DEVELOPING WEB MAPS WITH ARCGIS API'S

A Coding Approach to Web Map Development

Abstract

Learn to create web maps with the use of ArcGIS Java API's.

Valentine Adolsum Anaba

May 2021

Table of Contents

Introduction

There are various means to creating maps. A web map is an interactive display of geographic information as a means of communication or gathering data. Web maps are either use to tell stories, answer questions (queries) or take surveys.

Esri has created various means: from developed web map services through the ArcGIS online and Esri enterprise systems, and through developed Application Program Interface (API) for the development of interactive web maps. The ArcGIS online web resource provide templates or app builders that can be used to build applications without any code. The API on the other hand requires a little bit of coding, and the understanding of HTML, CSS, and Java. Both systems provide their own benefits and flexibility in the development process, but in this guide, the focus is going to be on developing web maps from scratch using the ArcGIS API resources.

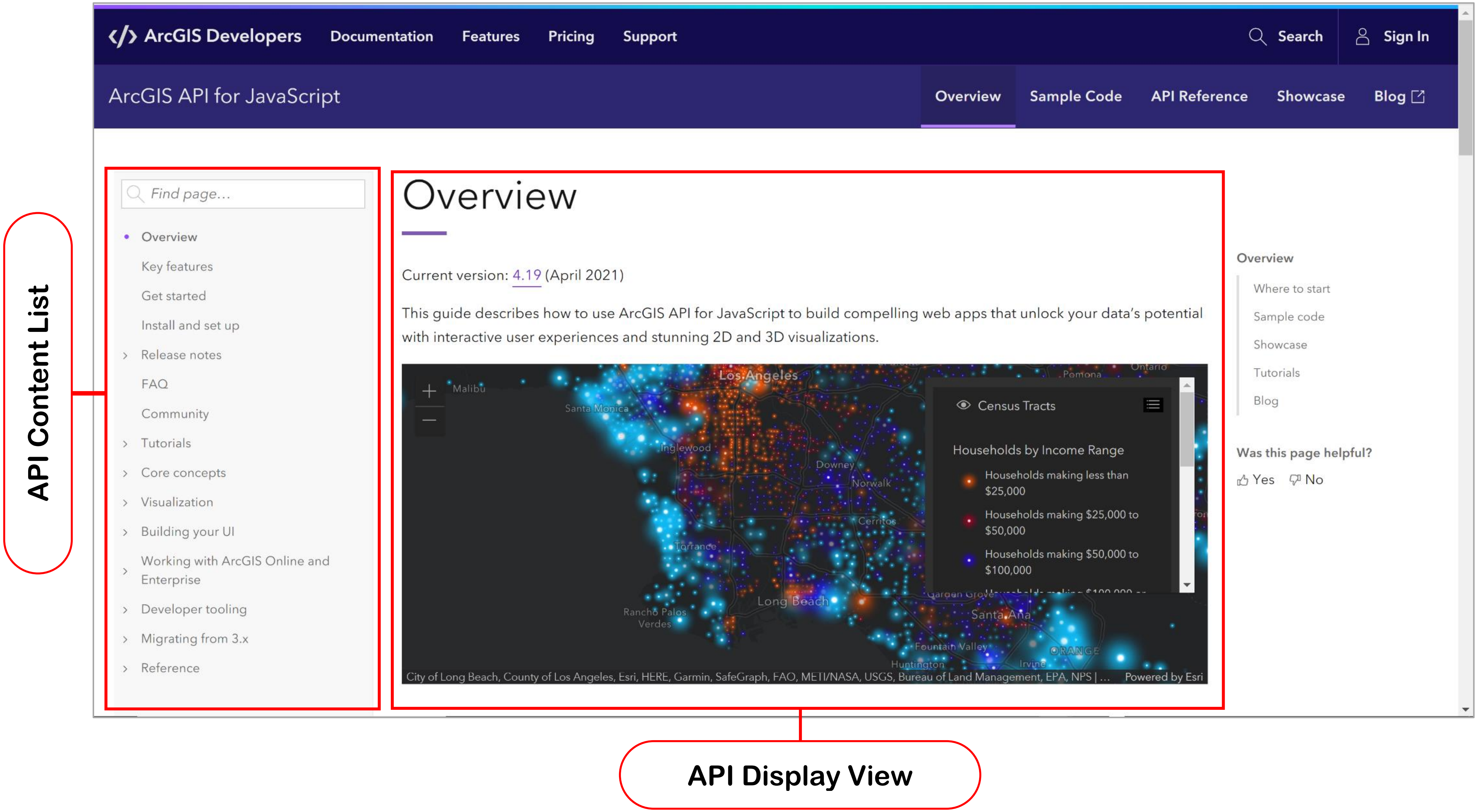
An API according to the oxford dictionary is a set of functions and procedures allowing the creation of applications that access the features or data of an operating system, application, or other services. Basically, an API acts as the building block, with composite functions, protocols, and interactions for a website. For instance, google maps, YouTube, Twitter, Flickr and other software have APIs that allow developers to embed or integrate that software into a new site or application. Thus, if a developer wants their software to have the same functionality as YouTube, all they need to do is access the YouTube API and integrate it into their webpage or application.

