Developing Imagery Apps using the ArcGIS API for JavaScript and Web AppBuilder

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Session goals

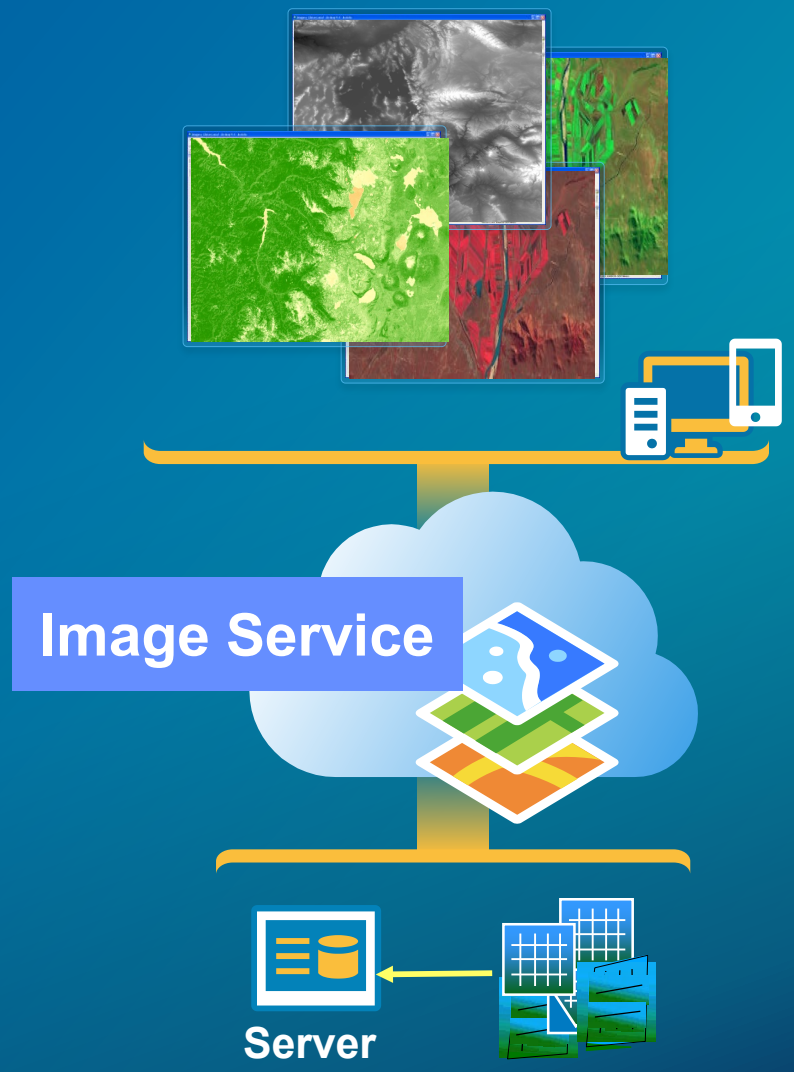
- Cover core concepts that allow you to leverage the power of raster data in your web applications.
- Provide an overview of the various ways to create Imagery Apps on the ArcGIS platform.
- What might be the best combination for you.

What we are talking about today

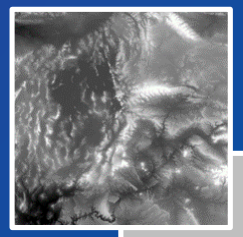
- Image Services
- ArcGIS API for JavaScript
- **Map viewer in ArcGIS Enterprise**
- **Web AppBuilder**
- **Configurable App Templates**

Image Services

- **Data**
  - shared through ArcGIS Server
  - accessed by any device that supports connecting to a web service
  - Single image or a collection of images
- **Visualization**
  - Fast dynamic display
- **Processing**
  - Well-known server-side raster functions
  - Publish processing models with the service



ImageServices



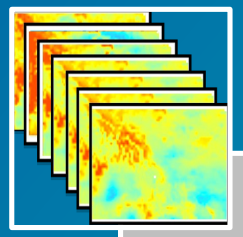
Raster Dataset

- Format
- Interpolation
- Rendering Rule

- GetRasterAttributeTable
- GetKeyProperties

Mosaic Dataset (MD)

- +
- MosaicRule
- QueryVisibleRasters



MultiDimensional MD

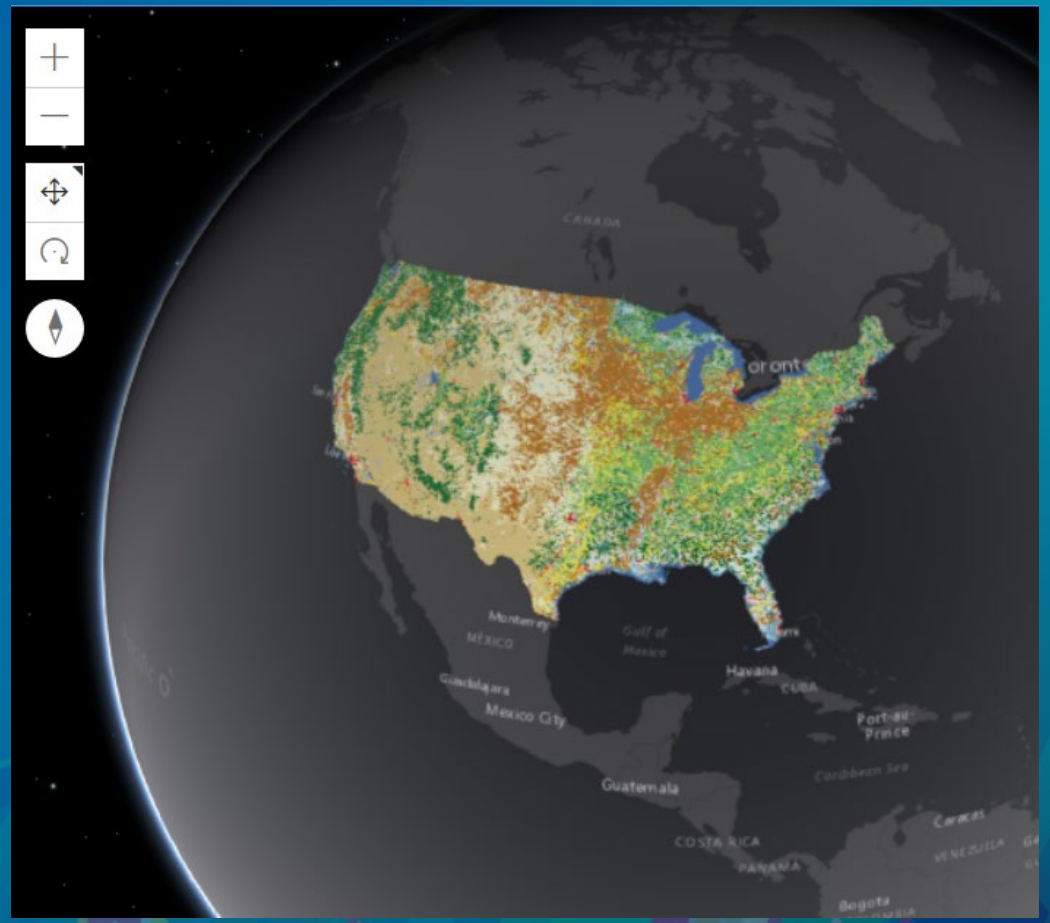
- +
- MultiDimensional Info
- Dimensional Definition

