

ArcGIS API for Javascript

What's new for 4.0

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4.0

- Overview
- Architecture: Map and Views
- Architecture: core components
- Features
- Future work

4.0 Overview

In a nutshell

- Simplified API
- `WebMap` and `WebScene`, first class citizens
- Brings 3D capabilities
- APIs and Widgets redesign
- Lot of common patterns shared with Quartz Runtime SDKs

In a nutshell

- New architecture
- AMD only
- IE9+ for 2D, IE11+ for 3D
- Classes properly cased: `esri/Map`, `esri/Graphic`, `esri/layers/Layer`
- New folder structure.

Releases

- Already in production in the WebScene Viewer
- beta1, released in mid-july
- beta2, November 19th
- Planned: beta3 in december
- Planned: final in 2016 - devsummit

Architecture

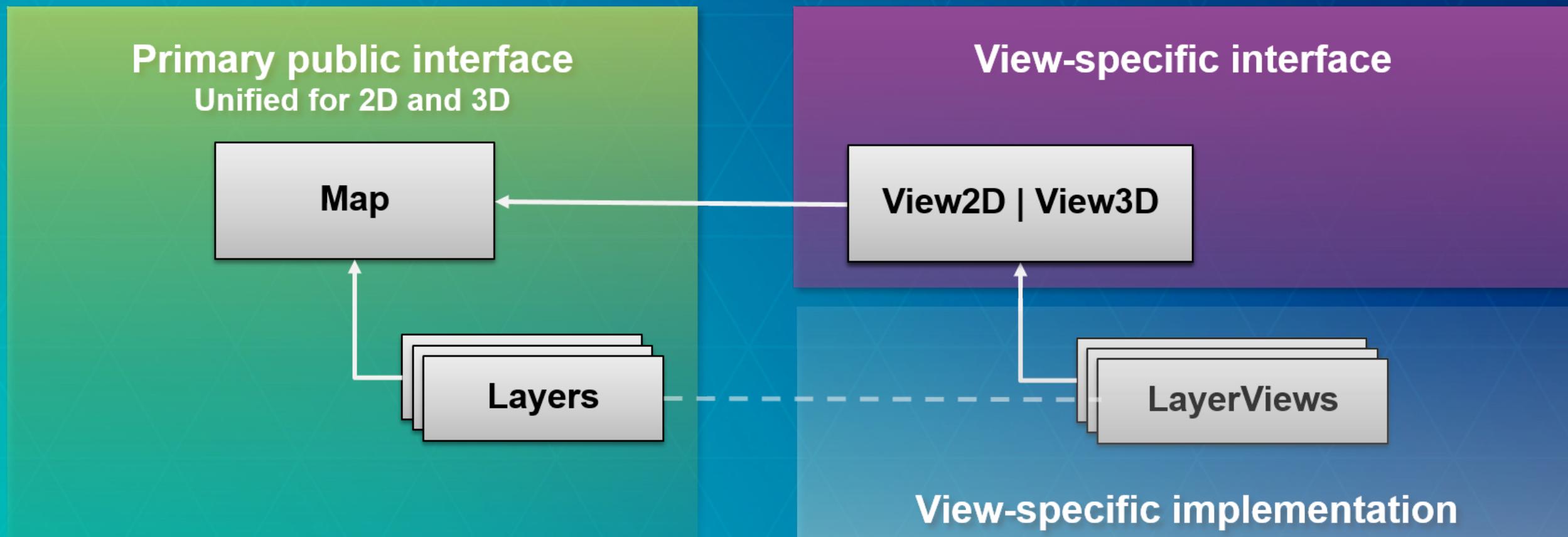
Map and Views

Why a new architecture?