Before you proceed, be sure you have a scripting tool/environment to work with your API, below are some recommendations:

- Visual Studio Code
- Notepad ++
- Sublime

In this guide, Visual Studio Code is used, but the same processes apply across all platforms.

Outlay of the ArcGIS Developers Site.



- Overview
- Key features
- Get started
- Install and set up
- Release notes
- FAQ
- Community
- Tutorials
- Core concepts
- Visualization
- Building your UI
- Working with ArcGIS Online and Enterprise
- Developer tooling
- Migrating from 3.x
- Reference

Overview

Current version: 4.19 (April 2021)

This guide describes how to use ArcGIS API for JavaScript to build compelling web apps that unlock your data's potential with interactive user experiences and stunning 2D and 3D visualizations.

Census Tracts

Households by Income Range

- ● Households making less than $25,000
- ● Households making $25,000 to $50,000
- ● Households making $50,000 to $100,000
- Households making $100,000 or ...

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Overview

- Where to start
- Sample code
- Showcase
- Tutorials
- Blog

Was this page helpful?

Yes No

API Content List: The content list contains a list of notes and API's that can be integrated or embedded in a web map application. It contains detailed syntax and explanation of the modules, functions and layers that make up the API.

API Display View: The selected item from the API content list is displayed in the Display View. It displays a graphical view of the API and displays the actual API.

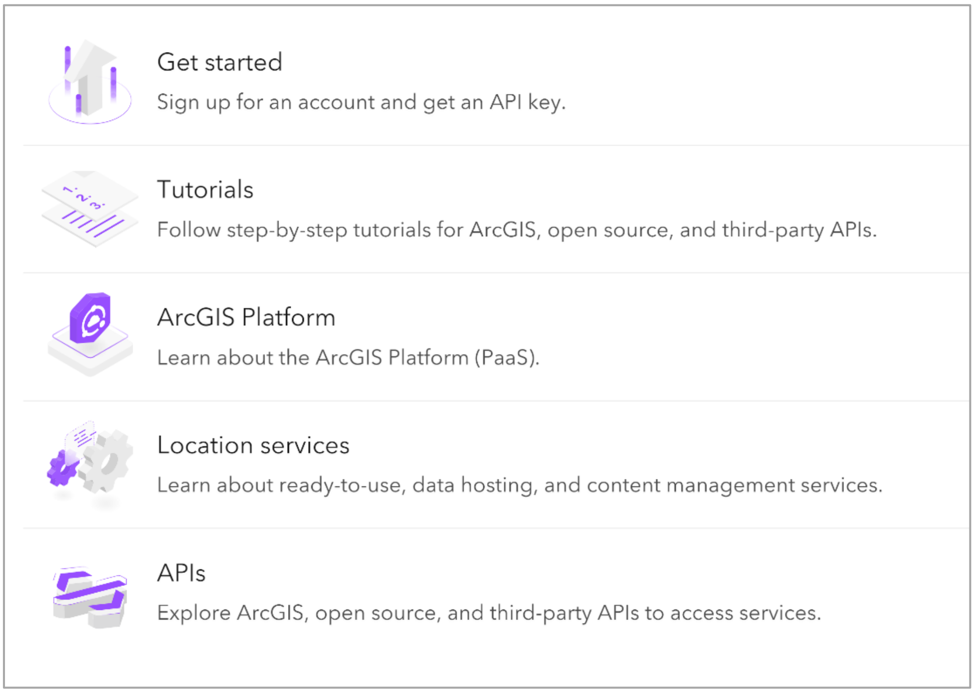
Search: Used to search for documentation, sample code, tutorials, scripts, tools, and other content on the webpage.

Sample Code: This is a section of sample codes that can be modelled in the sandbox to modify and interact with the functionality of the codes.

API Reference: The API reference is an index of all API content on the page. It is an alternative to the search (especially if you do not know what you are searching for).

Pre-Web Map Requirements

To structurally, start and build understanding on how to use the API, you will first of all have Sign-up to the developer's site.



Get started
Sign up for an account and get an API key.

Tutorials
Follow step-by-step tutorials for ArcGIS, open source, and third-party APIs.

ArcGIS Platform
Learn about the ArcGIS Platform (PaaS).

Location services
Learn about ready-to-use, data hosting, and content management services.

APIs
Explore ArcGIS, open source, and third-party APIs to access services.

NB: Esri has already done a remarkable job explaining the APIs in detail and how they can be used to create/ build web maps. This guide is basically a summarization and a simplification of the process for beginners.

Before, you continue through the guide, I presume you understand the basics of HTML and CSS. If you do not, check Introduction to html & css (invclick.com).