ArcGIS API for JavaScript

4x

Overview

- Build 2D and 3D web apps
- Integrate seamlessly with your web GIS
- New architecture with views and models
- Build better user experiences
- Modern browser support: IE11+



ImageryLayer

- Data source is an image service
- Renders image data
- Supports 2D and 3D visualization
- Retrieves data as pixels, enabling client side processing
- Server side processing using Raster Functions
- Provides Multi-dimensional API to view Scientific data
- View popups and query capabilities

Using an ImageryLayer

esri/layers/ImageryLayer

- Data source is an image service
- Image service parameters: compressionQuality, format, opacity

```
var layer = new ImageryLayer({
  url: "https://myServer.arcgisonline.com/arcgis/rest/services/NLCDLandCover/ImageServer"
});

/*************************
 * Add image layer to map
 *************************/

var map = new Map({
  basemap: "gray",
  layers: [layer]
});

var view = new MapView({
  container: "viewDiv",
  map: map,
  center: [-100, 40],
  zoom: 5
});
```

ImageryLayer: MosaicRule

esri/layers/support/MosaicRule

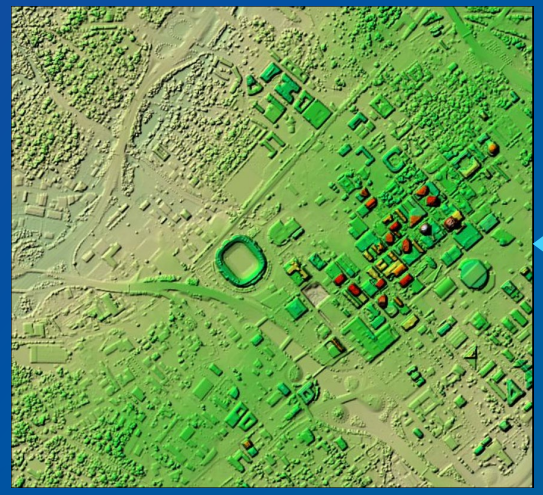
- MosaicRule defines how overlapping images are mosaicked together
- Method: none | center | nadir | viewpoint | attribute | lock-raster | northwest | seamline
- Select a subset of images using the where clause
- Sort using sort field and value

```
// Define the way overlapping images are mosaicked together
var mosaicRule = new MosaicRule({
  ascending: true,
  method: "center",
  operation: "last"
});
```

ImageryLayer: Server side processing

esri/layers/support/RasterFunction

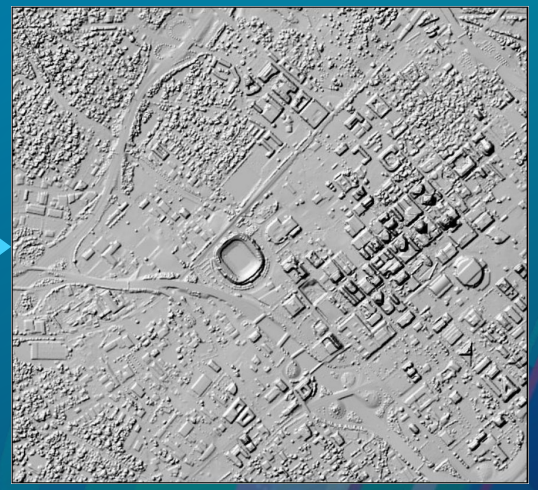
- Applied on the on the fly as renderingRule
- Wide range of supported server raster functions
- Can be used to together to perform complex processing
- See list http://esriurl.com/ServerRasterFunctions



Shaded Relief

fx

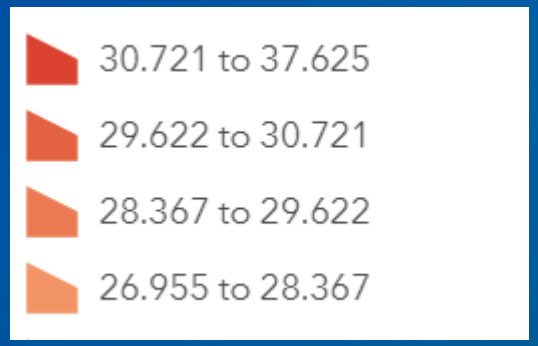
fx

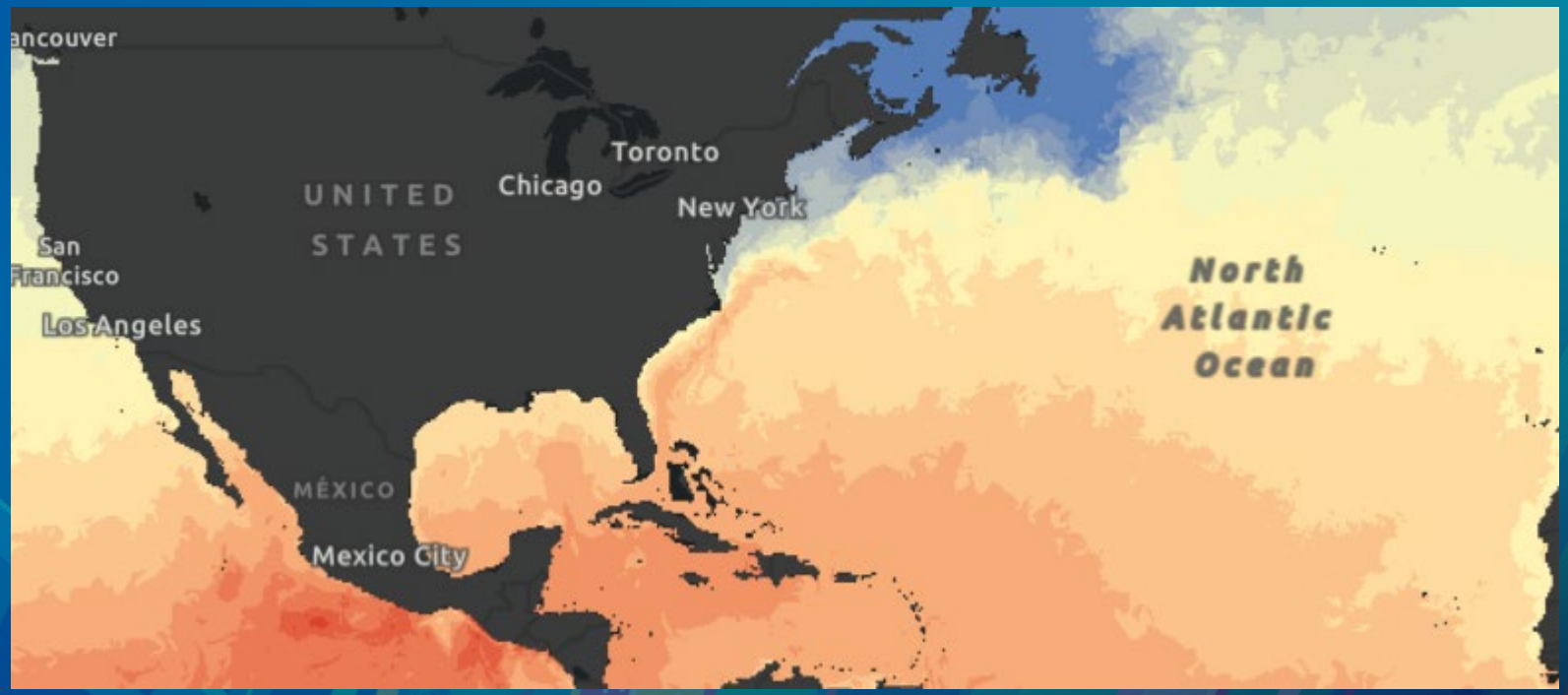


Hillshade

ImageryLayer: Renderer

- Being added in 4.11, upcoming release
- Renderers define how the layer should be rendered
- Available renderers:
  - Stretch Renderer: new in 4.11
  - Class Breaks Renderer
  - Unique Value Renderer





