ESRI DEVELOPER SUMMIT

10-12 November | Berlin, Germany

ArcGIS Runtime SDK for iOS and OS X: Building Apps

Mary Harvey

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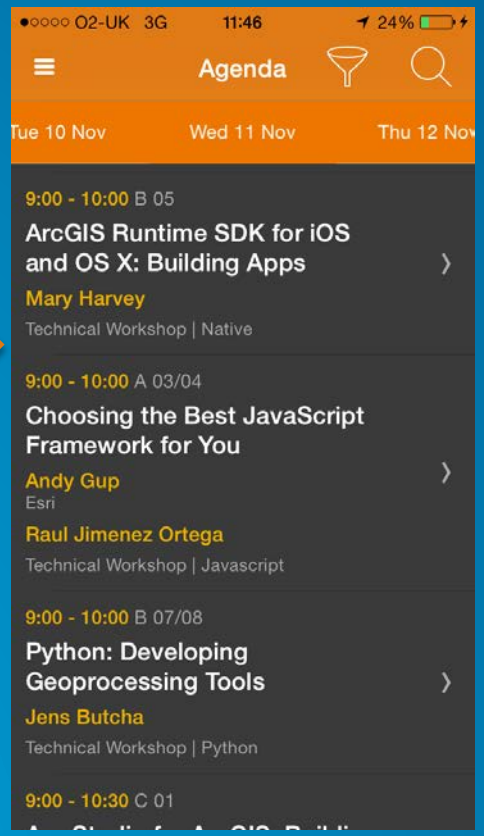
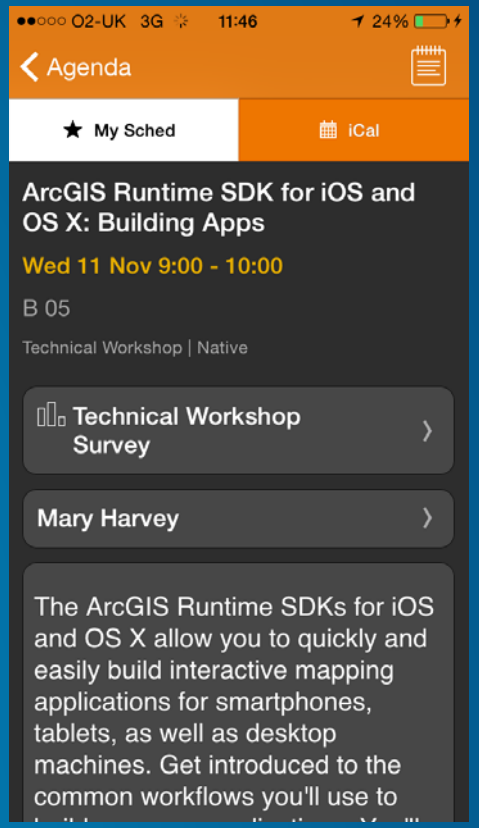
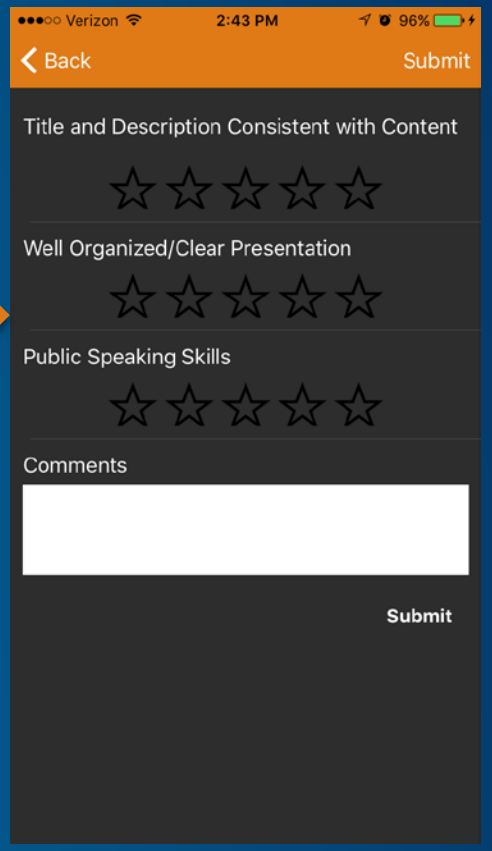
Select the session



Select “Technical Workshop Survey”



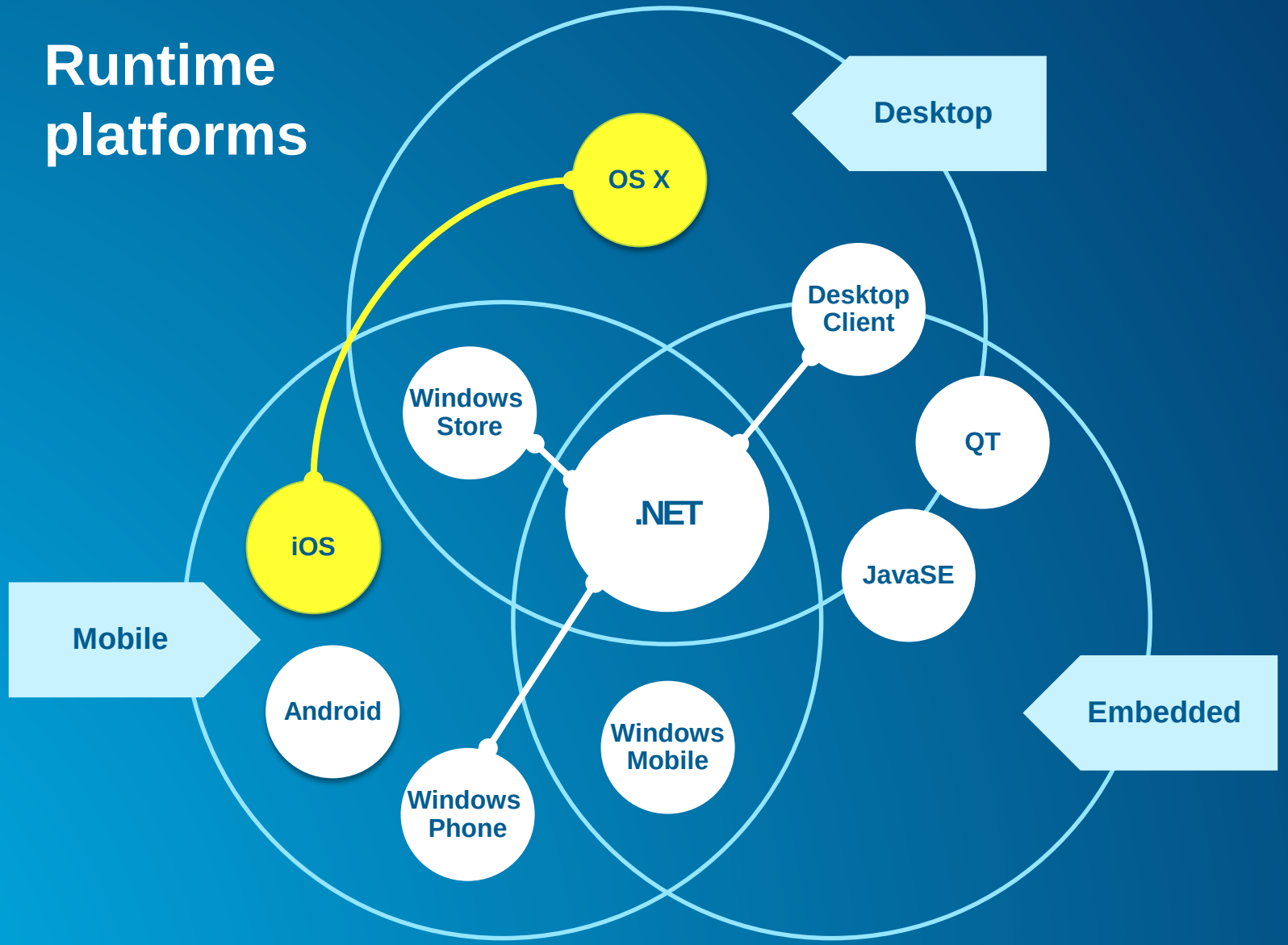
Complete Answers and Select “Submit”