Getting Started

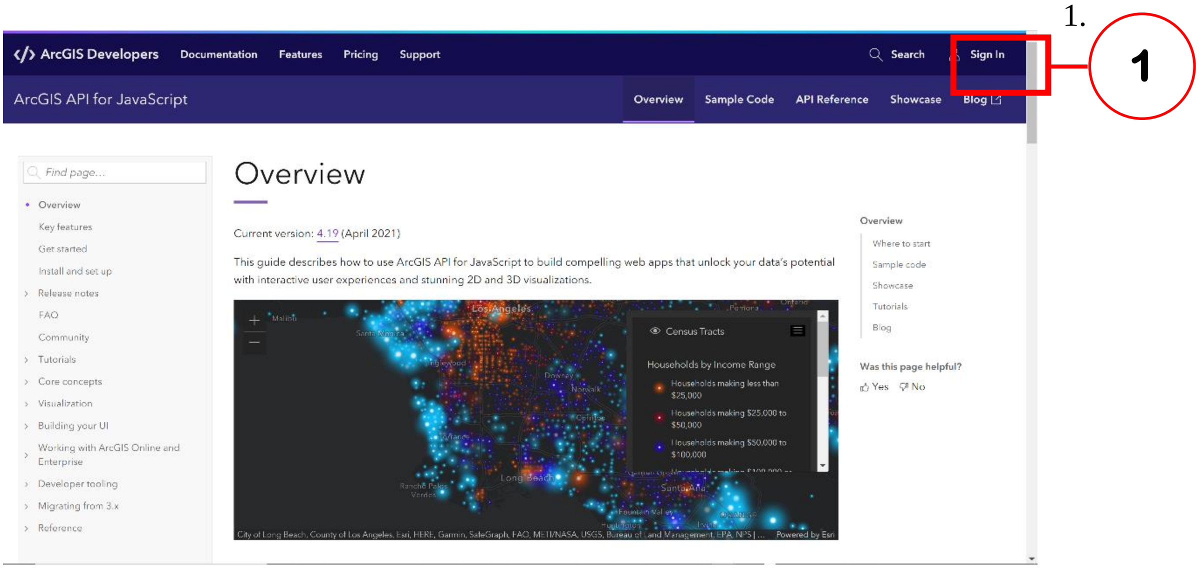
To get started, visit the ArcGIS API website. To access the site, open an internet browser and insert the link below:

https://developers.arcgis.com/javascript/latest/

At the top-right corner, click on sign-in and sign into your account. If you do not have an account,

1. click on **Sign In**
2. Select **"Create an ArcGIS Developers Account".**
3. Fill the form with the necessary details, then click on **"Create Developers Account".**

1.



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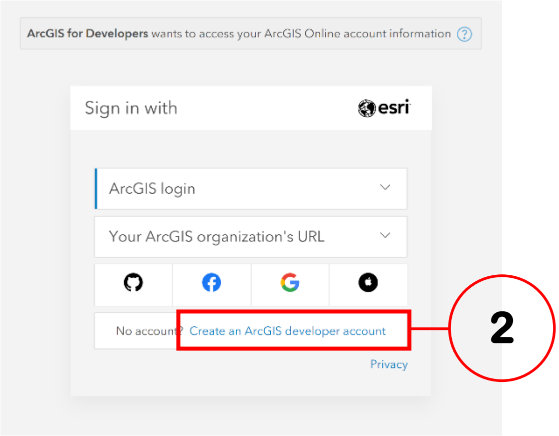
City of Long Beach, County of Los Angeles, Esri, HERE, Garmin, SafeGraph, FAO, METI/NASA, USGS, Bureau of Land Management, EPA, NPS | ...

2.



ArcGIS for Developers wants to access your ArcGIS Online account information

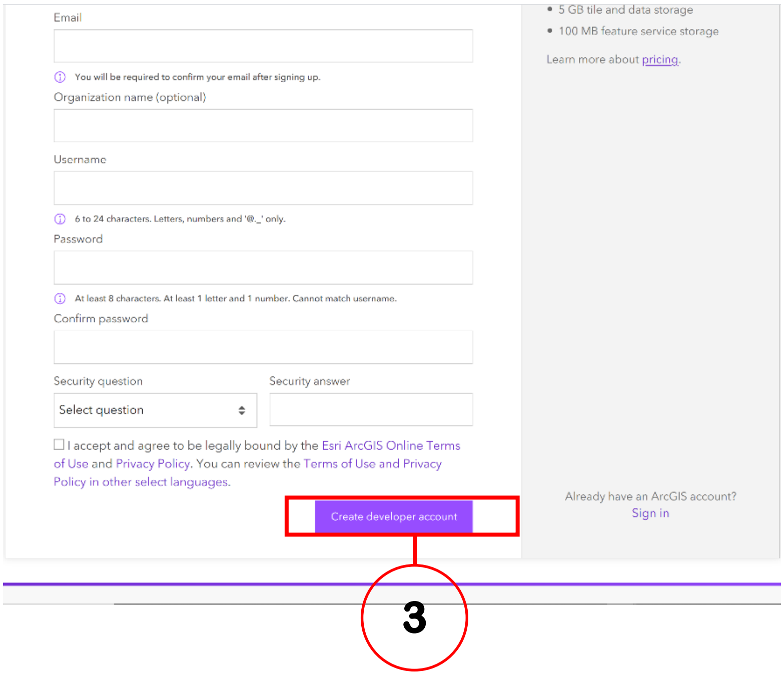
Sign in with esri

ArcGIS login

Your ArcGIS organization's URL

No account? Create an ArcGIS developer account

Privacy



Email

You will be required to confirm your email after signing up.

Organization name (optional)

Username

6 to 24 characters. Letters, numbers and '@._' only.

Password

At least 8 characters. At least 1 letter and 1 number. Cannot match username.

Confirm password

Security question

Select question

Security answer

□ I accept and agree to be legally bound by the Esri ArcGIS Online Terms of Use and Privacy Policy. You can review the Terms of Use and Privacy Policy in other select languages.