ImageryLayer: Client side processing

- Perform processing or custom rendering using the pixelFilter and PixelBlock API
- Create highly interactive experiences
- Consideration: cannot be saved with your webmap

PixelBlock

- Width: number of columns
- Height: number of rows
- Pixels: two dimensional array
- PixelType: s8 | s16 | s32 | u8 | u16 | u32 | f32 | f64
- Mask: array of 0 or 1
- Statistics: array of objects containing the min and max values

ImageryLayer: MultidimensionalData

esri/layers/support/MultidimensionalDefinition

- Filters data based on slices or ranges in one or more dimensions
- A multidimensional layer has multidimensionalInfo

ArcGIS API for JavaScript

3x

Layer Types

Raster

- Renders image data
- Retrieves data as pixels (PNG, JPEG, TIFF, LERC etc.)
- Processing using raster functions
- Processing using pixel filters

…

ArcGISImageService

- Renders image data
- Retrieves data as an image (PNG, JPEG, TIFF, etc.)
- Processing using raster functions

…

ArcGISImageServiceVector

- Renders vector data
- Retrieves data as pixels
- Supports scientific data
- Define Symbology

…

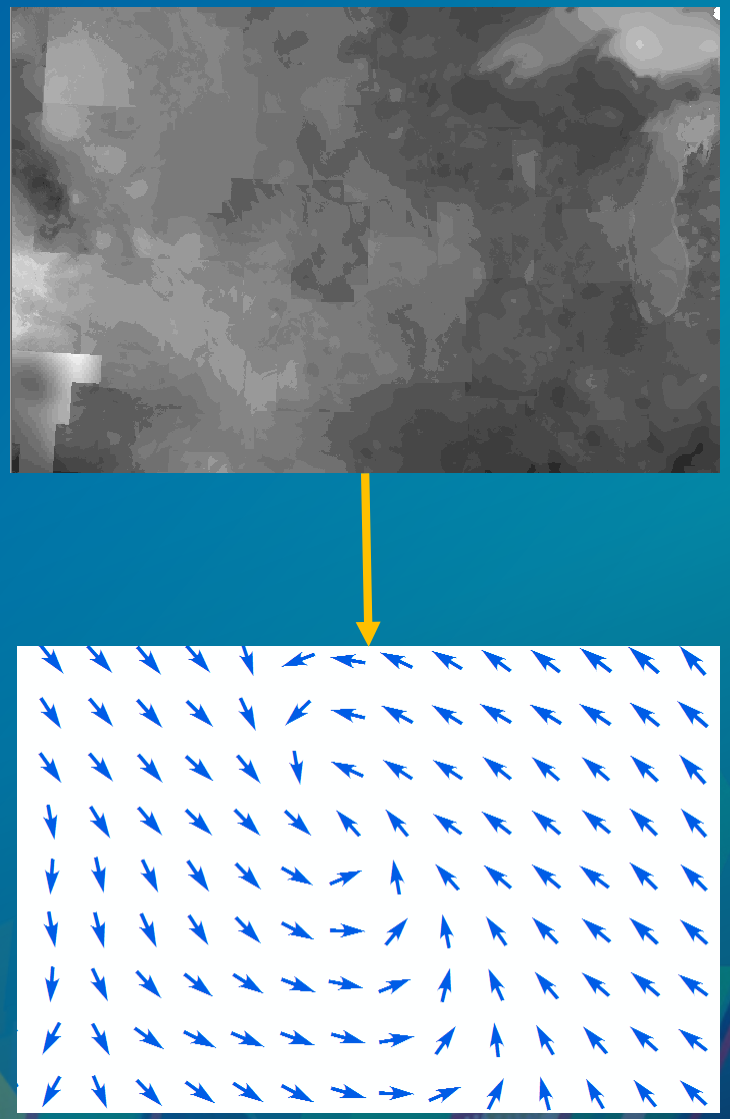
WCS

- Renders raster data using OGC WCS specs
- Processing using client side filters

ImageServiceVectorLayer

- Visualize vector data: magnitude and direction
  - Wind, Ocean current
- Renders raster data as vectors using VectorFieldRenderer
  - *Single Arrow, Simple Scalar, Wind Barbs, Beaufort Wind, Ocean Current*
- Uses a pixelFilter for conversion of U-V to Magnitude-Direction

```
Var layer = new ArcGISImageServiceVectorLayer(url,
    {
      imageServiceParameters: params,
      symbolTileSize: 60,
      rendererStyle: "single_arrow"
    });
```



WCS Layer

- Enable Web Coverage Service on image services
- Get server info: coverages, formats, interpolations, versions, etc.
- Support for identify
- Client side pixel filters too!

```
var wcsUrl = "//sampleserver6.arcgisonline.com/arcgis/services/ScientificData/MODIS_Landcover/ImageServer/WCSServer";
var wcsLayer = new WCSLayer(wcsUrl, {
  version: "1.0.0",
  pixelFilter: colorizer }
);
```