Topics

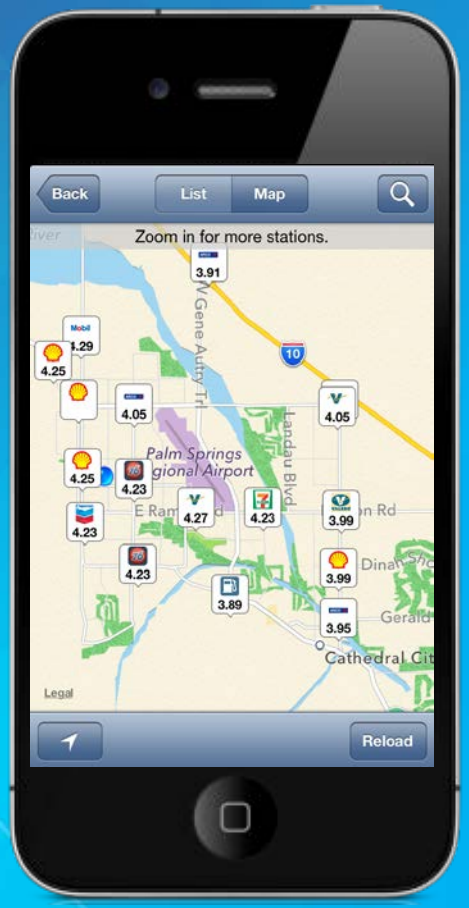
- How to start with the SDKs
- Common functionality & patterns
  - Displaying map content
  - Searching for content
  - Editing geographic data
  - Offline capabilities
- Quartz Release

