/directions"
    android:icon="@drawable/ic_routing_take_center_fork_do
    android:showAsAction="ifRoom"
    android:title="@string/action_directions"
    android:visible="false"/>
item
    android:id="@+id/action_settings"
    android:icon="@android:drawable/ic_menu_edit"
    android:orderInCategory="100"
    android:showAsAction="ifRoom"
    android:title="@string/action_settings"/>
```

Maps App on Github

- https://github.com/Esri/maps-app-android
- Get involved
- Report Issues
- Contribute Code
  - Fork it
  - Clone it
  - Configure remotes
  - Send pull requests



README.md

maps-app-android

Your organisations mapping app built with the ArcGIS Runtime SDK for Android. ArcGIS Maps is a modern Android app which aims to be a starting off point for developers looking to extend a basic interactive mapping app.

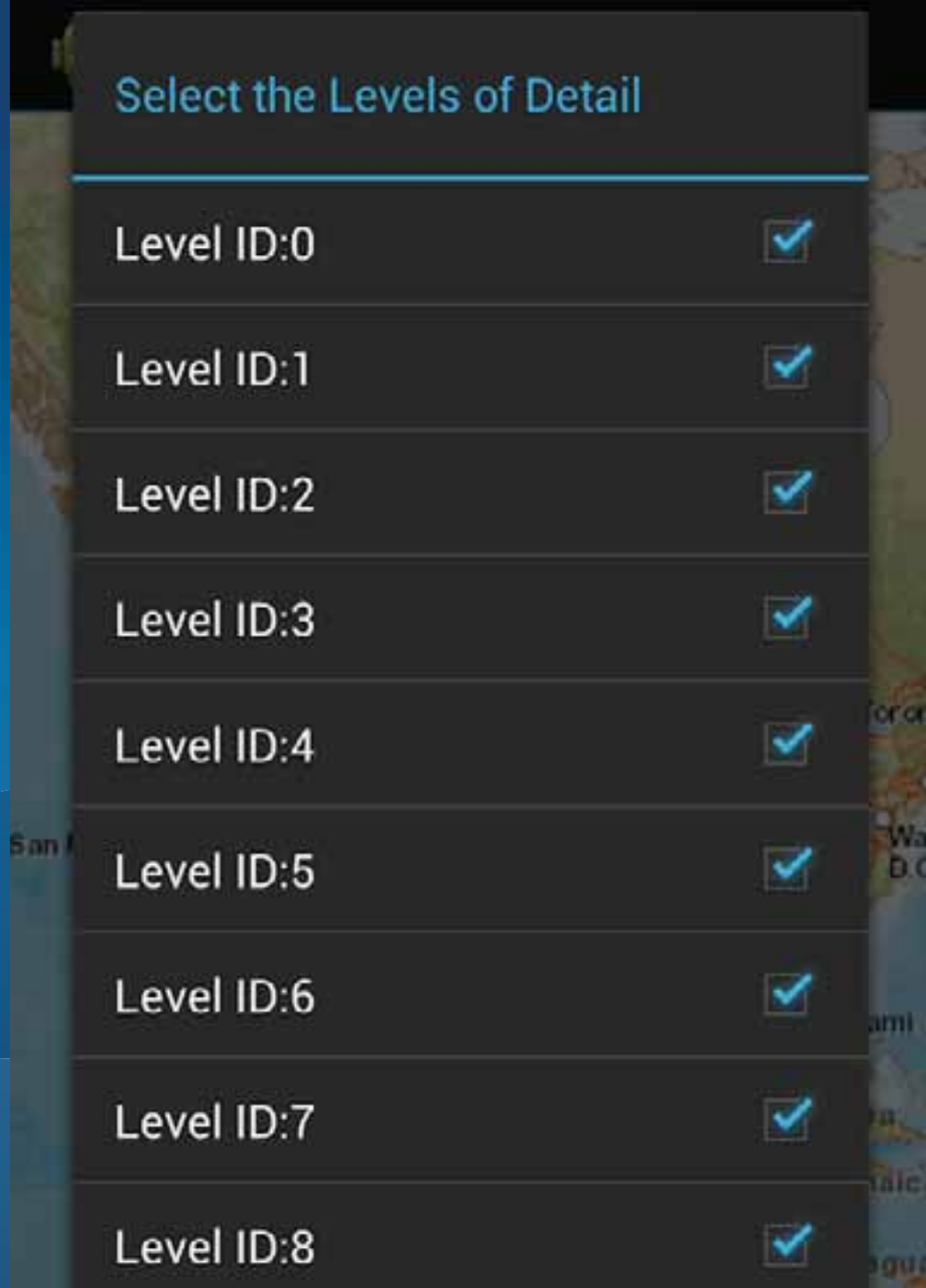
App

Features

- Dynamically switching basemaps
- Place Search
- Geocode addresses
- Reverse geocode
- Routing

Offline Patterns

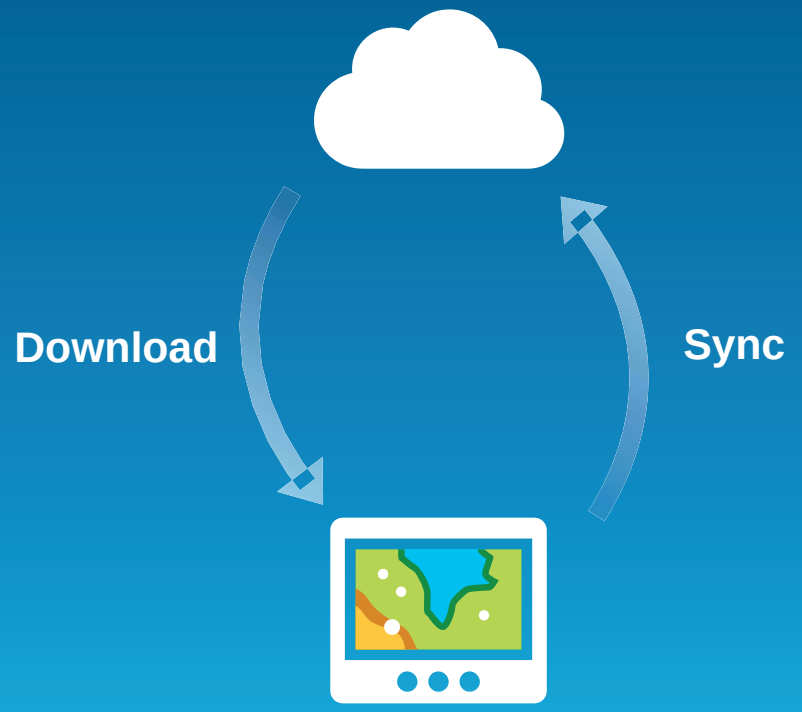
Dan O'Neill



Offline Patterns

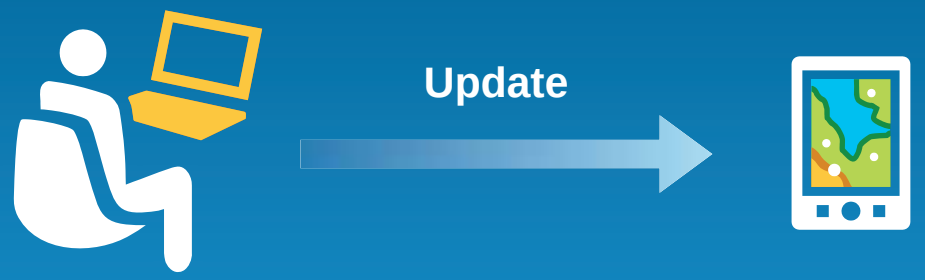
Service

- Programmatic pattern to support large number of users