- One of the starting point of 4.0: bring 3D
- currently in 3.x:
 - Map, many DOM nodes
 - Each Layer, 1 DOM Node
- rendering 3D with WebGL which is completely different

New architecture

- Separate the business logic from the drawing logic.



```
var map = new Map( {  
    basemap: 'topo',  
    layers: [  
        new ArcGISDynamicLayer(...)  
    ]  
} );  
  
var mapView = new MapView({  
    map: map,  
    container: 'mapDiv'  
});  
  
var sceneView = new SceneView({  
    map: map,  
    container: 'sceneDiv'  
});
```

side by side views

2D/3D

- For the rest, one API
- DEMO

2D

- new "engine" in the work.
- faster, more future proof
 - abstraction to draw tiles and dynamic images to ease custom layers/layerviews
 - abstraction to draw in DOM or Canvas, possibly WebGL
- display graphics while zooming.
- rotation
- continuous zoom
- vector map tiles, basemaps

3D

- WebGL engine to display the globe.
- z/m support in the API, tasks, layers...
- support for simple symbols
- new 3D Symbols

Architecture

new core components

- esri/core/Accessor
- esri/core/Promise
- esri/core/Loadable
- esri/core/Collection

esri/core/Accessor

- Mixin similar to [dojo/Stateful](#)
- Consistent pattern:
 - getting and setting properties value
 - watching properties change
- Single object constructor
- Computed properties
- Autocast

Properties watching

- Direct benefits:
 - remove inconsistencies between constructor, getter, setter functions, events
 - one convention everywhere. "*just need to know what properties for a class*"
 - Single object constructor, no more 3+ constructors
 - Leaner SDK: we doc only the properties, the rest is convention
- Changes:
 - no more *property*-change events, use `watch()`
 - in 3.x, listen for `extent-change` event.
 - in 4.0 `extent` watchers will be called very often
 - new events and properties for animation.

Accessor - Properties watching

```
var map = new Map(...);
var view = new MapView({ map: map });

// watch for viewpoint updates
view.watch('viewpoint', function(newValue, oldValue, property, target) {
  console.log(newValue, oldValue, property, target);
})

// chain watching
map.watch('basemap.title', function(value) {
  console.log(value);
});
map.basemap = 'topo';
```

Accessor - Properties watching

- Frameworks integration
 - properties are framework agnostic
 - better/easier integration
- Examples
 - dbind
 - React
 - camera recorder

Accessor - unified single object constructor

- Constructors of any subclass of `Accessor` accepts a single object.
- forget the order of arguments
- we do support old signatures for convenience like `new Point(x, y, z)`
- /!\ This can look like JSON, but it isn't. Old JSON constructor signatures are removed instead `MyClass.fromJSON()`

Accessor - unified single object constructor

```
require([
  'esri/Map',
  'esri/Basemap',
  'esri/core/Collection',
  'esri/layers/ArcGISTiledLayer'
],
function(
  Map,
  Basemap,
  Collection,
  ArcGISTiledLayer
) {
  var map = new Map({
    basemap: new Basemap({
      baseLayers: new Collection([
        new ArcGISTiledLayer(url)
      ])
    })
  });
});
```

Accessor - autocast

- Automatically create an instance of the expected type.
- What you assign to the property is passed to the constructor of the class.
- For example, `MapView.center` is of type `Point` so you can do

```
view.center = [0, 0];
view.center = [0, 0, 0];
view.center = { longitude: 0, latitude: 0 };
view.center = { x: 0, y: 0, spatialReference: 102100 };
...
```

- All properties might not support this at the moment.

Accessor - autocast

```
require([
  'esri/Map',
  'esri/layers/ArcGISTiledLayer'
],
function(
  Map,
  ArcGISTiledLayer
) {
  var map = new Map({
    basemap: {
      baseLayers: [
        new ArcGISTiledLayer(url)
      ]
    },
    initialExtent: {
      xmin: -180, xmax: 180,
      ymin: -80, ymax: -80,
      spatialReference: { wkid: 4326 }
    }
  });
});
```

Accessor - autocast

```
// 3.x
new SimpleMarkerSymbol(SimpleMarkerSymbol.STYLE_SQUARE, 10,
    new SimpleLineSymbol(SimpleLineSymbol.STYLE_SOLID,
        new Color([255,0,0]), 4),
        new Color([255,255,255,0.25]));

// 4.0
new SimpleMarkerSymbol({
    style: 'square',
    color: 'red',
    size: 10,

    outline: {
        color: 'rgba(255, 255, 255, 0.5)'
        width: 4
    }
});
```