Runtime platforms



Types of location apps

GasBuddy

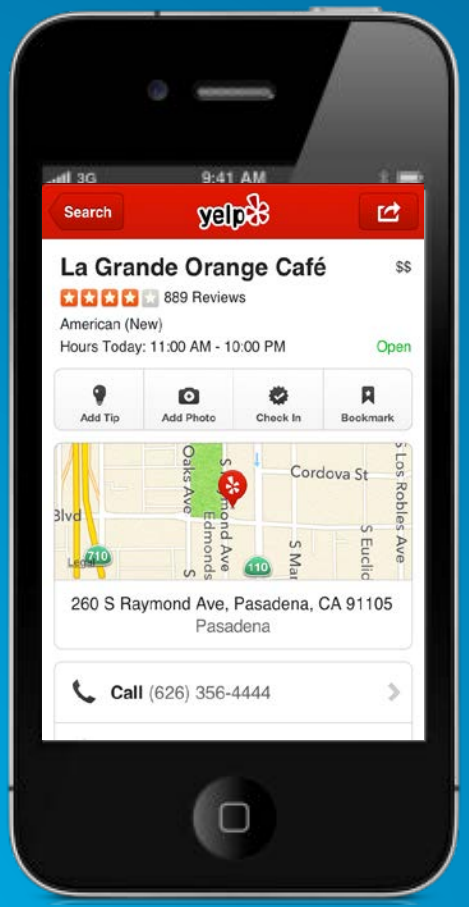


Reminders

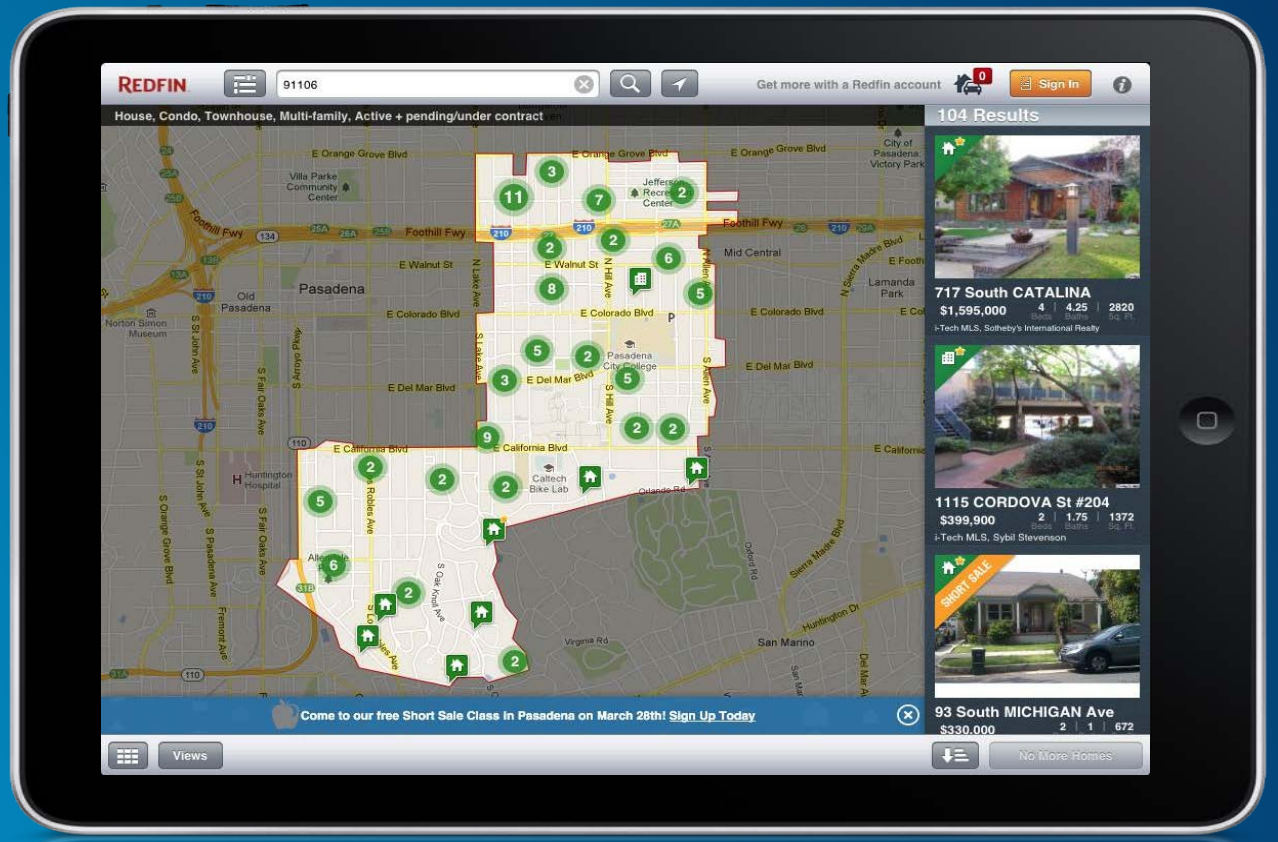
Map centric ⟷ **No map**

Types of location apps

Yelp



Redfin

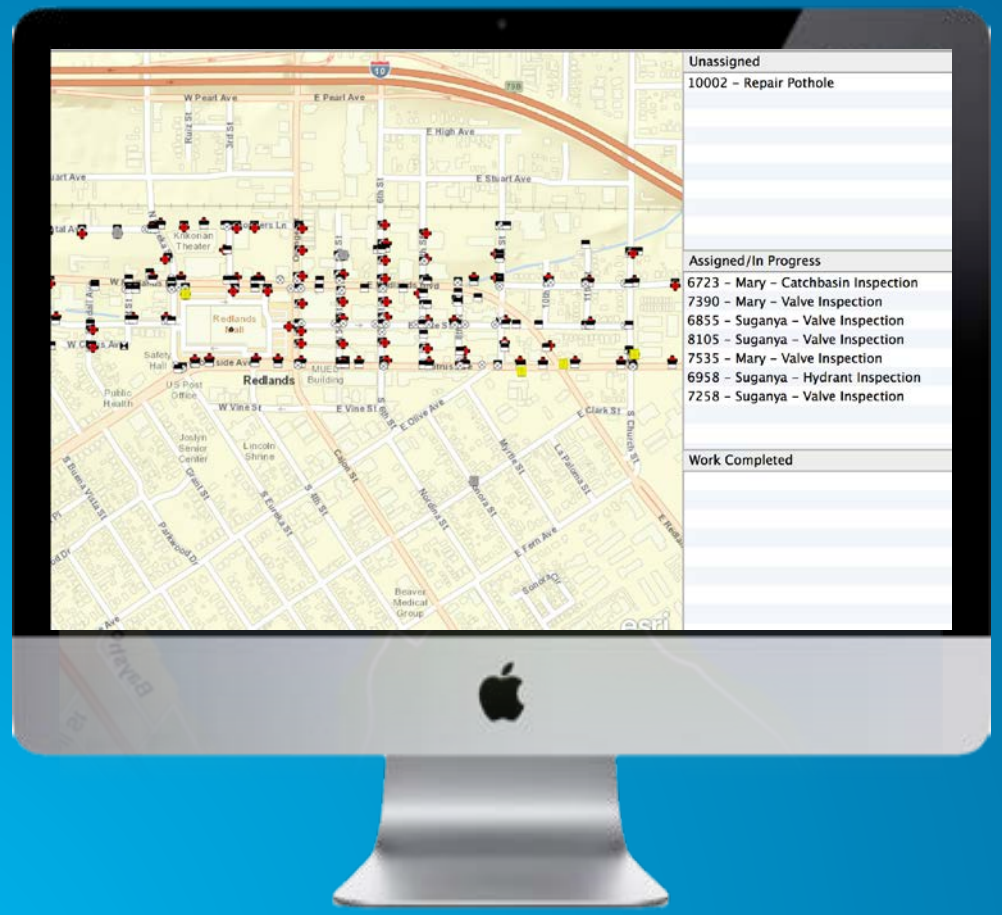


Map as context

Map centric ← → No map

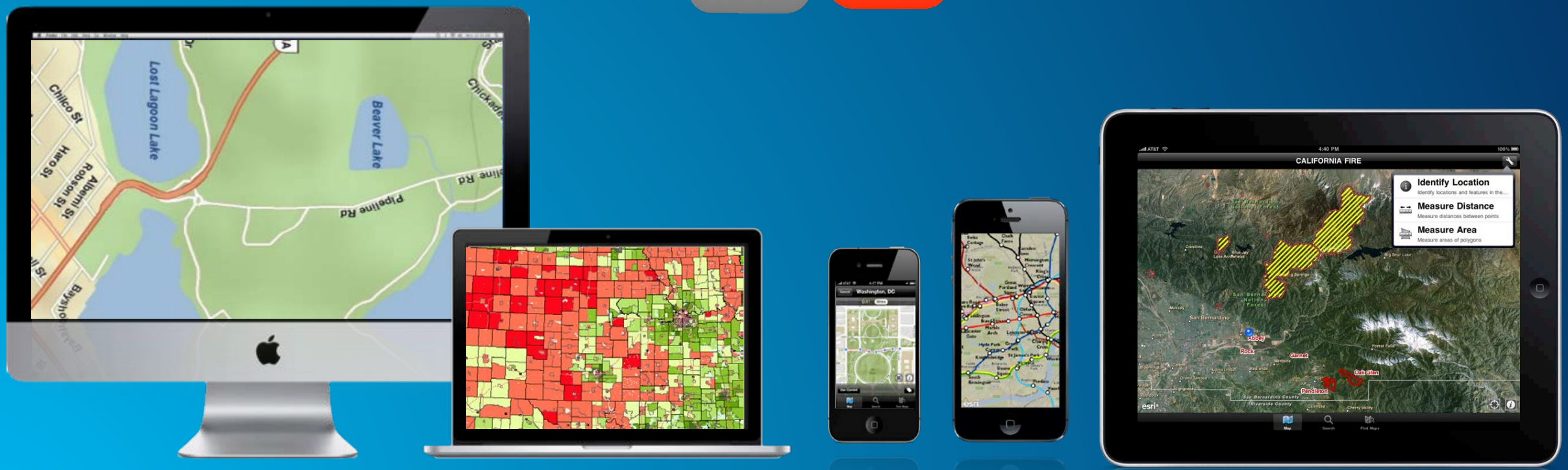
Companion apps, working together

For various form-factors



ArcGIS Runtime SDK for iOS & OS X

Build native applications
using Objective-C & Swift



OS X (Mountain Lion, Mavericks, Yosemite, El Capitan)

iOS (6.x, 7.x, 8.x, 9.x)

Before you begin…

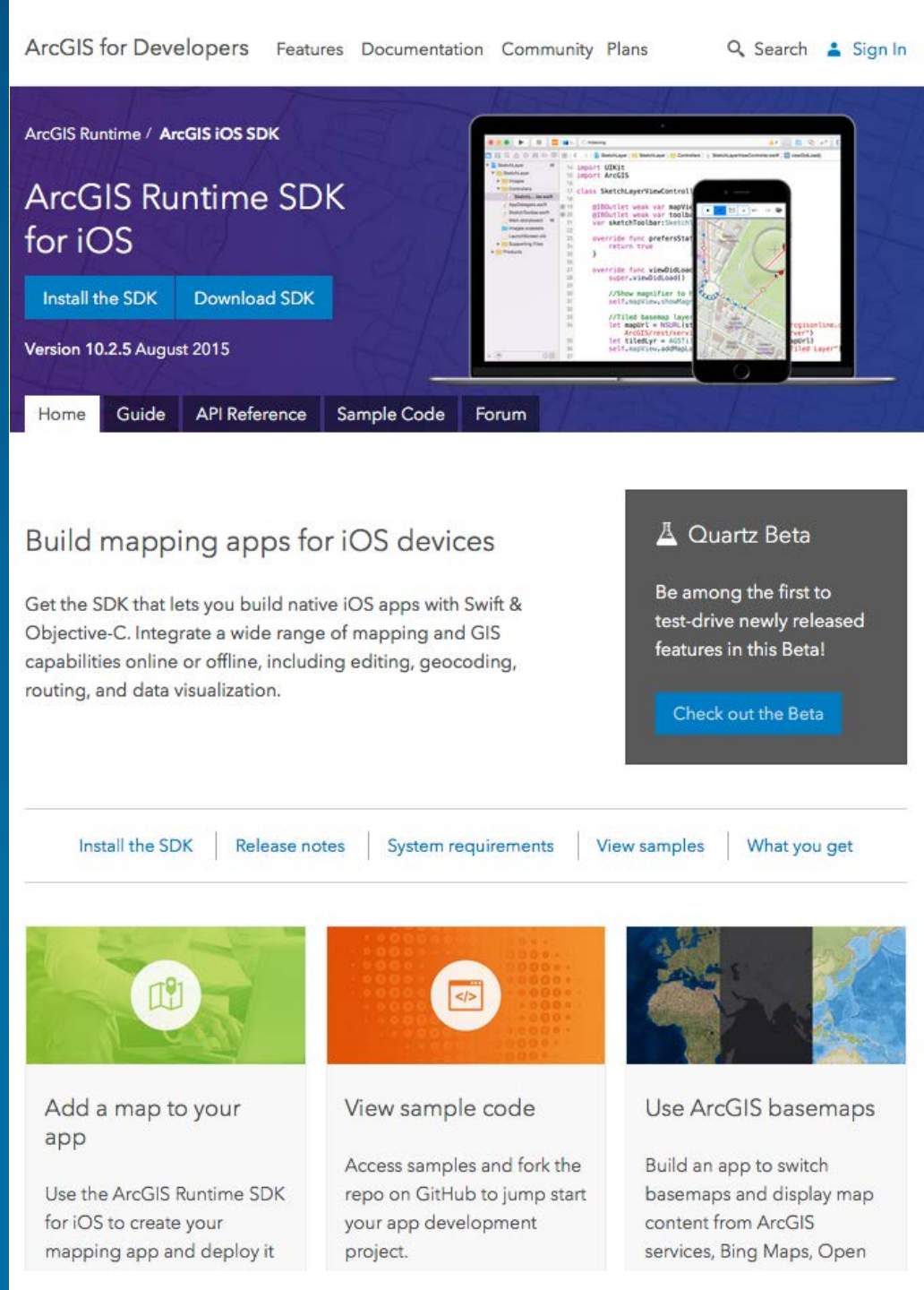
- Mac
  - OSX 10.9, 10.10, 10.11
    (Mavericks, Yosemite, El Capitan)

- Xcode 5.x, 6.x, 7.x
  - Apple's iOS & OSX SDKs
  - iOS Simulator
  - Instruments

- ArcGIS Runtime SDK
  - iOS - Latest release : Version 10.2.5
  - OS X - Latest release : Version 10.2.4

DEMO 1 - SDK Resources

developers.arcgis.com
Github – iOS Samples
OSX Sample application
Install the SDK
Cocoapods
Xcode - iOS MapViewDemo