- Can use the map extent to select parts of database to download to device



Desktop

- Consume Runtime content created in ArcGIS for Desktop
- Best for single user
- Network datasets for offline routing



Offline Workflows

- Take Map Offline
  - View / Basemap
  - Edit
  - Sync
- Perform Offline Tasks
  - Routing
  - Geocoding
  - Query
- Create Your Own Layer
  - Define layer and symbology
  - Persist it to device

Offline Basemaps

- From a Tiled Service
  - TPK or Compact Cache
  - Service must support **exportTiles** operation

```
final ExportTileCacheTask exportTileCacheTask = new
        ExportTileCacheTask(tileURL, null);
```

- Requesting a Tile Cache paramaters
  - Level Of Details (LOD)
  - Level ID's supported
  - Extent of the Tile Cache
  - SpatialReference

```
ExportTileCacheParameters params = new
   ExportTileCacheParameters(createAsTilePackage,
            levels,
            ExportBy.ID,
            extentForTPK,
            mMapView.getSpatialReference());
```

Offline Basemaps

- Submit a tile cache job
- Poll for status
- Download the completed cache to device

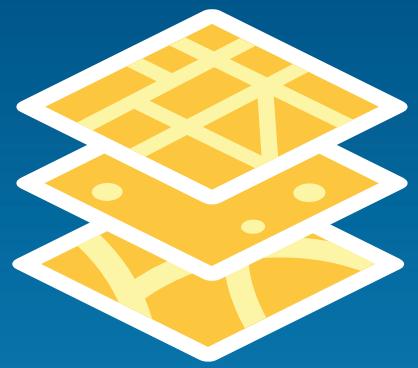