Create developer account

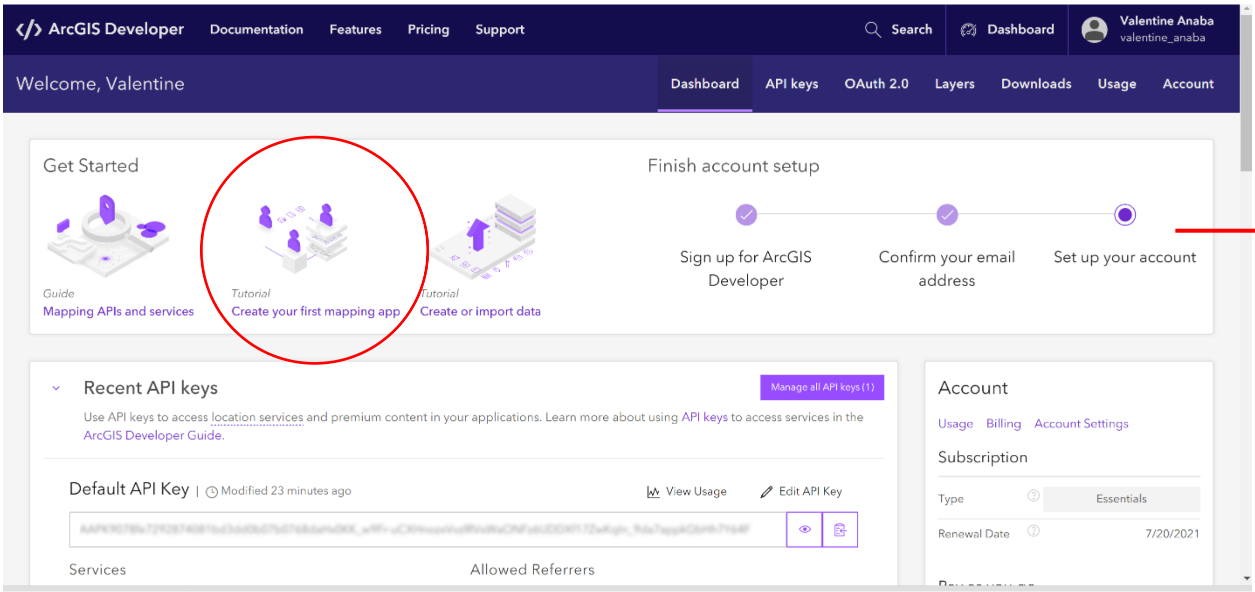
- 5 GB tile and data storage
- 100 MB feature service storage

Learn more about pricing.

Already have an ArcGIS account?
Sign in

After creating your account, you will be logged into the developer page on the dashboard.

NB: you will be sent an email to verify your account. Kindly verify it, via the email you created the account with, else the account will expire in 72hours.



Use API keys to access location services and premium content in your applications. Learn more about using API keys to access services in the ArcGIS Developer Guide.

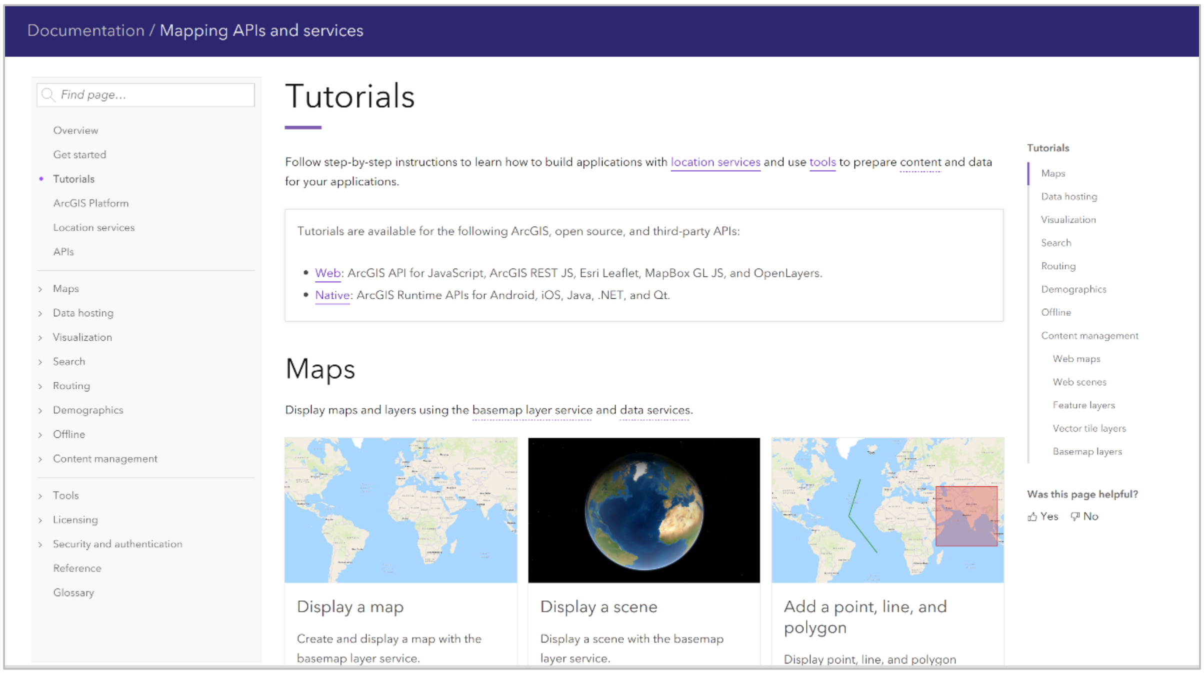
Account Set up Status

Creating our First Map

Creating a Basemap

After the account has been created, the next stage is to design a web map using available API's.