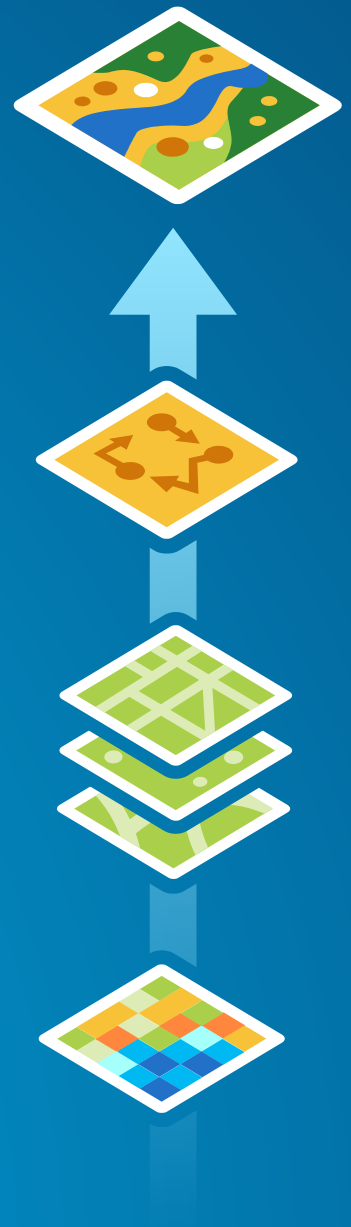


Display Map Content

Displaying a Map

- **UI Component : AGSMapView**
  - **Responds to gestures**
    - **Touch**
    - **Trackpad**
    - **Mouse**
    - **Keyboard**
  - **In-built Magnifier & Callout**
  - **Displays device location**
    - **Auto pan for location updates**

A Map is composed of Layers



- **Temporary app data**
  - Graphics layers

- **Operational data**
  - Dynamic layers
  - Feature layers

- **Basemap**
  - Tiled layer

Sources of map data

- **Tiled layers – subclasses of** AGSTiledLayer
  - **ArcGIS Map Services (Cached), OGC WMTS, Bing, OpenStreetMap**
  - Fetch pre-cached tiles from services and assemble on screen
  - Extremely fast. Good for static data.

- **Dynamic layers - subclasses of** AGSDynamicLayer
  - **ArcGIS Map Services, ArcGIS Image Services, OGC WMS**
  - Generate map images from service on-demand.
  - Good for changing data, or customizing map display

- **Feature layers –** AGSFeatureLayer
  - **ArcGIS Feature Services**
  - Download raw features and draw natively on screen
  - Good for editing

Layer pattern

ArcGIS Online

On Premise

1. **Construct & Connect**
   - URL to web service

```
//Construct layer
let tiledLayer = AGSTiledMapServiceLayer(URL: serviceUrl)
```

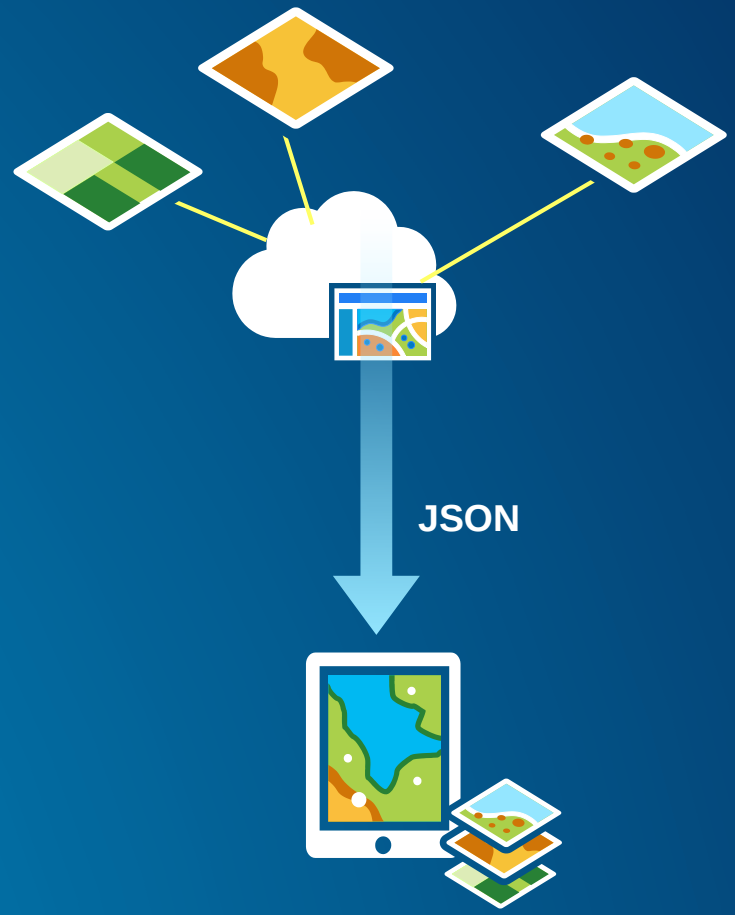
1. **Add to mapview**

```
//Add to map view
self.mapView.addMapLayer(tiledLayer, withName:"World Street Map")
```

Web Maps

- **Author on ArcGIS Online or on-premise ArcGIS Portal**
  - **Predefined list of layers**
  - **Initial map configuration**
    - **Extent, scale range, symbology etc**

- AGSWebMap
  - **Creates layer objects when opened into mapview**




```
//Create webmap
self.webmap = AGSWebMap(itemId: "b31153c71c6c429a8b24c1751a50d3ad", credential:nil)

//Open into mapview
self.webmap.openIntoMapView(self.mapView)
```

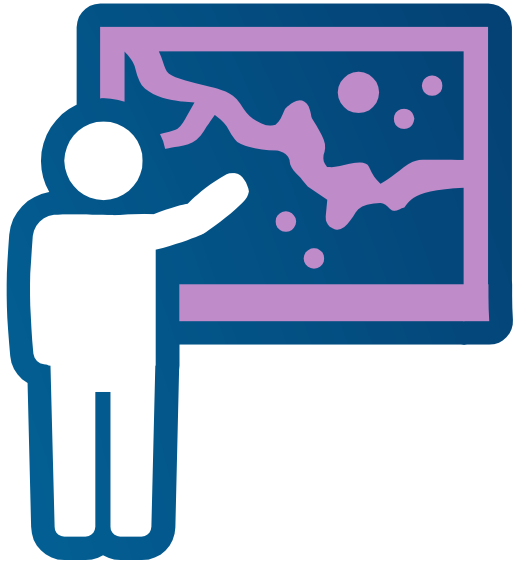
Popup Configuration

- **Popups make it easy to view**
  - **Attributes**
  - **Graphs, Charts**
  - **Attachments**
    - **Picture**
    - **Video**
    - **PDF/MS-Office attachments**

Demo 2 – Display map

San Diego Map
OS X sample app - popups
Xcode

- load a webmap
- fetch popups
- show popups



Searching for Content

Common workflows

Searching for Content

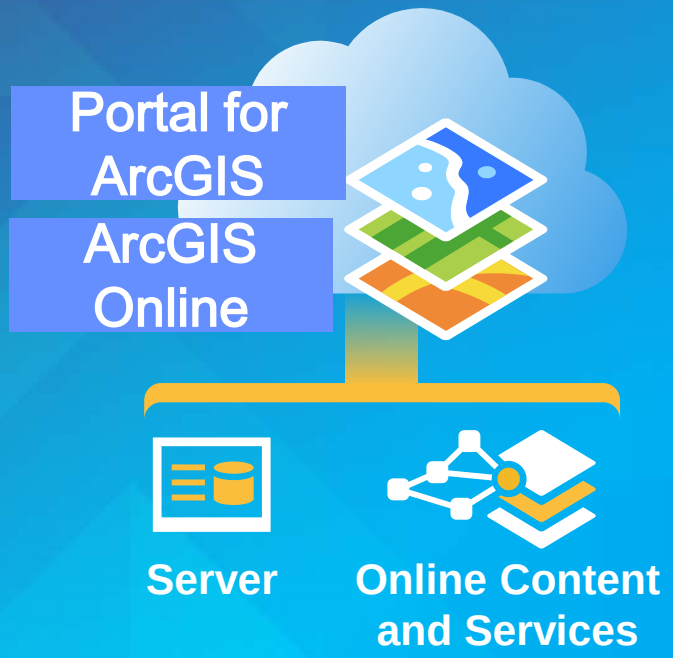
ArcGIS Online
Portal

Search Portal /
ArcGIS Online

Search for Places

Search for Features

Searching on Portals



- Webmap
- Tile Layer
- Map Image Layer
- Feature Layer

Create portal

```
let url = NSURL(string: "http://maps.arcgis.com")
let credential = AGSCredential(user: "john_doe", password: "<password>")

self.portal = AGSPortal(URL: url, credential: credential)
```