```
exportTileCacheTask.generateTileCache(
    ExportTileCacheParameters params,
        CallbackListener<ExportTileCacheStatus> statusCallback,
        CallbackListener<String> downloadCallback,
        String tileCachePath)
```

Offline Basemap Demo

Gunther Heppner

Offline Custom Layers

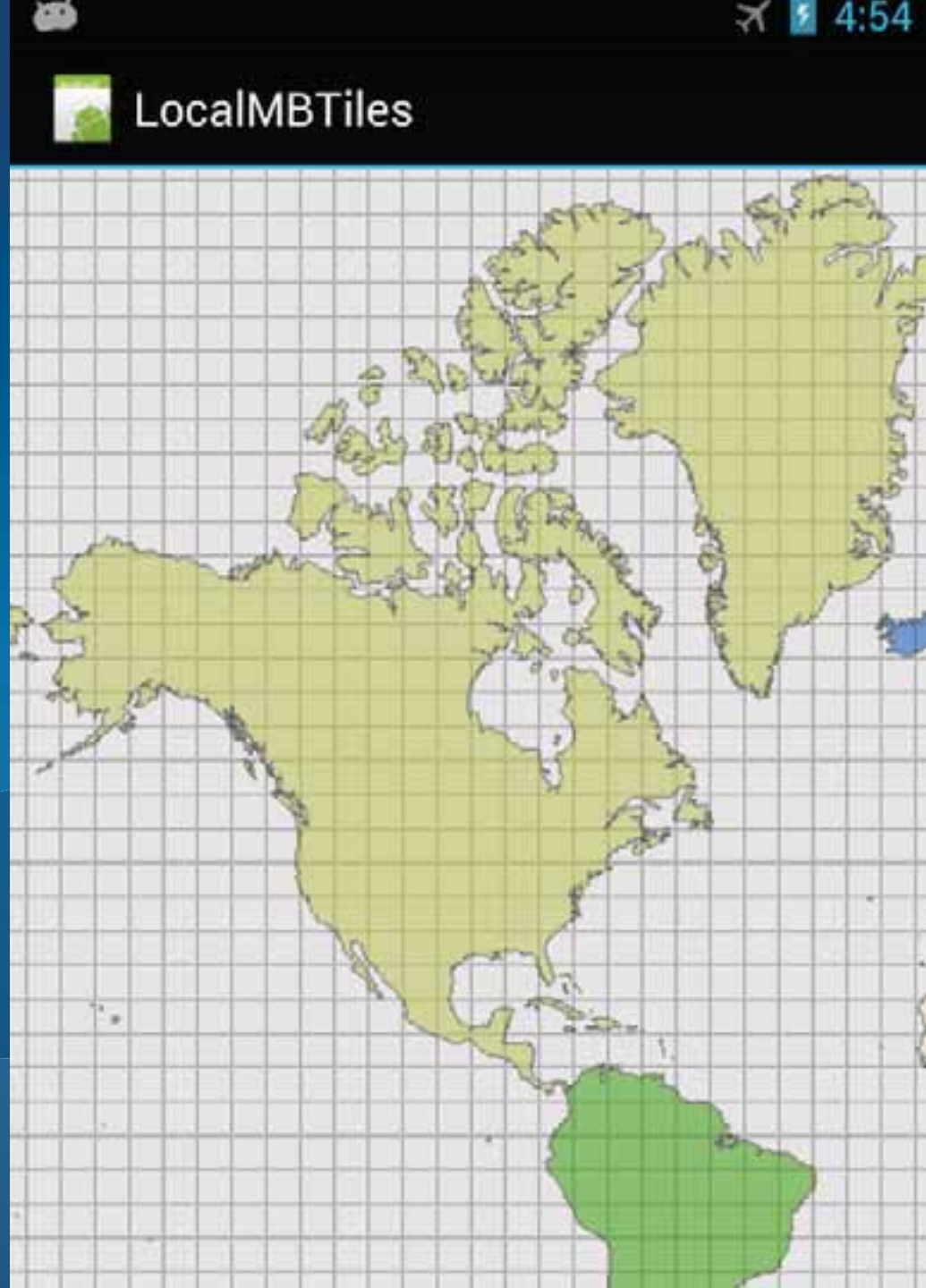
- Base Abstract Class – TiledServiceLayer
  - Used by
    - ArcGISTiledMapServiceLayer
    - BingMapsLayer
    - OpenStreetMapLayer
- Fetch Tiles
  - Implement abstract getTile() method



```
MBTilesLayer mbLayer = new MBTilesLayer(
        Environment.getExternalStorageDirectory().getPath()
        + "/ArcGIS/samples/mbtiles/world_countries.mbtiles");
```

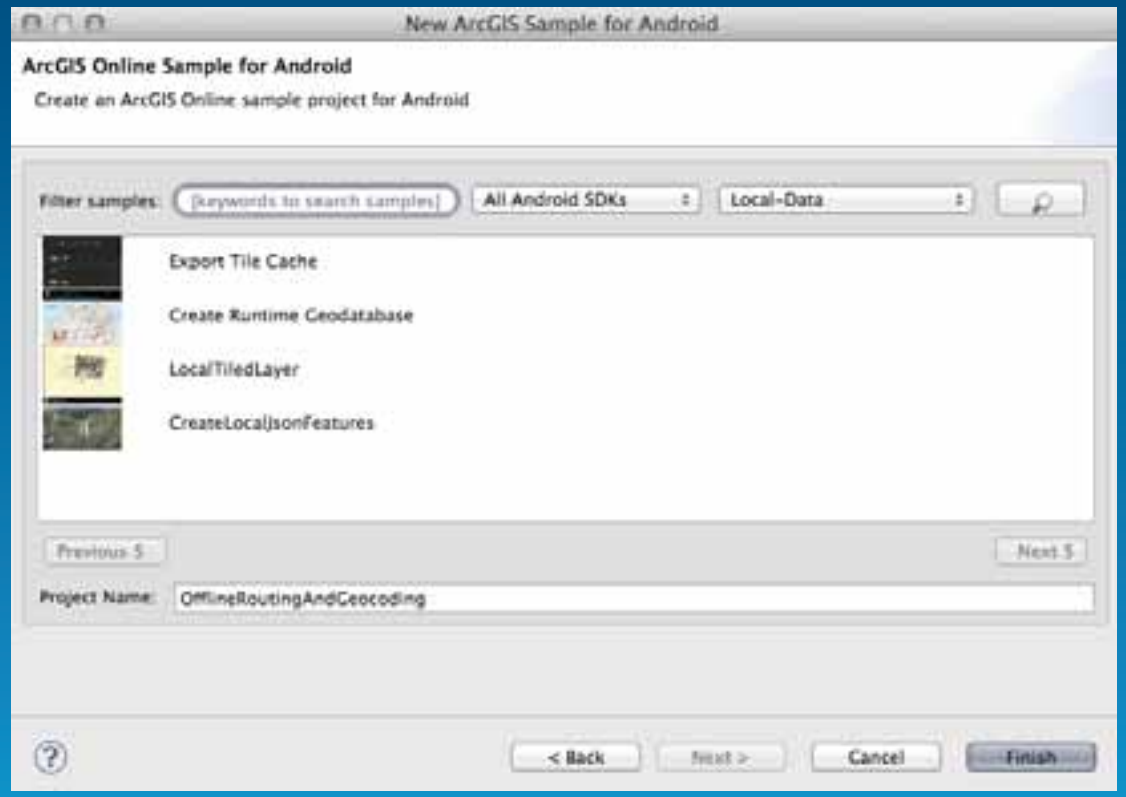
Custom Layer Demo

Dan O'Neill



Offline demos in the SDK

- Local Tile Layer
- Create Local JSON Features
- Create Local Geodatabase
- Offline Editor
- Export Tile Cache
- Offline Routing and Geocoding



Next release…

- Direct read of raster datasets
  - Mosaic datasets
  - Raster Files – GeoTIFF, NITF, IMG, RPF, DTED, PNG, HFA, JPEG, JP2K
  - GeoPackage
- Direct read of vector data
  - Shapefile