In the Dashboard, select Create your first mapping app, as circled in the image above. This brings you to the tutorial page with various sample maps.



Tutorials

Follow step-by-step instructions to learn how to build applications with location services and use tools to prepare content and data for your applications.

Tutorials are available for the following ArcGIS, open source, and third-party APIs:

- Web: ArcGIS API for JavaScript, ArcGIS REST JS, Esri Leaflet, MapBox GL JS, and OpenLayers.
- Native: ArcGIS Runtime APIs for Android, iOS, Java, .NET, and Qt.

Maps

Display maps and layers using the basemap layer service and data services.

Display a map

Create and display a map with the basemap layer service.

Display a scene

Display a scene with the basemap layer service.

Add a point, line, and polygon

Display point, line, and polygon

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Each map displayed under the maps has its accompanying API to enable you create that map, function, or tool.

But before we proceed to reviewing the API, there are three things to take note of:

1. The Requirement Module (require statement)
2. The Function
3. The Mapview / ViewDiv
4. The position of the above elements in the html syntax.

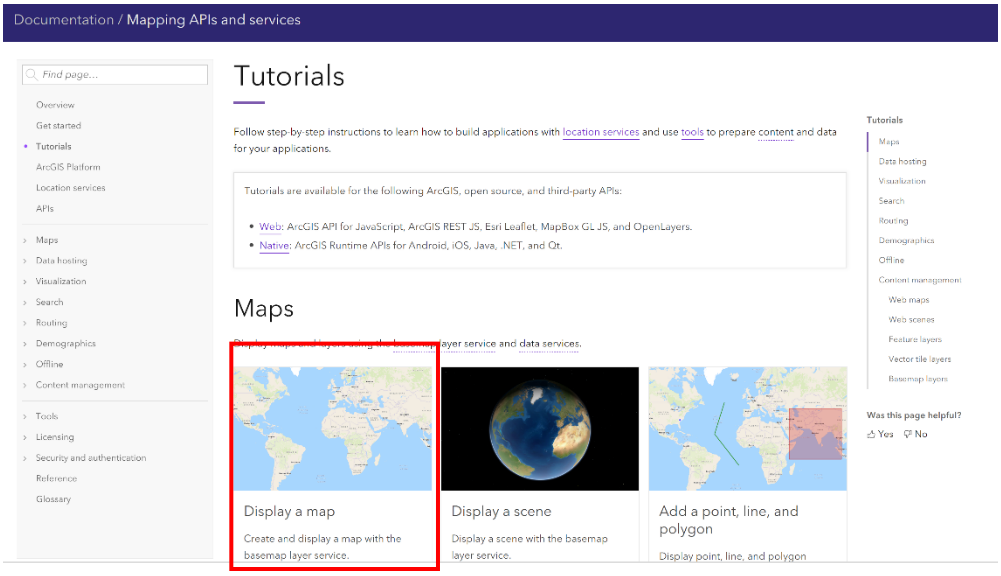
Now let's assume I want to prepare chocolate cake (in this case our map). I know that the basic requirements are floor, sugar, honey, chocolate etc (in this case our required module). Each of these ingredients has a function in our cake. For instance, sugar makes the cake sweet, chocolate is what makes it a chocolate cake, etc, thus, to make this cake, we need to add all these before putting it in the oven. The order in which the ingredients are added or placed on the cake is very important (in the case of our API, the placement of elements in the html script is very important). The proper integration of these elements would eventually help us prepare our delicious chocolate cake (web map).

Thus, when creating our map, we need to look out for the required module, the function of the module, and the placement of the syntax in the HTML script, which will thus lead to the proper functioning of our app.

So now we are going to prepare our base map (Chocolate Cake).

1. Select "Display a map"
2. Under Web API select "ArcGIS API for JavaScript".
3. Scroll to the bottom of the page to "create a map view"
4. Copy the API in that box and paste it into visual studios.
5. Save it as an html.
6. Open it in a browser

1



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Display maps and layers using the basemap layer service and data services.

Display a map

Create and display a map with the basemap layer service.