Searching for content

Searching on Portals

Adopt protocol

```
class MyViewController: UIViewController, AGSPortalDelegate {
    ...
}
```

Set delegate

```
self.portal.delegate = self
```

Searching ArcGIS Org or Portal

Create Query Parameters

Predefined Queries

```
//1. Searching for groups based on its owner or a title.
let queryParams = AGSPortalQueryParams(forGroupsWithOwner: "<username>", title: "<title>")

//2. Searching for all items in a group.
let queryParams = AGSPortalQueryParams(forItemsInGroup: "<group_id>")
```

Custom Queries

```
//Define the query criteria
let queryString = "title:\"San Francisco\" AND type:\"tile package\" "
//Create the query params object
let queryParams = AGSPortalQueryParams(query: queryString, limit: 10)
```

Searching for content

Searching ArcGIS Org or Portal

Execute Queries

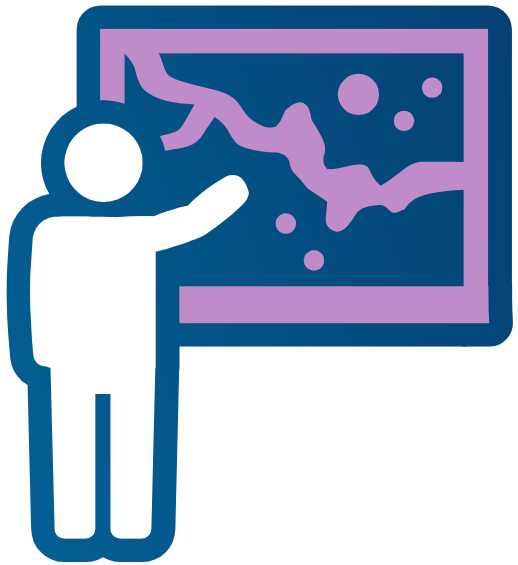
```
portal.findGroupsWithQueryParams(queryParams)

portal.findItemsWithQueryParams(queryParams)
```

Query Results – Async Callback

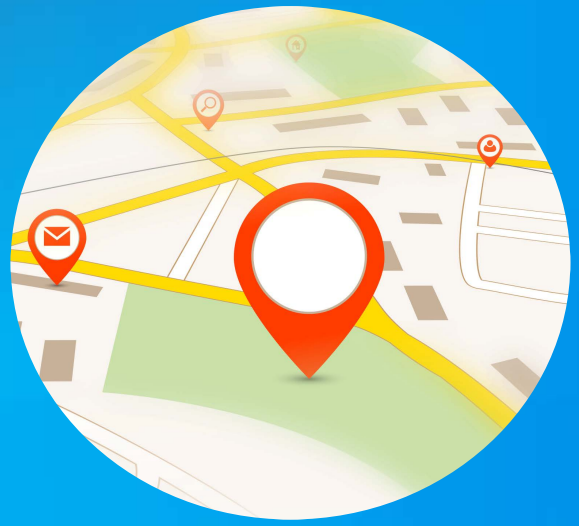
```
func portal(portal: AGSPortal!, operation: NSOperation!, didFindGroups resultSet: AGSPortalQueryResultSet!) {
    //process group results
}

func portal(portal: AGSPortal!, operation: NSOperation!, didFindItems resultSet: AGSPortalQueryResultSet!) {
  //process item results
}
```

Demo 3 – Search portal

iOS – Portal Explorer
Query parameters – text
Find items with query parameters
Found items
Displayed the map



Search Portal /
ArcGIS Online



Search for Places

Search for Features

Searching for content

Search for Places

- Geocode Service
  - http://<server>/ArcGIS/rest/services/Locators/ESRI_Geocode_USA/GeocodeServer
- Geocoding – Address to Locations
- Reverse Geocoding – Locations to Addresses

Create locator

```
let locator = AGSLocator(URL: url)
locator.delegate = self
```

Set delegate

Searching for content

Search for Places

Geocoding

Set Parameters

```
let address = ["Address": "380 New York St", "City": "Redlands", "State": "CA", "Zip": "92373"]
```

Execute

```
locator.locationsForAddress(address, returnFields: outFields)
```

Searching for content

Search for Places

Delegate Methods for Results

```
func locator(locator: AGSLocator!, operation op: NSOperation!, didFindLocationsForAddress candidates: [AnyObject]!) {

    //AGSAddressCandidate Objects
}
```

Handle Geocoding Results

- Address Candidate objects
  - Location
  - Attributes
- Display in Map

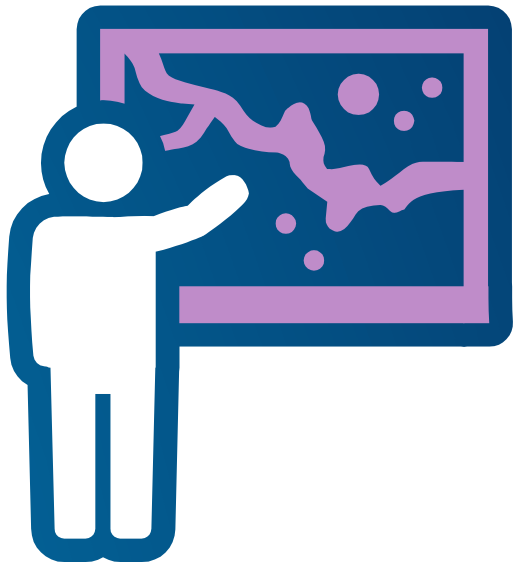
Demo 4 - Geocoding

OS X – Geocoding

Source Code

- Locator Task
- Delegate
- Text Parameters
- Execute
- Results

OS X – Offline Geocoding



Search Portal /
ArcGIS Online

Search for Places

Search for Features

Searching for content

Search for Features

In a single layer

Query Task

At a map location

Identify Task

Searching for content

Search for Features

Query Task

- Single layer or table
- ArcGIS Map Service, Feature Service
- Query for Features, ObjectIDs

Create a Query task

```
let url = NSURL(string: "http://<server>/<instance>/services/<service>/MapServer/<layer_or_table_ID>")
let queryTask = AGSQueryTask(URL: url)
queryTask.delegate = self
```

Search for Features

Types of Queries

Attribute Query - Attributes of the layer
- where, outFields etc

Statistics - *Count, Std Dev etc*
- Group By

Spatial Query - Input geometry
- Intersects, Within, Touches etc

Temporal Query - Input time extent

Order By - Attributes
- Asc or Desc

Related Features - Relationship query

Searching for content

Search for Features

```
let query = AGSQuery()

//Attribute Query
query.whereClause = "POPULATION > 1000000"
query.outFields = ["STATE_NAME", "POP2010"]

//Spatial Query
let env:AGSEnvelope = ...
query.geometry = env
query.spatialRelationship =  .Intersects

//Temporal Query
let start:NSDate = ...  //Dec 3, 2014
let end:NSDate = ... //Mar 17, 2015
let time_period = AGSTimeExtent(start: start, end: end)
query.timeExtent = time_period

queryTask.executeWithQuery(query)
```

```
func queryTask(queryTask: AGSQueryTask!, operation op: NSOperation!, didExecuteWithFeatureSetResult featureSet: AGSFeatureSet!) {
    //Query Results.
}
```

Searching for content

Search for Features

Identify Task

- Multiple layers
- ArcGIS Map Service

Create Identify Task

```
let url = NSURL(string: "http://<server>/<instance>/services/<service>/MapServer")
let identifyTask = AGSIdentifyTask(URL: url)
identifyTask.delegate = self
```