Documentation Resources

- **ArcGIS API for JavaScript:**
  https://developers.arcgis.com/javascript/3/

- **ArcGIS API for JavaScript 4.x**
  https://developers.arcgis.com/javascript

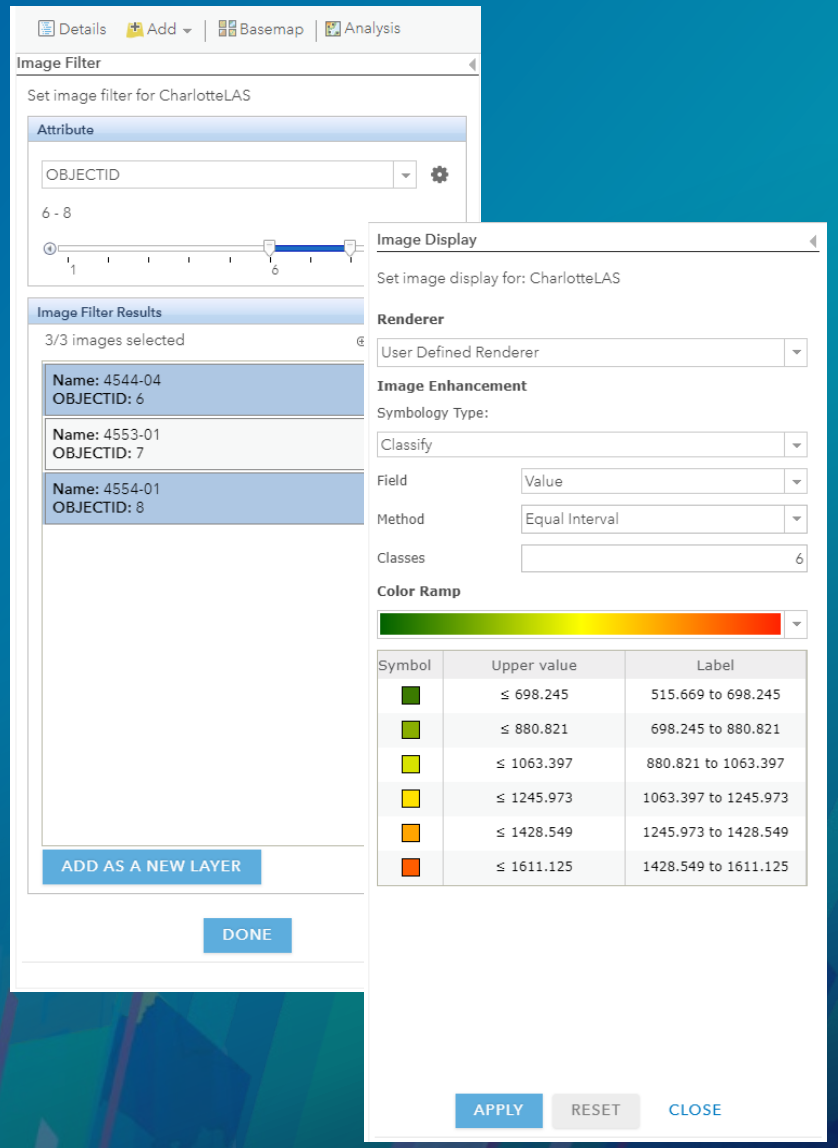
What are we talking about today…

- Image Services
- ArcGIS API for JavaScript
- **Map viewer in ArcGIS Enterprise**
- **Web AppBuilder**
- **Configurable App Templates**

ArcGIS Enterprise Map Viewer

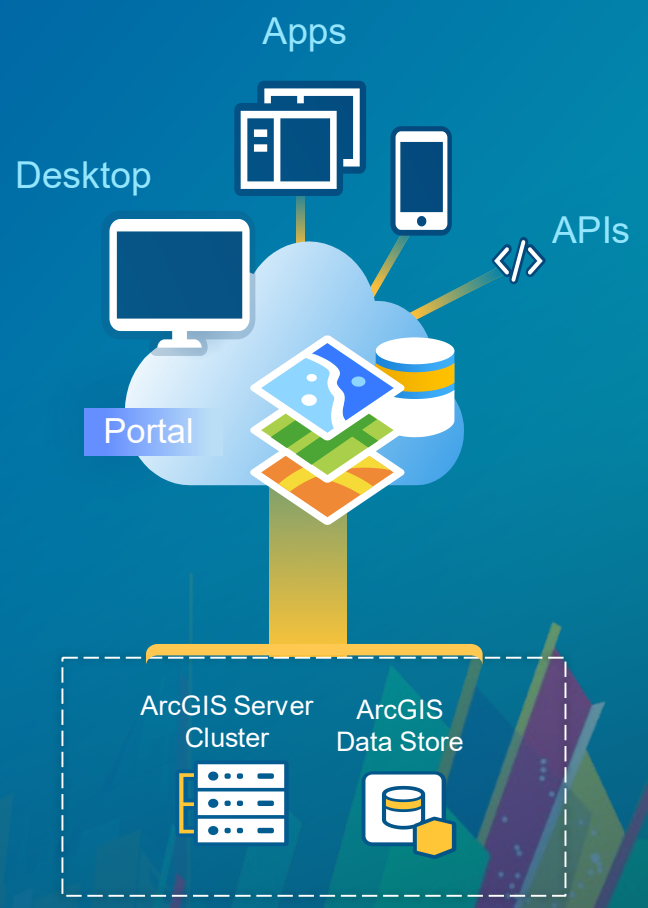
Map Viewer Capabilities

- **Image Filter**
  - Select imagery based on an attribute in a specific geographic area of interest
  - Create a new layer with the results
- **Symbology**
  - Stretch, Classify and Unique Values renderers
  - Leverages the rendering capability in ArcGIS JavaScript API
  - Access from the Image Display pane
- **Image Processing**
  - Dynamic processing (on the fly): Server processing templates
  - Persisted output: Raster Analysis (ArcGIS Enterprise)



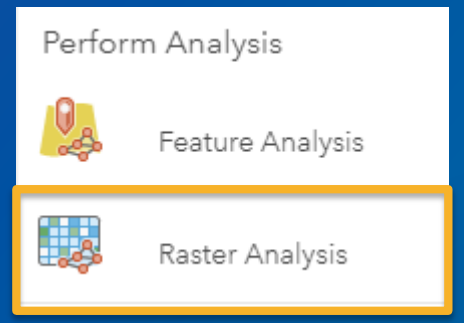
Raster Analysis

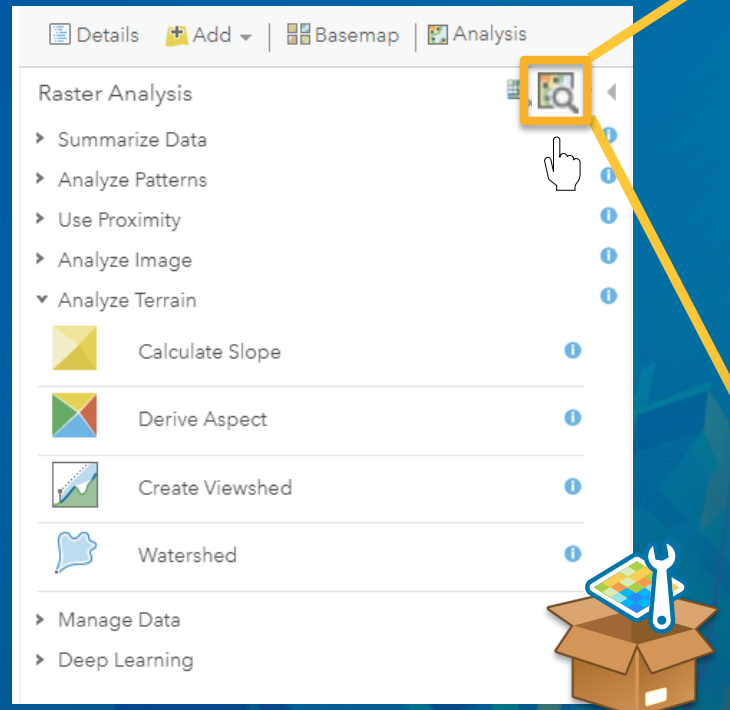
- Quickly extract information using spatial analysis and raster models by leveraging distributed processing and storage on ArcGIS Server
- Optimized raster format: CRF (Cloud Raster Format)
  - Multi-band, block based, multiple readers and writers
- Can be accessed by different clients (ArcGIS Pro and Map viewer) and have a REST API to access services
- Once completed, results immediately available in your Web GIS