Accessor - autocast

class example:

```
var Map = Accessor.createSubclass({
    // or declare([Accessor], { ... })
    classMetadata: {
        properties: {
            basemap: {
                type: Basemap
            },
            initialExtent: {
                type: Extent
            },
            layers: {
                type: Collection
            }
        }
    }
});
```

Accessor - computed properties

```
var Person = Accessor.createSubclass({
  classMetadata: {
    properties: {
      fullName: {
        readOnly: true,
        dependsOn: [ 'lastName', 'firstName' ]
      }
    }
  },
  _fullNameGetter: function() {
    return this.firstName + ' ' + this.lastName;
  }
});

var john = new Person({
  firstName: 'John',
  lastName: 'Doe'
});
john.fullName; // 'John Doe'
```

Promises

- 4.0 is a promises-based architecture!
- Getting Started with Dojo
- all `async` functions and methods are returning to `Promise`. no more `events`

```
someAsyncFunction()
  .then(
    function(resolvedVal){
      //This is called when the promise resolves
      console.log(resolvedVal); //logs the value the promise resolves to
    }
  )
  .otherwise(
    function(error){
      //This function is called when the promise is rejected
      console.error(error); //logs the error message
    }
);

```

Promises

- Classes may be Promise
 - because they might have to load resources
 - because they might be asynchronously initialized

Map, Layer, View

```
var map = new Map({...})  
  
view = new SceneView({  
  map: map,  
  // ...  
});  
  
view.then(function() {  
  // the view is ready to go  
});
```

Loadable - 4.0beta2

- brings better control, and scheduling of loading resources.
- extension of `esri/core/Promise`
- in 3.x, instanciating a layer loads it. in 4.0, it's an explicit call
- the views automatically loads the map and its layers
- use cases:
 - `WebMap` / `WebScene` / `Basemap` need to load:
 - the portal item
 - the layer modules
 - the layer portal items
 - `MapView` / `SceneView` need to load:
 - the map
 - the layers
 - `BasemapGallery` need to load
 - basemaps from the portal, not the layers

In a single page application, get a feature from a FeatureLayer from a WebMap without displaying it, ASAP!

```
var webmap = new WebMap({
  portalItem: {
    id: 'affa021c51944b5694132b2d61fe1057'
  }
});

webmap.load()
  .then(function() {
    return webmap.getLayer('myFeatureLayerId').load();
  })
  .then(function(featureLayer) {
    return featureLayer.queryFeatures({
      where: 'OBJECTID = 1'
    });
  })
  .then(function(result) {
    displayDetails(result.features[0]);
  })
  .otherwise(function(error) {
    console.error(error);
  });
}
```

Collection

- More or less like an Array
- `add` / `remove` / `forEach` / `map` / `find` / `findIndex`...
- emit '`change`' events when something is added/removed/moved
- used for layers, used for layers in Basemap, used for graphics...

Features

SDK

- New SDK built from scratch
 - beta1
 - beta2
- Simpler, focused samples
- User experience
 - Find the relevant information
- More code snippets

Layers

- `map.layers`, a collection of the operational layers
 - mix of image AND graphics
- Shorter names: `ArcGIStiledLayer`, `ArcGISDynamicLayer`
- new ones:
 - `ArcGISElevationLayer`
 - `SceneLayer`
 - `GroupLayer`

GroupLayer

- New layer: GroupLayer
- group layers together
- structure your data visualization
- visibility mode: **exclusive, independent, inherit**
- listMode: **hide-children, hidden**
- **DEMO**

GroupLayer

```
map = new Map({
  basemap: 'dark-gray',
  layers: [
    new GroupLayer({
      title: 'USA Tiled Services',
      visibilityMode: 'exclusive',
      //listMode: 'hide-children',
      layers: [
        new ArcGIStiledLayer({
          url: '//server.arcgisonline.com/ArcGIS/rest/services/Demographics/USA_MedHInc_Topo/MapServer',
          title: 'Median Household Income',
          visible: false
        }),
        new ArcGIStiledLayer({
          "url": '//services.arcgisonline.com/ArcGIS/rest/services/Demographics/USA_TapestrySeg/MapServer',
          "title": "Tapestry Segmentation",
          visible: true
        })
      ]
    })
  ]
});
```