Searching for content

Search for Features

Identify Task Parameters

layerIDs

tolerance

spatialReference

layerOption

size

geometry

mapEnvelope

returnGeometry

Execute Identify Task

```
identifyTask.executeWithParameters(identifyParams)
```

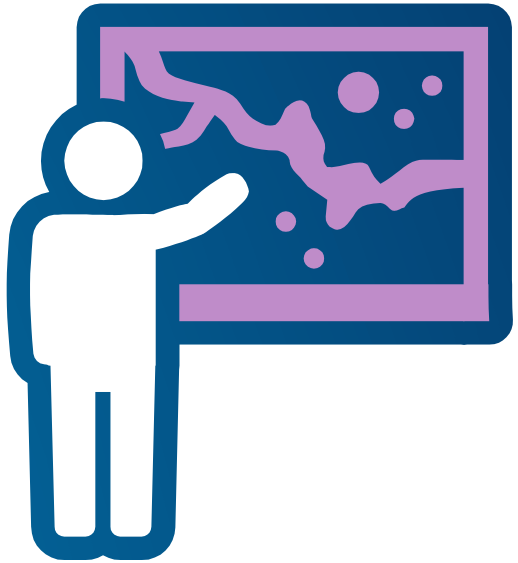
Searching for content

Demo 5 – Query Task

OS X – Query

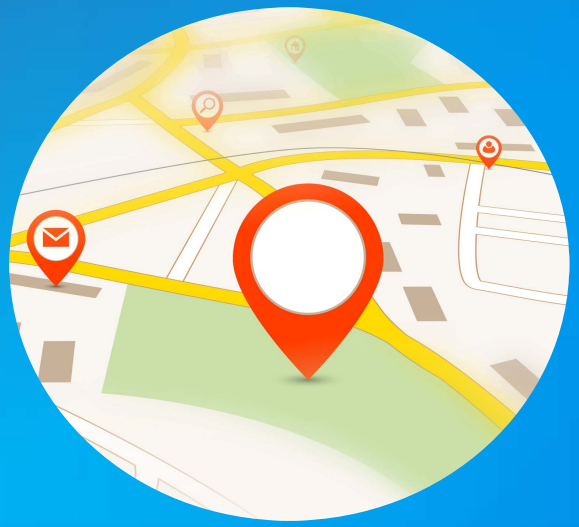
Source Code

- Query Task
- Delegate
- Query - Parameters
- Execute
- Results



Search Portal / ArcGIS Online

Find featured maps
Find Items/Groups
Predefined/Custom queries



Search for Places

Geocoding

Search for Features

Query Task
Identify Task
Graphic

Searching for content

Recap: Task Pattern

1. Construct & Connect.
   - URL to web service
   - File path or App Bundle
2. Assign a delegate
3. Set up input parameters. Invoke.
4. Process results in the delegate.

ArcGIS Online

On Premise

Route Analysis

- **Plan routes -** AGSRouteTask
  - **Point to Point, or multi-point**
  - **Optimize based on distance or travel time**
  - **Reorder stops for best sequence**
  - **Time windows, Barriers & Restrictions**
- **Compute service areas -** AGSServiceAreaTask
- **Find closest facilities –** AGSClosestFacilityTask

- **ArcGIS Online World Route service**
  - **100+ Countries. Live & Historical Traffic data**
  - **Requires subscription. Consumes credits**
- **On-premise Route services for custom data**

Spatial Analysis

- AGSGeoprocessor
  - **Invoke geoprocessing services**

- **ArcGIS Online Spatial Analysis service**
  - **Summarize Data** (Aggregate points, etc)
  - **Analyze Patterns** (Watershed, Viewshed,etc)
  - **Use Proxmity** (Density, HotSpot, Interpolate, etc)

- **On-premise Geoprocessing services**
  - **Custom geoprocessing tools & models**

Editing

Editing

Feature Layer | Feature Layer in webmap

What layer is required for Editing?

ArcGIS Server | ArcGIS Online/Org | Portal | Developers Site

What are possible Feature Layer sources?

Spatial Features | Non-Spatial Tables | Related Records | Time Aware

What types of features can be edited?

Online | Offline

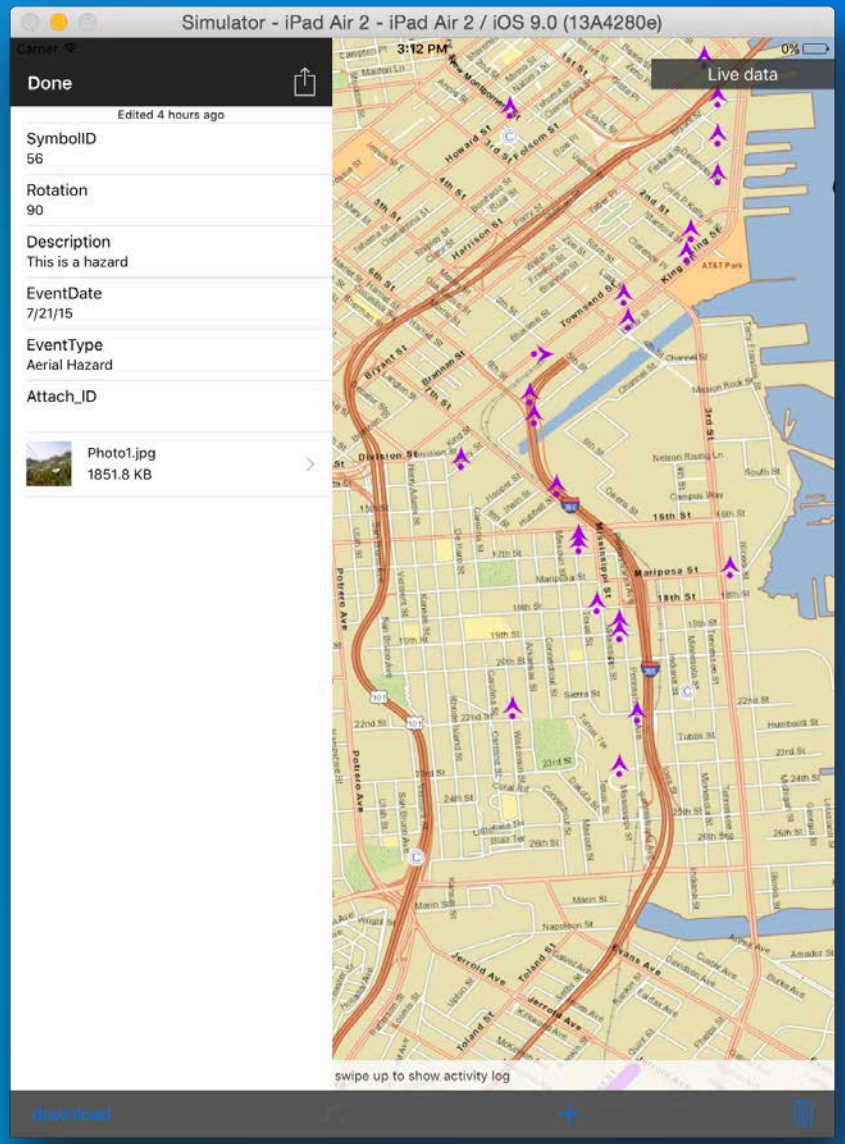
What are available Editing modes?

Popups

Display Feature Information

Edit Attributes & Attachments

Edit Geometry through Sketch Layer



Popups

Delegate Methods

Start Edit

Finish Edit

Done View

Cancel

Delete

and much more…

CustomiZe

Attributes

Tool Bar

Buttons

Presentation

Editing

Editor Tracking

- User & Timestamp of Create/Update

Ownership Based Access Control

- Limit editing depending on user

Capabilities

- Limit editing for all users

Data Validation

- Non null, Coded and Range Values etc

Popups handle all this!