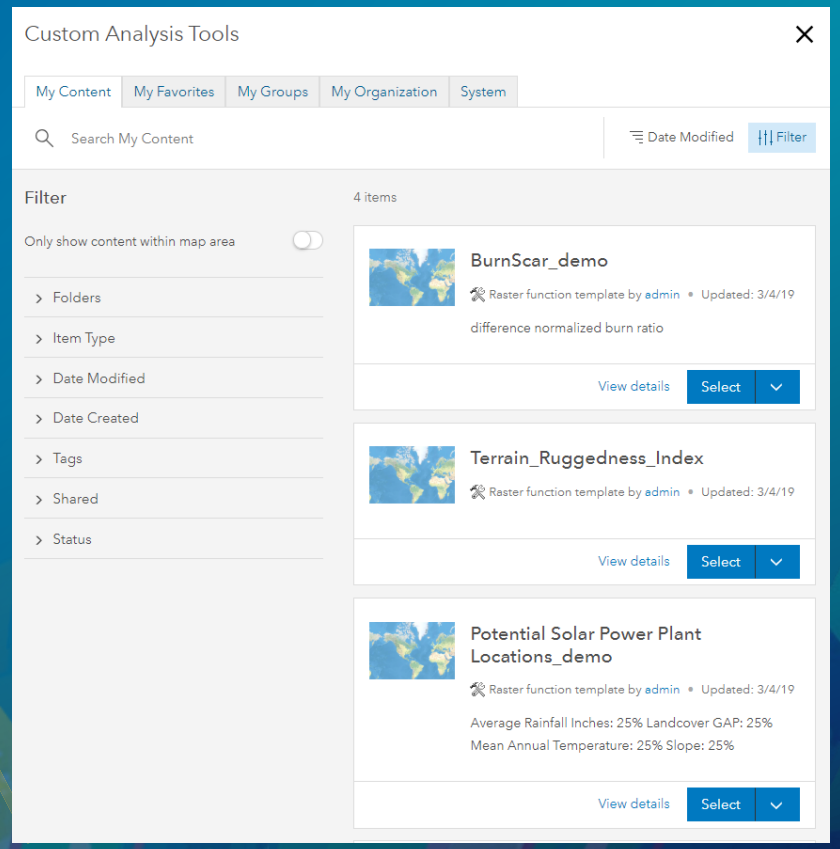


Raster Analysis using ArcGIS Enterprise Map Viewer

- 17 out of the box tools available
- Ability to **share** and **apply** Raster Function Templates
- **Build** and **edit** custom templates