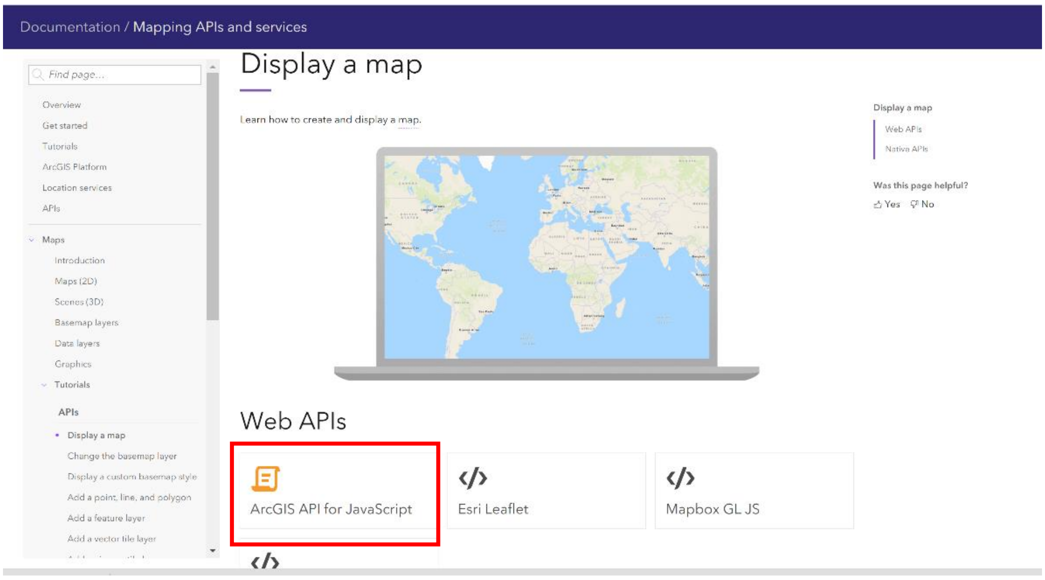
Display a scene

Display a scene with the basemap layer service.

Add a point, line, and polygon

Display point, line, and polygon

2



Display a map

Learn how to create and display a map.

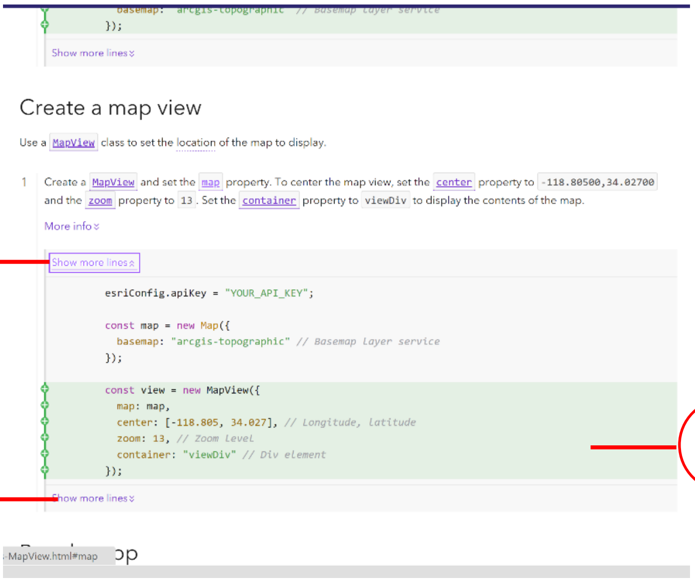
Web APIs

ArcGIS API for JavaScript

Esri Leaflet

Mapbox GL JS

3



```
      basemap: "arcgis-topographic" // Basemap layer service
    });
```

Show more lines

Create a map view

Use a MapView class to set the location of the map to display.

1 Create a MapView and set the map property. To center the map view, set the center property to -118.80500,34.02700 and the zoom property to 13. Set the container property to viewDiv to display the contents of the map.

More info

Show more lines

```
    esriConfig.apiKey = "YOUR_API_KEY";

    const map = new Map({
      basemap: "arcgis-topographic" // Basemap layer service
    });

    const view = new MapView({
      map: map,
      center: [-118.805, 34.027], // Longitude, latitude
      zoom: 13, // Zoom level
      container: "viewDiv" // Div element
    });
```

Show more lines

Expand here

Copy API

Expand here

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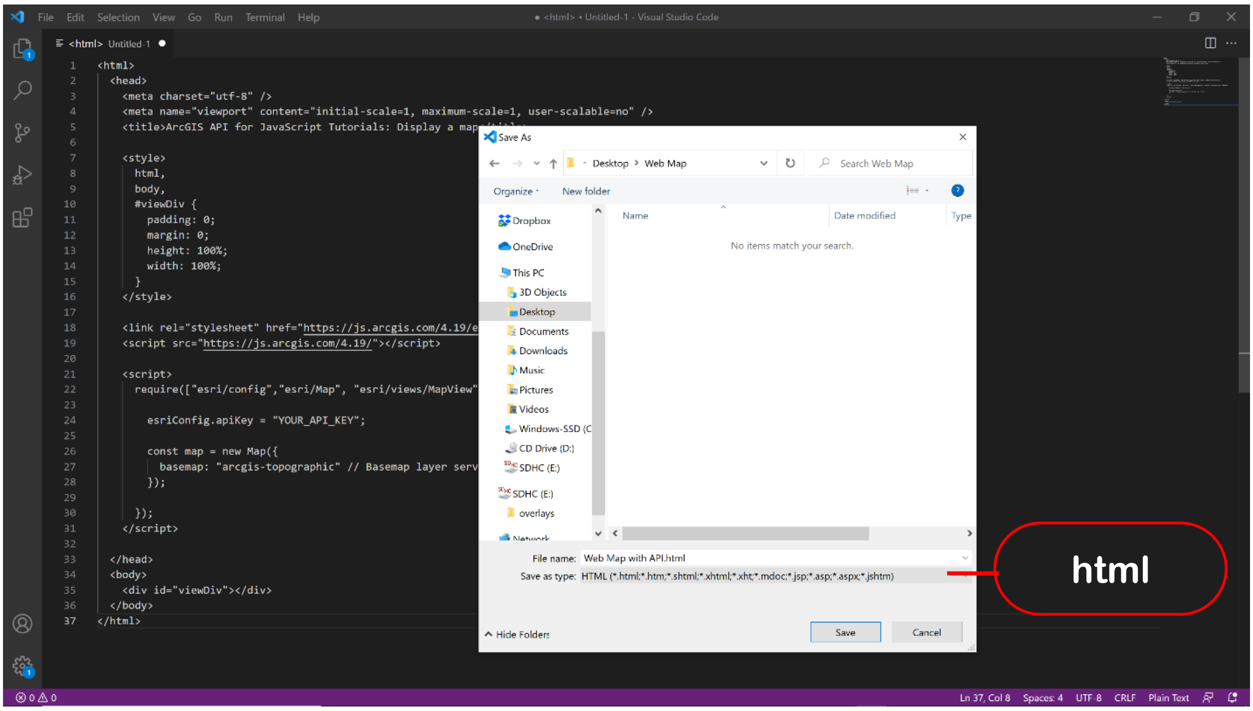
4