  - KML
  - GeoPackage
- Simplification
  - Open Source Toolkit
- Analysis
  - Renderscript
  - Spatial Analysis

Related Session

- Debugging and Troubleshooting ArcGIS Runtime SDK for iOS and Android
  - Wednesday July 16, 11:30AM
  - Demo Theater – Technical Support Exhibit Hall B
- Offline Routing and Geocoding in ArcGIS Runtime SDK's
  - Wednesday July 16, 3:00PM & Thursday July 17, 10:00AM
  - General Theater 2 Exhibit Hall A
- Create Your Own Android App Tools Using ArcGIS Runtime SDKs
  - Thursday July 17, 9:30AM
  - Demo Theater – Developer Island Exhibit Hall B
- ArcGIS Runtime SDK's: The Road Ahead
  - Thursday July 17, 1:30PM
  - Room 07 A/B

Agenda

- Maps App
  - ArcGIS Online Subscription
  - Portal API Patterns
    - ArcGIS Basemaps
    - Licensing API
  - Analysis Functions
    - Routing and Geocoding
    - Measure Tool
- Offline Developer Patterns
  - Offline Basemaps
  - Custom Tile Layers

Thank You

- **Please fill out the session survey:**

Offering ID: 1172

Online – www.esri.com/ucsessionsurveys

Paper – pick up and put in drop box

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Understanding our world.