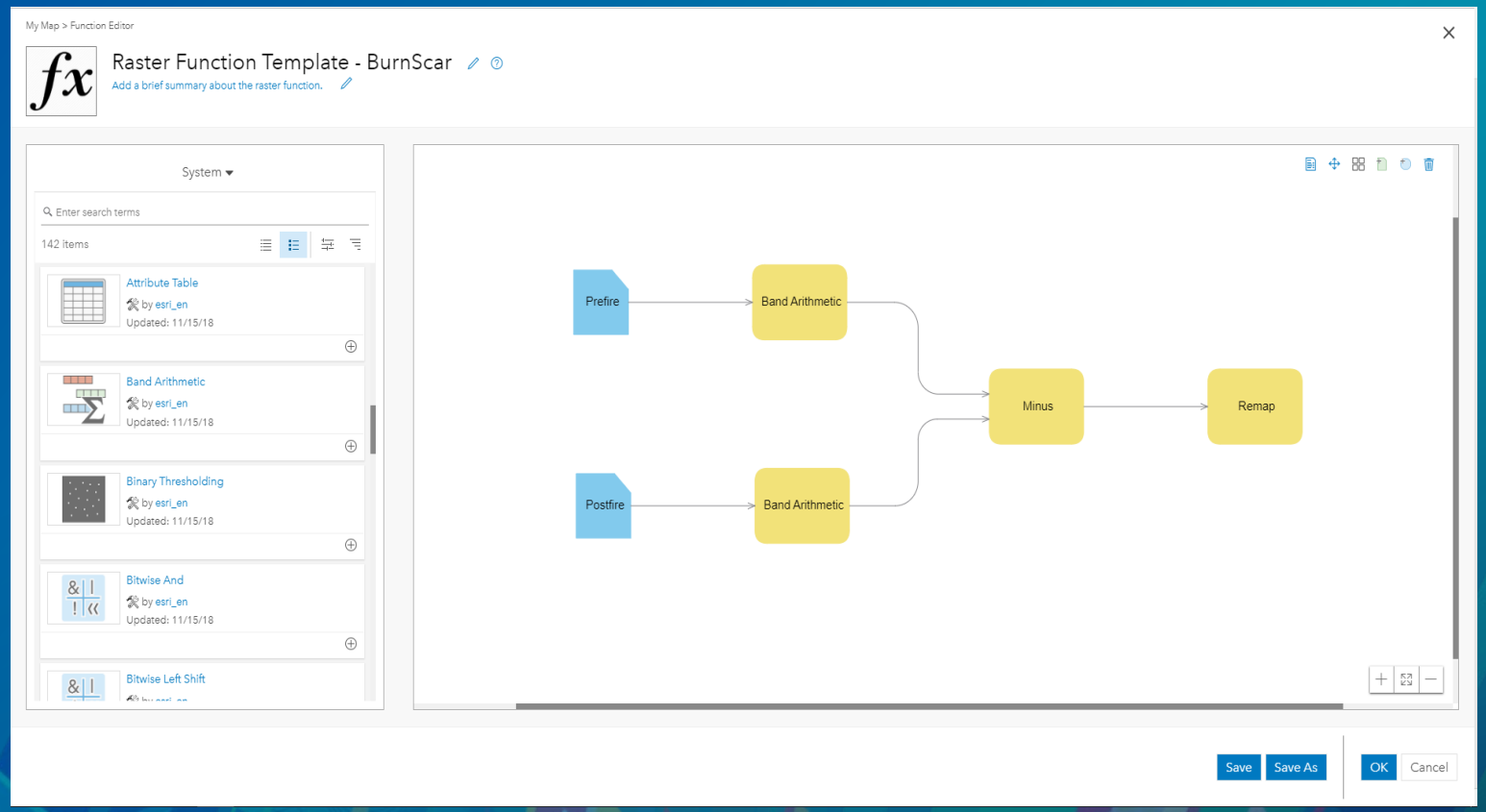


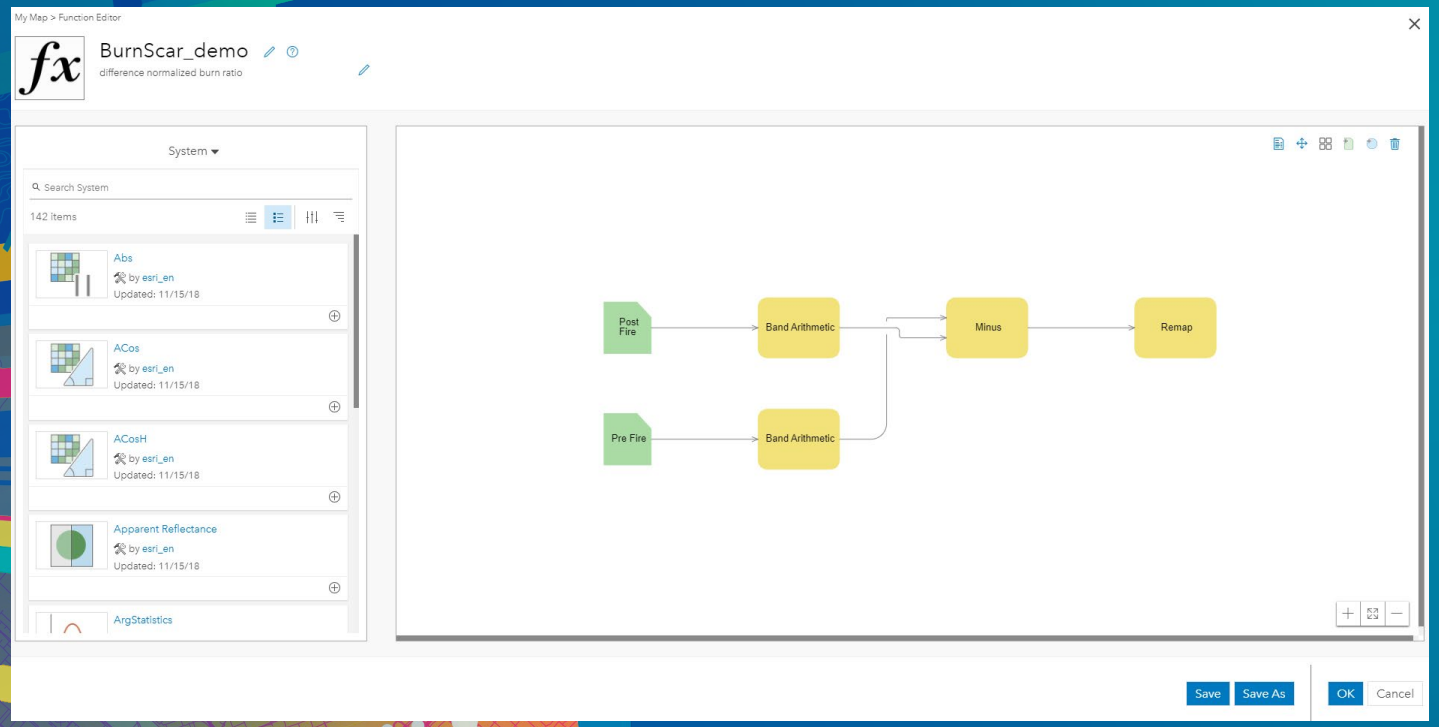




Raster Function Editor

- **View**, **edit** and **build** Raster Function Templates in Portal
- **Save** and **share** new or updated templates
- **Run** as an analysis operation to produce a persisted output
- Available in 10.7 release





Raster Function Editor Demo

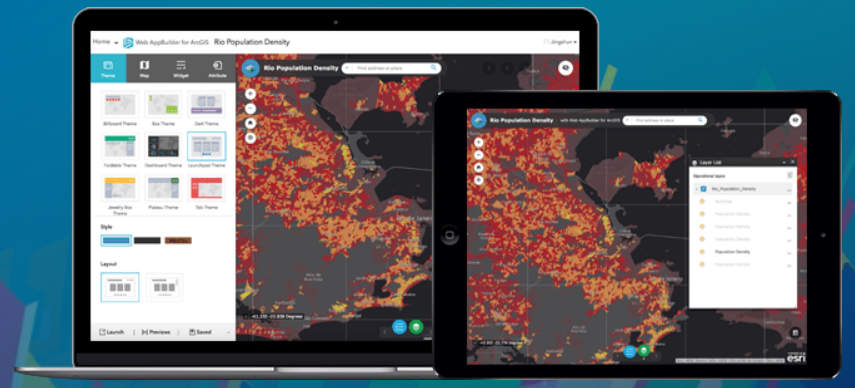
BurnScar

Image Services in

Web AppBuilder for ArcGIS

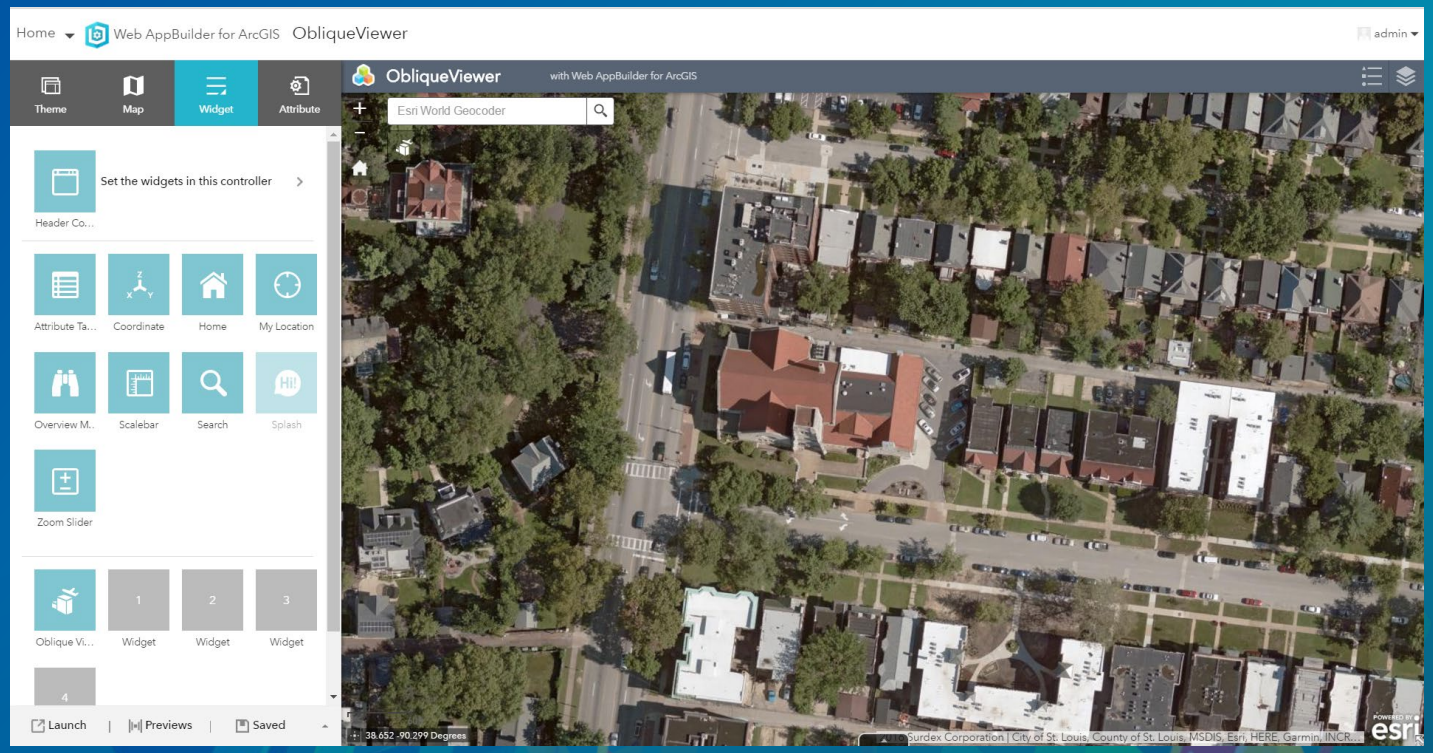
Web AppBuilder for ArcGIS

- Create apps with ease (no coding required)
- Extensible framework with the developer edition
- Fully integrated with the ArcGIS platform
- Apps run on any device