VectorTileLayer

- vector data stored in tiles
 - binary format
- styling is done clientside
- consumes new VectorTile service
- new client-side layer

```
new VectorTileLayer({  
  url: ...  
});
```

- vector basemaps available through known names
- DEMO

Basemap

- full fledge class `esri/Basemap`
- basemap's layers are *not* part of the `map.layers`, but from `map.basemap`
- contains 3 Collections: `baseLayers`, `referenceLayers`, `elevationLayers`
- can be set with
 - string for esri's basemap
 - or custom Basemap instance
 - in 2D and 3D

Basemap

- **basemap** as a string, creation of the appropriated Basemap instance

```
var map = new Map({  
  basemap: 'topo'  
});  
  
map.basemap = 'streets';
```

- **basemap** as an instance of **Basemap**

```
var map = new Map({/*...*/});  
  
var toner = new Basemap({  
  baseLayers: [  
    new WebTiledLayer({  
      urlTemplate: '...'  
    })  
  ]  
});  
  
map.basemap = toner;
```

Padding

- easier fullscreen view application.
- defines inner margin to make space for UI.
- 2D
- 2D
- 3D

Animation

- generic function `animateTo(target, options):Promise`

```
querytask.execute(query).then(function(result) {  
    view.animateTo(result.features, {  
        duration: 3000  
    });  
});
```

- customize `easing`, `duration`, `chaining`
- DIY using other libs
- `esri/core/Viewpoint`: common way to share between 2D/3D

UI/UX - Resizing

- DOM isn't our friend
- automatically measure and position the view
- resize by center, or not
- better integration with responsive design pages
- and frameworks

UI/UX - CSS

- all existing CSSs are revisited for the views and widget.
- decreased class complexity
 - easily customize the tiniest aspects of each component.
- consistent **kebab** case of CSS class names.
- all classes are prefixed by **esri-** to avoid conflicts with CSS frameworks.

UI/UX - ViewUI

View exposes an API to manipulate the UI elements on top of the layers. Still WIP

```
view = new MapView( {  
  ui: {  
    components: [ "zoom", "compass", "attribution" ]  
  }  
} );
```

```
// adding UI elements on specific positions  
var ui = view.ui;  
ui.add(search, "top-right");  
ui.add(home, {  
  position: "top-left",  
  index: 0  
});
```

DEMO

UI/UX - Widgets

- widgets designed as MVVM
 - one ViewModel, many Views
 - separates the logic from the UI/UX implementation
 - easier to create new views using other frameworks
- ported to 4.0beta: **Search, Zoom, Attribution, Popup**
- new ones: **Compass**

UI/UX - Popup

- The Popup in 4 went through a complete redesign.
- The UX was improved in the following areas:
 - It can be docked, through a user action or as an property
 - It is **responsive** and works well in small spaces
 - Allows for easy navigation of multiple features.
 - in beta3, includes new large scale view of images and charts to better communicate key information.
- On the developer side:
 - Easily style the popup to match your app
 - **Custom actions** can be configured to expose extra capabilities

Portal, WebMap, WebScene

- are central classes of the API.
- replace the 3.x `esri/arcgis/utils`
- easy to access, modify, and persist back to portal.

```
var portal = new Portal({
  authMode: 'immediate', // anonymous | auto | immediate
  canSearchPublic: true,
  url: '//jsapi.maps.arcgis.com'
});

portal.load()
  .then(function() {
    return portal.queryItems({
      query: 'Brest'
    });
  })
  .then(function() {
    displayResults(...)

  });

```

WebMap and WebScene

- Map holds
 - basemap
 - operational layers
 - initial state
- WebMap, WebScene hold
 - portal item
 - presentations
 - environment options
- Scene can be global or local

```
var scene = new WebScene({
  portalItem: new PortalItem({
    id: 'affa021c51944b5694132b2d61fe1057'
  })
});

var view = new SceneView({
  map: scene,
  container: 'viewDiv'
});
```

loading a webscene
scene local
scene slides

Conclusion

- One API
- 3D, and better 2D
- New concepts
 - to observe properties with Accessor
 - to handle asynchronous operations with Promise
- Simplified and consistent API

Questions

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