Building 3D Web Applications with ArcGIS

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Topics

Introduce Web 3D
- Why Web 3D for ArcGIS
- Use cases
- What is Web 3D for ArcGIS
- Web 3D Architecture

Develop Web 3D Apps
- Create 3D map environment
- Add 3D data
- Visualize feature data
- Use geoprocess
- Render 3D Symbols
- More …

What’s New and Road Ahead
- Scene Service
- Web Scene
- Elevation
- Symbology
Why Web 3D

Urban Planning
City Model
3D Mesh
Analysis
Point Cloud
Elevation
WE LIVE IN A 3D WORLD

Our users are solving real life problems using 3D tools, on the Web
Introduce

Web 3D for ArcGIS
Web 3D initiative
Enable 3D GIS on mobile devices & browsers

Story Telling in 3D
Asset Management in 3D
Situational Awareness in 3D
Esri is developing 3D technologies around the world and around the clock.
Develop

Web 3D Applications
Web 3D – Overview
New 3D Service, Viewer, Apps and APIs

ArcGIS Platform

3D Scene Service

Web Scene Layer

ArcGIS Server, Online, Portal

Developers

ArcGIS API for JavaScript

ArcGIS Runtime SDKs

ArcGIS Professional

ArcGIS Online/Portal

3rd Party tools
Web 3D Client Architecture
Web 3D Client Architecture

- ArcGIS API for JavaScript with 3D capabilities
  - New internal architecture but same* public JS API classes

![Diagram showing Map, Layer, Viewport(s), and LayerView(s)]

* 99% backwards compatible code + new classes for 3D
Web 3D Client Architecture

- Developers now need to choose between a Viewport type:
  - 2D, 3D WebGL or 3D Plugin

* 99% backwards compatible code + new classes for 3D
Demo: Map and Viewport
Demo: Map and Viewport
New ArcGIS API for Javascript 3D Capabilities

- Same Javascript class model extended with
  - New 3D Layer (Scene Service Layer)
  - New 3D Symbology
  - New 3D Mesh geometry type
  - Added Z values to geometries