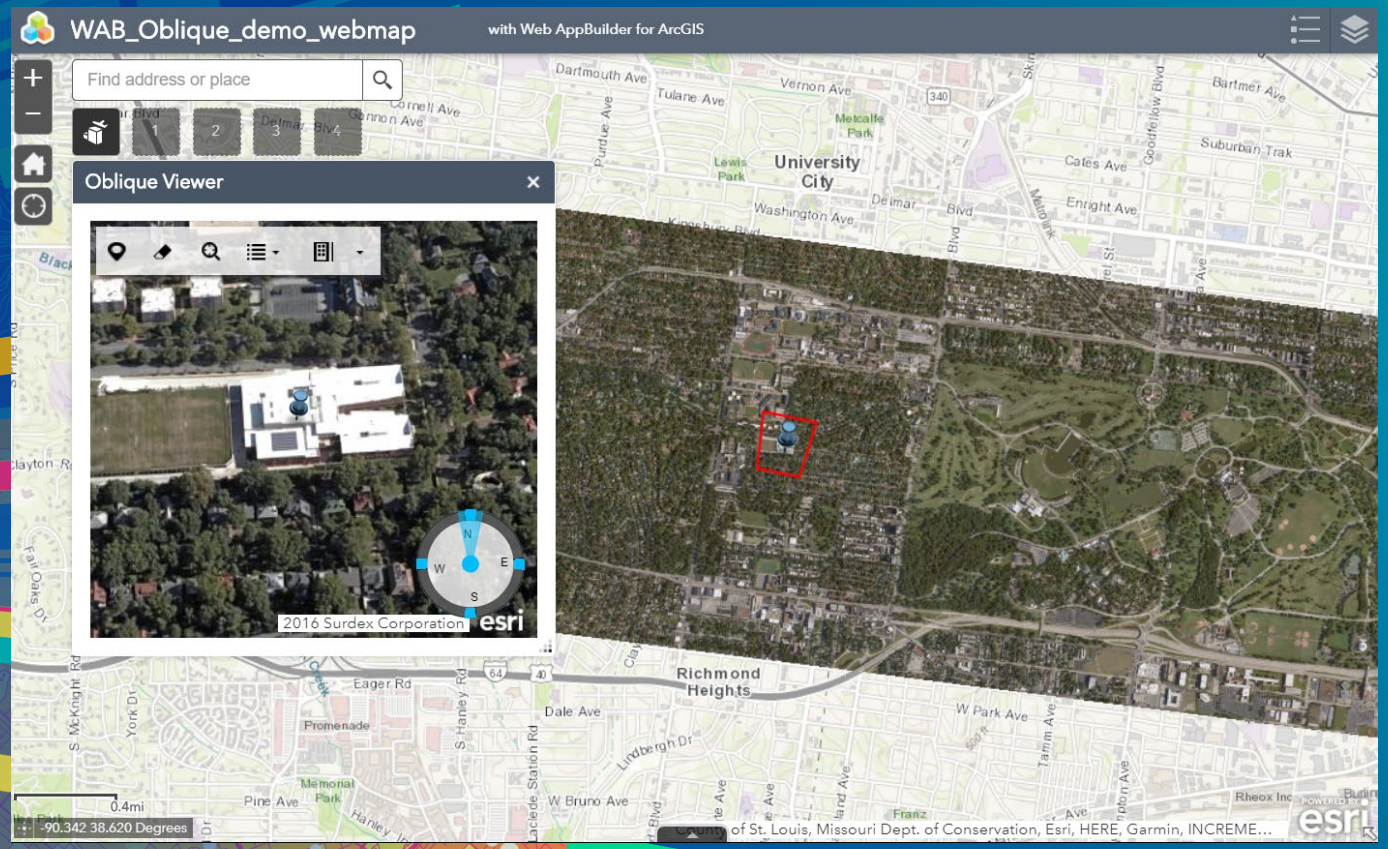


Imagery support in Web AppBuilder for ArcGIS

- Layer List
- Legend
- Query
- Attribute Table
- Popups
- Image Measurement*
- Oblique viewer*



** Specifically designed to work with image services*



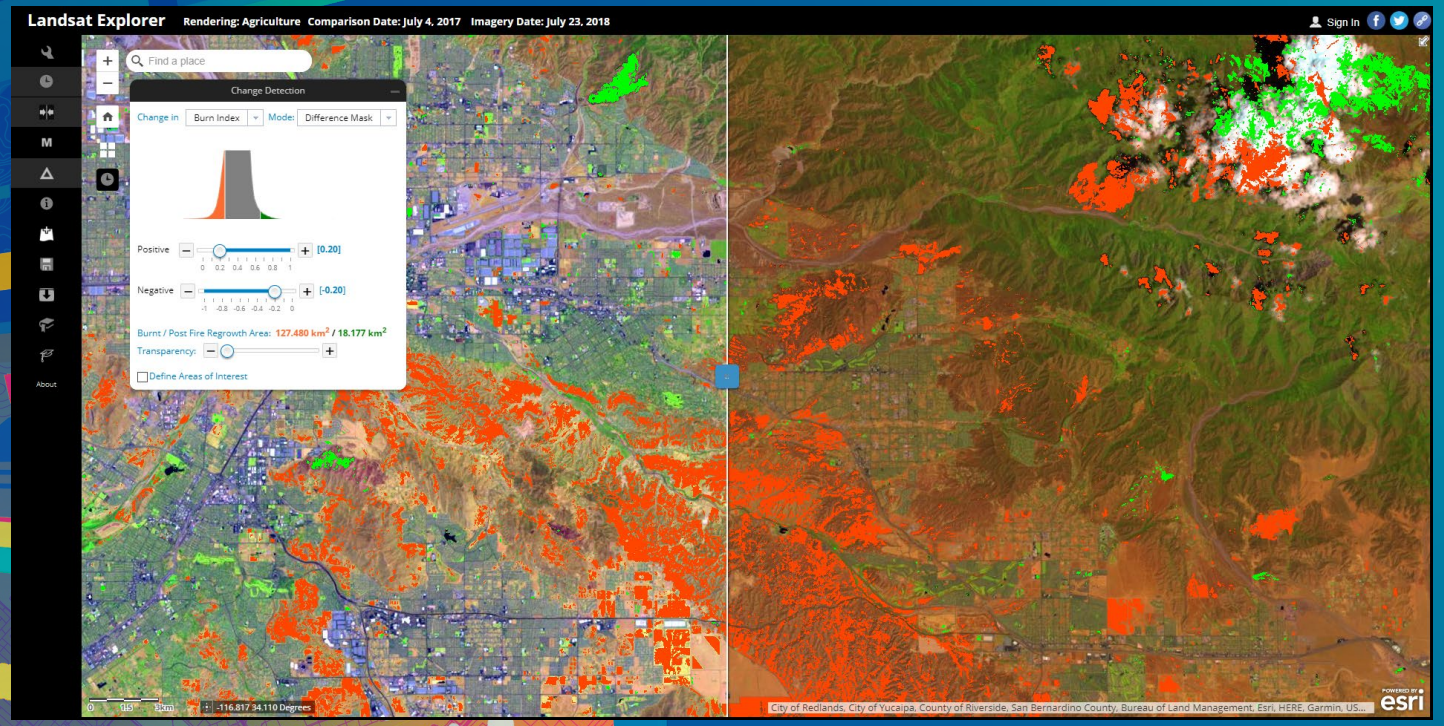
Web AppBuilder Demo

Oblique Viewer widget

Web AppBuilder widgets for Image Services (WABIS)