5

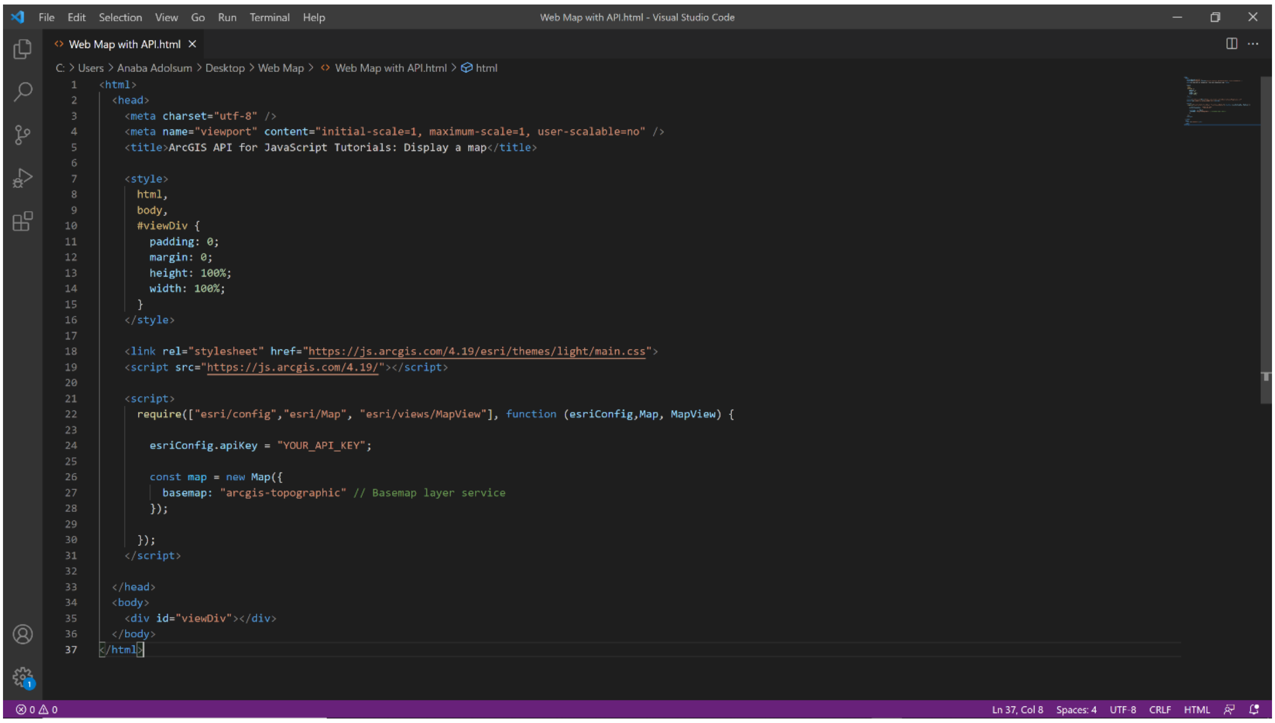


```
<html>
  <head>
    <meta charset="utf-8" />
    <meta name="viewport" content="initial-scale=1, maximum-scale=1, user-scalable=no" />
    <title>ArcGIS API for JavaScript Tutorials: Display a map

    <style>
      html,
      body,
      #viewDiv {
        padding: 0;
        margin: 0;
        height: 100%;
        width: 100%;
      }
    </style>

    <link rel="stylesheet" href="https://js.arcgis.com/4.19/e
    <script src="https://js.arcgis.com/4.19/"></script>

    <script>
      require(["esri/config","esri/Map", "esri/views/MapView"

        esriConfig.apiKey = "YOUR_API_KEY";

        const map = new Map({
          basemap: "arcgis-topographic" // Basemap layer serv
        });

      });
    </script>

  </head>
  <body>
    <div id="viewDiv"></div>
  </body>
</html>
```