- Same programming pattern that has been taught, learned and used for many years

- The 3D core and rendering technologies are transparent to developers and browser-independent
Let's Code
Create a Map

```javascript
require([  "esri/Map" ], function(  
  Map) {

    // setup the map
    // when creating a map, the option "viewportType"
    // indicates which kind of map to create;
    // the possible values are:
    // "2d" - 2D map
    // "3d-canvas" - WebGL based 3D map
    // "3d-plugin" - Runtime cora based 3D map

    var map = new Map("mapDiv", {  
      viewportType: "3d-canvas"  
    });
  });
```
Add a Basemap

```javascript
require([
  "esri/Map",
  "esri/layers/ArcGISTiledMapServiceLayer"
], function(
  Map, ArcGISTiledMapServiceLayer) {

  // setup the map
  var map = new Map("mapDiv", {
    viewportType: "3d-canva"
  });

  // create tiled layer
  var layer = new ArcGISTiledMapServiceLayer("http://

  // add layer to map
  map.addLayer(layer);
});
```
Add 3D Scene Service Layer

```javascript
require(['esri/Map', 'esri/layers/SceneServiceLayer'], function(
    Map, SceneServiceLayer) {

    // setup the map
    var map = new Map('mapDiv', {
        viewportType: '3d-canvass
    });

    // create scene layer
    var layer = new SceneServiceLayer('http://scene_se

    // add layer to map
    map.addLayer(layer);
});
```
Add A Dynamic Map Layer

```javascript
require(['esri/Map',
'esri/layers/ArcGISDynamicMapServiceLayer'],
function(
Map, ArcGISDynamicMapServiceLayer) {

  // setup the map
  var map = new Map("mapDiv", {
    viewportType: "3d-canvas"
  });

  // create dynamic layer
  var layer = new ArcGISDynamicMapServiceLayer("http:

  // add layer to map
  map.addLayer(layer);
});
```
Add a Graphic Layer

```javascript
require(
    ["esri/Map", "esri/Graphic", "esri/layers/GraphicsLayer", "esri/geometry/Point", "esri/symbols/SimpleMarkerSymbol"], function(
    Map, Graphic, GraphicsLayer, Point, SimpleMarkerSymbol) {

    // setup the map
    var map = new Map("mapDiv", {  
        viewportType: "3d-canva",
    });

    // create graphics layer
    var graphicsLayer = new GraphicsLayer();

    // add layer to map
    map.addLayer(graphicsLayer);

    // create graphic object
    var point = new Point(...);
    var symbol = new SimpleMarkerSymbol(...);
    var graphic = new Graphic(point, symbol);

    // add graphic to graphics layer
    graphicsLayer.add(graphic);
});
```
Add a Feature Service Layer

```javascript
require([  
    "esri/Map",
    "esri/layers/FeatureLayer"
], function(
    Map, FeatureLayer) {

    // setup the map
    var map = new Map("mapDiv", {  
        viewportType: "3d-canvass"
    });

    // create feature layer
    var layer = new FeatureLayer("http://feature_layer_url");

    // add layer to map
    map.addLayer(layer);
});
```
3D Symbology

```javascript
var map = new Map("mapDiv", { viewportType: "3d-canvas" });

// create feature layer
var layer = new FeatureLayer("http://sampleserver6.arcgisonline.com/a

// setup the renderer with 3D symbology to the feature layer
var renderer = new RampExtrusionRenderer(new SimpleExtrusionSymbol());
// set the color ramp of the renderer
renderer.setColorInfo({
  field: "pop2000",
  colors: [
    new Color([0, 255, 0]), new Color([255, 0, 0])
  ]
});
// set the height ramp of the renderer
renderer.setHeightInfo({
  field: "pop2000", heights: [10000, 100000]
});

// add layer to map
map.addLayer(layer);
```
Running a Geoprocess

```javascript
require([  "esri/Map",  "esri/tasks/Geoprocessor"
], function(  Map, Geoprocessor) {

  // setup the map
  var map = new Map("mapDiv", {  
    viewportType: "3d-canvas"
  });

  // setup the params for the drive time GP
  var params = {
    "Input_Location" : "...",  
    "Drive_Times" : "1 2 3"
  };

  // execute the drive time GP and display the results
  var gp = new Geoprocessor("http://sampleserver1.arcgisonline.com/arcgis/services/World_911_Emergency_Response/Geoprocessor/1.0/execute"),
  gp.setOutSpatialReference({
    wkid : 4326
  });
  gp.execute(params, function(results, messages) {
    var features = results[0].value.features;
    // display the features
    ....
  });
});
```
Demo: Elevation
The latest and more...
Intro to ArcGIS Scene Service

- New service type in ArcGIS Server
- For 3D vector data (mesh, point, line, polygon)
- Based on vector cache (i3s)
  - Spatial index
  - Level of detail
  - Optimized data encoding
- Data streaming through REST
- Client-side rendering
Consuming ArcGIS Scene Service

- JS API - Scene Service Layer
- How does it work?
  - Quad-tree node traversal
  - Based on distance to camera
  - Level of Detail support
  - 3D Geometry / Textures
- How to use it?
Demo: Scene Service Layer
Web Scene

- New in ArcGIS Online and Portal
- Mash-up of 3D / 2D layers
- Web Scene Viewer and Author
- Built with the JavaScript API
Web Scene – designed for 3D

- 3D Layers
- 3D Symbology
- 3D Labels
- Table of Contents
- 3D Popups
- Tours
- ...
Demo: Web Scene viewer
ArcGIS WebApp Builder for 3D
Demo
Road Ahead

- 2014 Developer Summit
- 2014 User Conference
- 2014 ArcGIS 10.x

- 3D Clients
- 3D Services
- 3D Content
I'm a Javascript developer, now I'm a ArcGIS Web 3D developer!