- Custom widgets to be used in Web AppBuilder
- Designed to work with image services
- Requires ArcGIS Online account and WAB Developer Edition
- IS Image Selector, Layers, Change detection, Renderer, Mask, Export, etc.
- Process imagery, export and share your results

https://github.com/Esri/WAB-Image-Services-Widgets



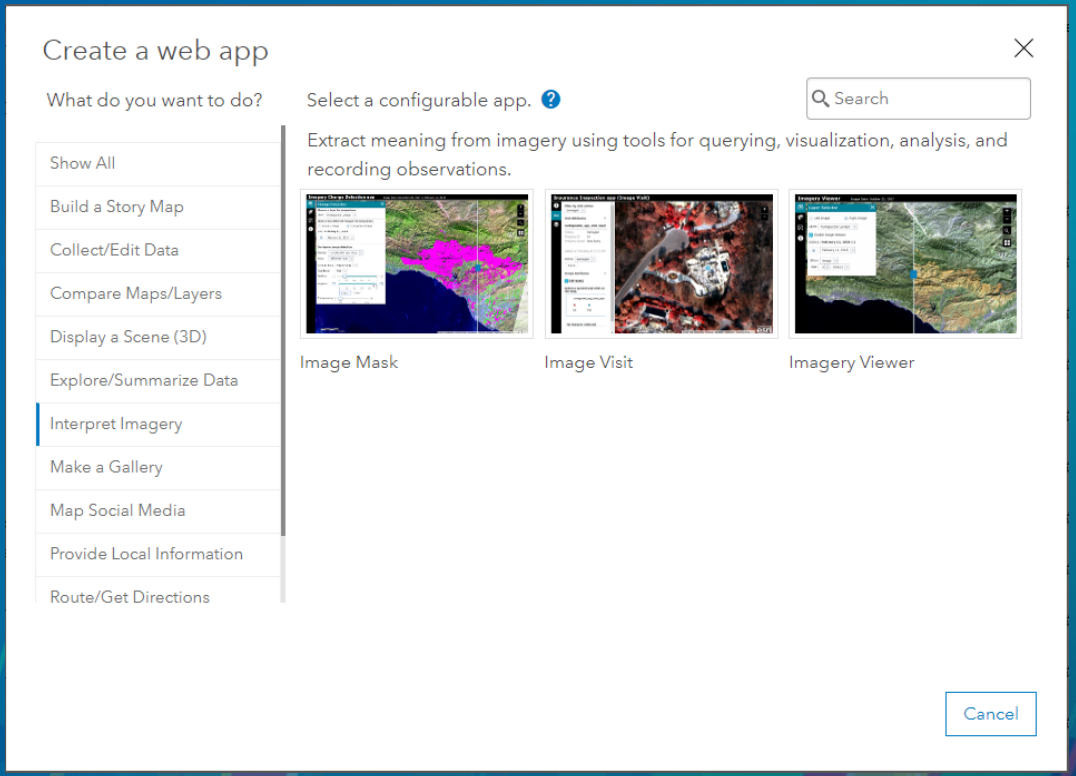
Custom Imagery Widgets Demo

Landsat Explorer

http://landsatexplorer.esri.com/

Configurable App Templates

- Image Mask
  - Calculate and visualize change between two images in an imagery layer
- Image Visit
  - Review the attributes of a predetermined sequence of locations in imagery
- Imagery Viewer
  - Visualize and interpret imagery layers through time and space



What should I use…

ArcGIS API for JavaScript	• Latest features, the most flexibility • Create, customize, and optimize full-featured 2D/3D web apps • Your app needs to be hosted on your own server, or third-party resources like Amazon AWS or Microsoft Azure
Web AppBuilder	• No coding required • Ready-to-use widgets and configurable themes • Host your apps online or run them on your own server • Create custom app templates
Configurable App Templates	• No coding required • The fastest and easiest way to go from a map to a shareable app • Many configurable apps to choose from • Easily share your app with others. Your app can be hosted on ArcGIS Online, it can reside on your organization's servers, or you can use third-party resources

Road ahead

- In ArcGIS API for JavaScript (4)
  - Support for visualizing vector data
  - Non-blocking decoding of pixel blocks
  - Time support
- Map viewer
  - Support for creating custom processing chains for on the fly processing

To conclude…

- Leveraging image services using the ArcGIS API for JavaScript
  - Mosaic rule, server side processing, client side processing and rendering
- Imagery capabilities in Map Viewer
  - Raster analysis
  - Symbology, filtering capabilities
  - Author your layers and use across the platform!
- Imagery in Web AppBuilder
  - Out of the box widgets
  - WABIS
- Configurable App Templates

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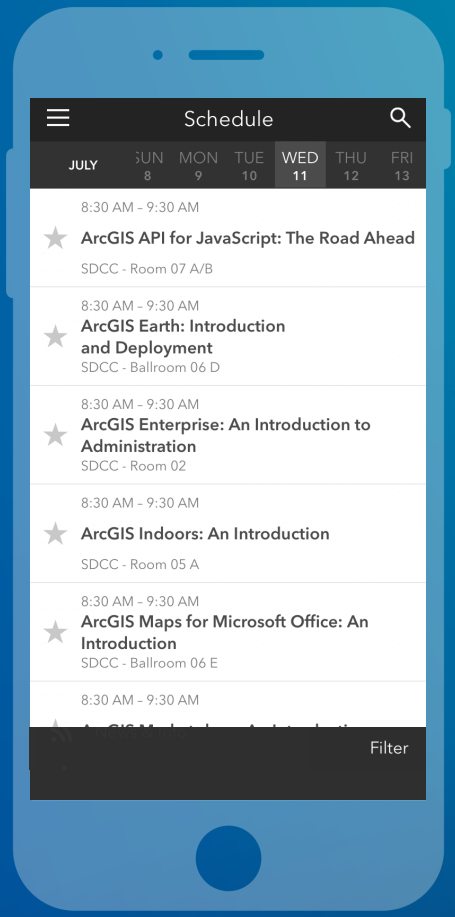
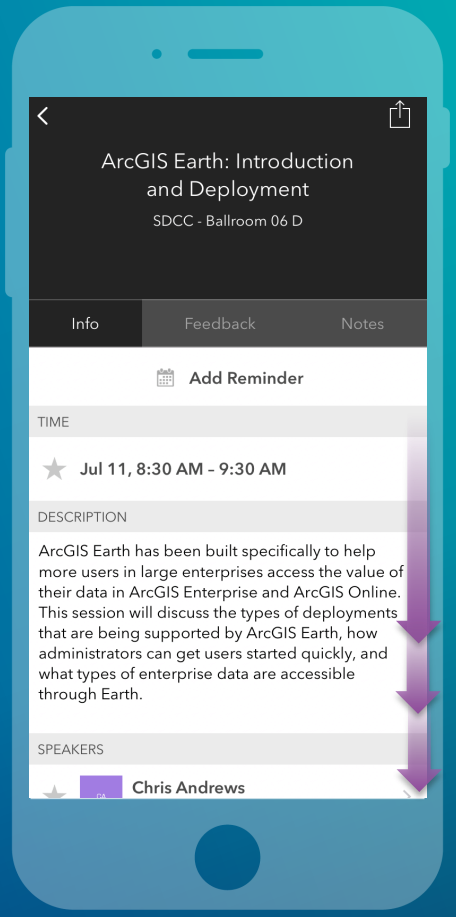
Select the session you attended



Scroll down to find the feedback section



Complete answers and select “Submit”