Sketch Layer

Create, Edit Geometries

Interactive

No Code *almost!*

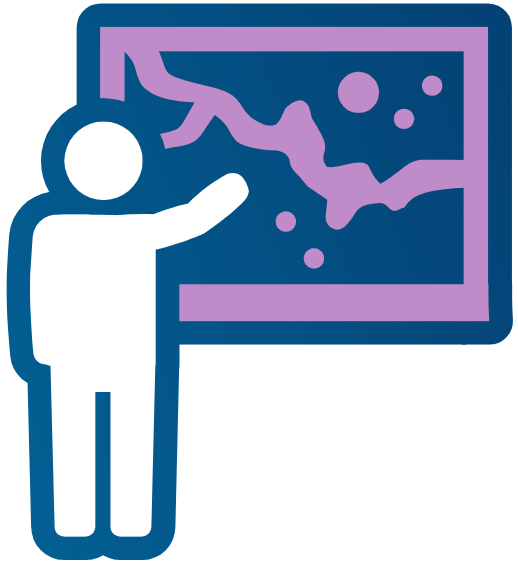
Geometry used for Feature Layer Editing

Demo 6 – Online Editing

iOS – Feature Layer Editing

Source Code

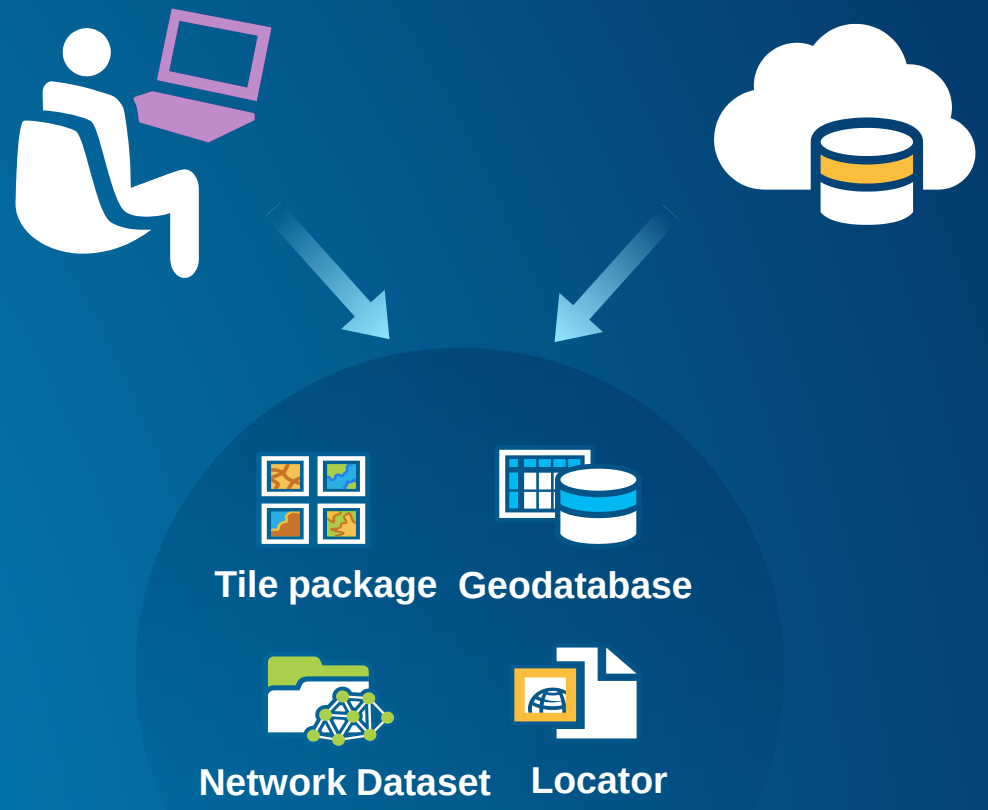
- Sketch Layer
- Touch Delegates
- Popup Delegates



Offline

Patterns for generating offline content

- **Desktop Pattern**
  - **Package data through ArcMap or Pro**
  - **Side load onto device, or bundle in application**
- **Services Pattern**
  - **Extract data from services on-the-fly**
    - **Tile package -** AGSDownloadTileCacheTask
    - **Geodatabase -** AGSGDBSyncTask



Offline Mapping

- View & Interact with maps
  - Display Tile package - AGSLocalTileLayer
  - Display Geodatabase - AGSFeatureTableLayer
    - Query using SQL or spatial criteria
    - Edit existing or create new features

- Layer pattern remains the same

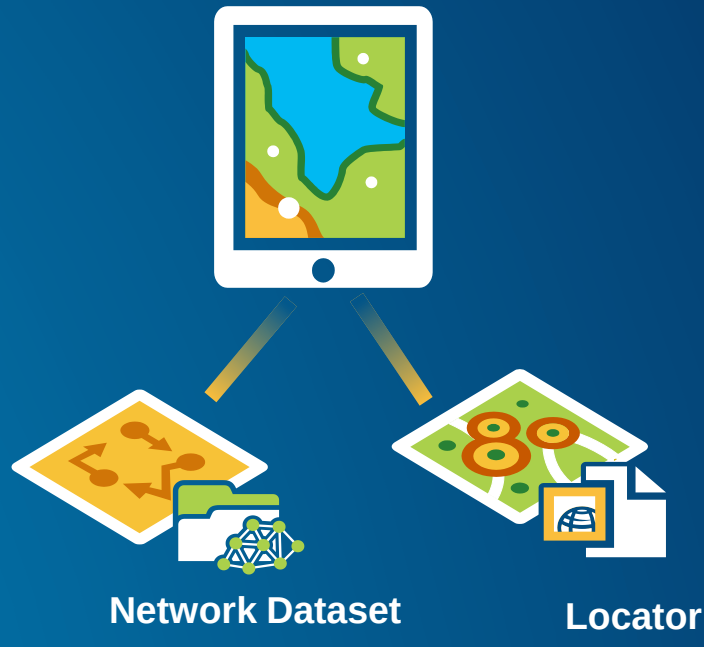
1. Construct & Connect
   - Path to local data

2. Add to mapview

Offline Analysis

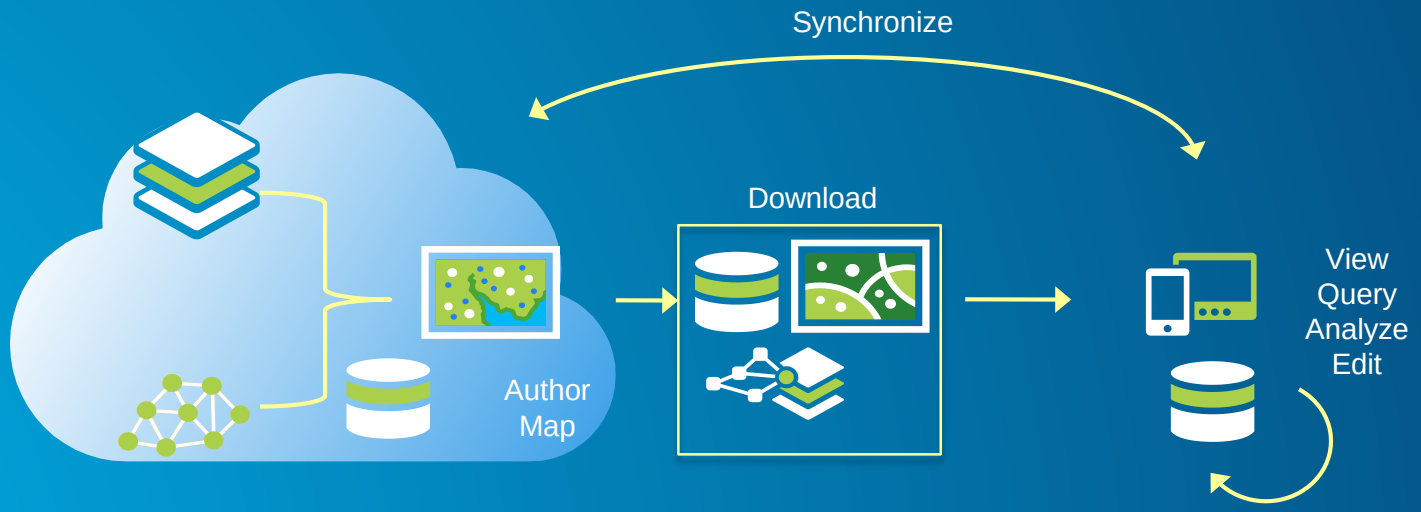
- **Find addresses**
  - AGSLocator **using Locator files**
- **Get directions**
  - AGSRouteTask **using Network dataset**

- **Task pattern remains the same**
  1. **Construct & Connect.**
     - **Path to local data**
  2. **Assign a delegate**
  3. **Set up input parameters. Invoke.**
  4. **Process results.**



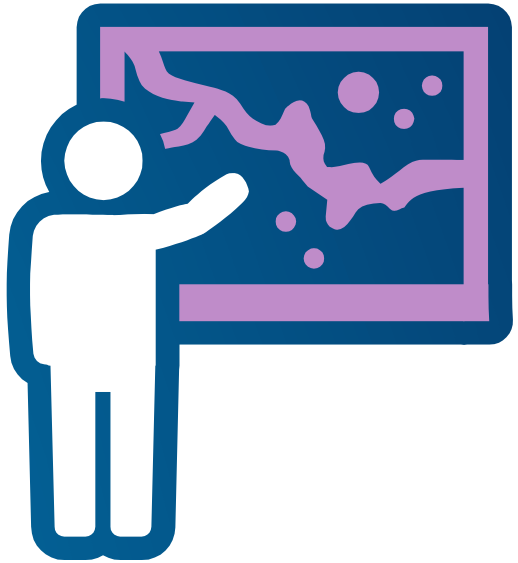
Offline Editing

- Edits persisted in the geodatabase on the device
- Changes can be synchronized with the service
  - Upload only, Download only, or Bidirectional



Offline

Geocoding
Routing
Feature Editing (Offline Session)



Quartz

What's coming?

ArcGIS Runtime Quartz

Numbers were not working, so we picked something solid, sharp and shiny….

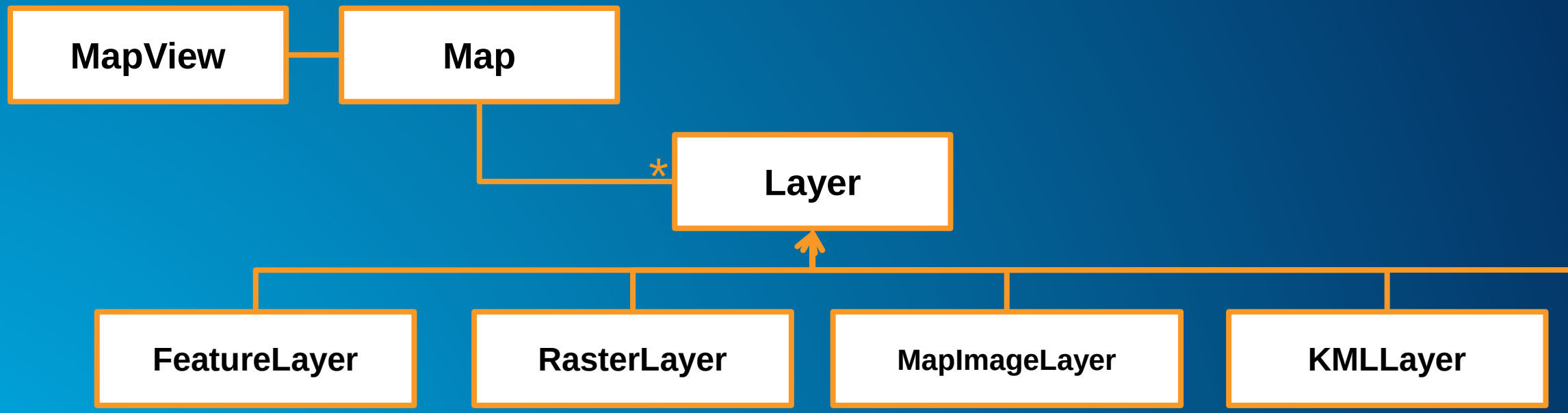
Quartz

- Major release
  - Many new capabilities
  - New and changed APIs
  - Improved internal architecture
- Goals
  - Support the ArcGIS Platform
  - Synchronize APIs across all ArcGIS Runtime platforms

What does Quartz API include?

- Full map authoring support
- Taking maps offline
- Maps offline
- Layers offline
  - Support for Local Data and data taken offline
  - Shapefiles, KML etc.
- Analysis offline
- 3D content

All this requires new and changed apis…



What does Quartz mean for iOS & OS X?

- SWIFT 2 integration
  - Generics, Nullability, Kind Of, Error handling
  - Dynamic and Static frameworks
  - Bitcode
- Better SDK features
  - iOS interactive sample app
  - Inline editing
- Target tvOS
- Apple in 2016?

QUESTIONS?

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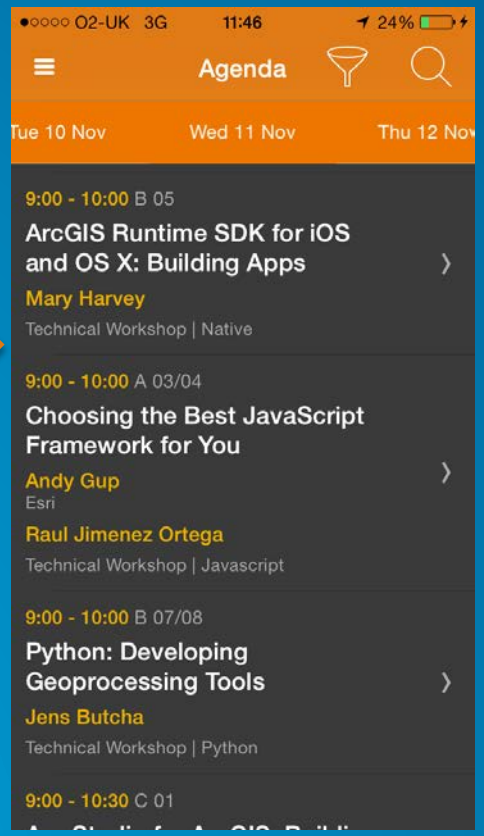
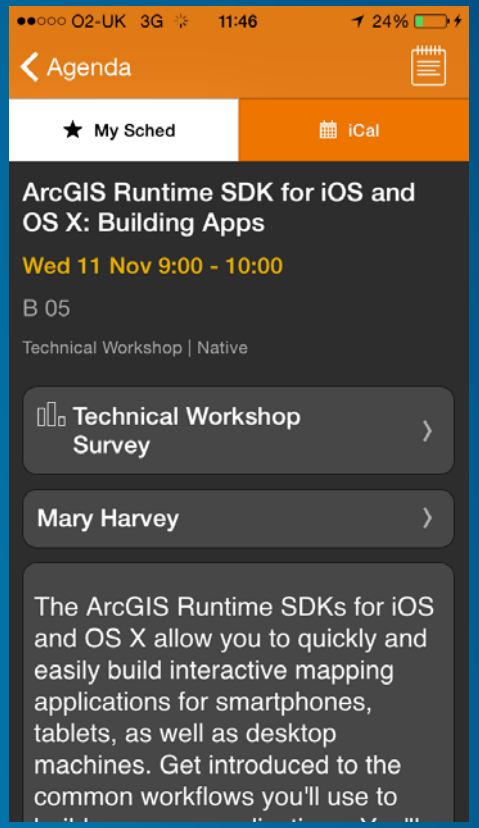
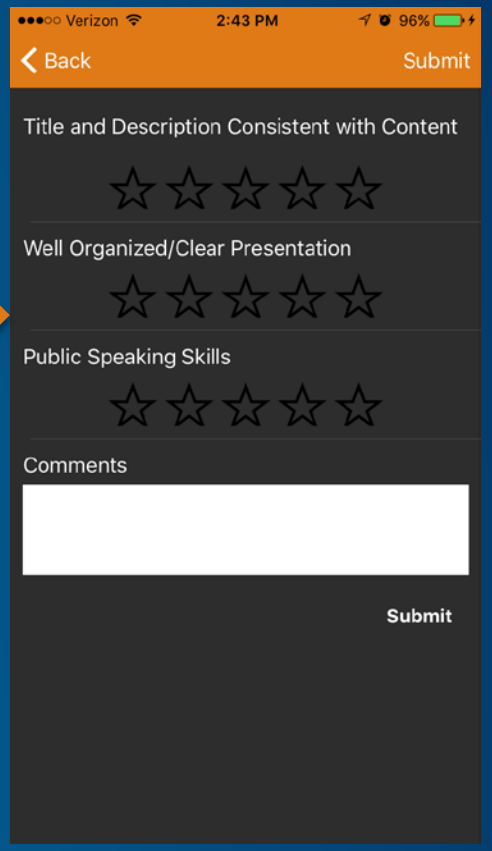
Select the session



Select “Technical Workshop Survey”



Complete Answers and Select “Submit”



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