File name: Web Map with API.html

Save as type: HTML (*.html;*.htm;*.shtml;*.xhtml;*.xht;*.mdoc;*.jsp;*.asp;*.aspx;*.jshtm)

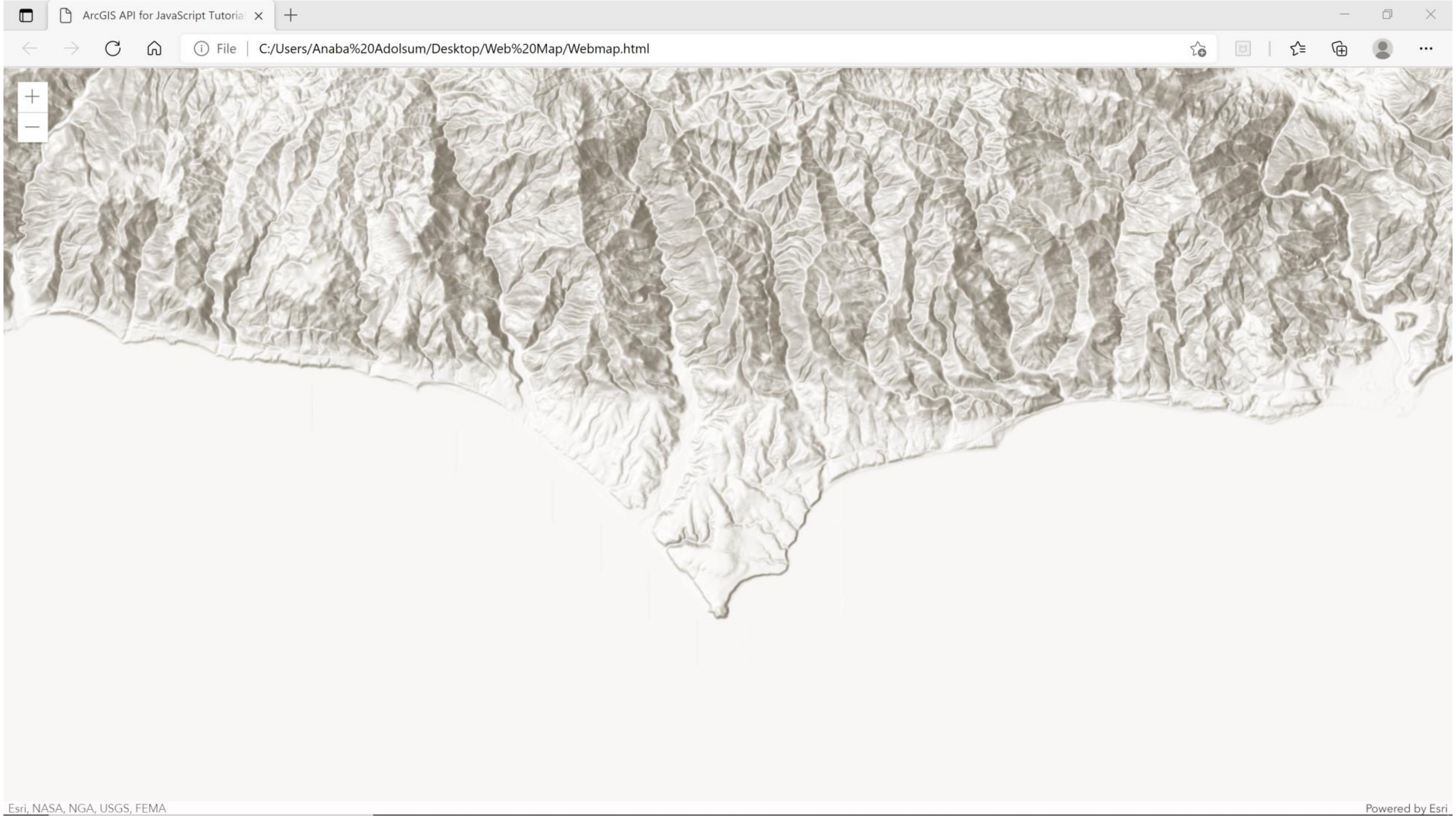
5


File Edit Selection View Go Run Terminal Help
Web Map with API.html - Visual Studio Code
Web Map with API.html
C: > Users > Anaba Adolsum > Desktop > Web Map > Web Map with API.html > html
Ln 37, Col 8 Spaces: 4 UTF-8 CRLF HTML

```
<html>
  <head>
    <meta charset="utf-8" />
    <meta name="viewport" content="initial-scale=1, maximum-scale=1, user-scalable=no" />
    <title>ArcGIS API for JavaScript Tutorials: Display a map</title>

    <style>
      html,
      body,
      #viewDiv {
        padding: 0;
        margin: 0;
        height: 100%;
        width: 100%;
      }
    </style>

    <link rel="stylesheet" href="https://js.arcgis.com/4.19/esri/themes/light/main.css">
    <script src="https://js.arcgis.com/4.19/"></script>

    <script>
      require(["esri/config","esri/Map", "esri/views/MapView"], function (esriConfig,Map, MapView) {

        esriConfig.apiKey = "YOUR_API_KEY";

        const map = new Map({
          basemap: "arcgis-topographic" // Basemap layer service
        });

      });
    </script>

  </head>
  <body>
    <div id="viewDiv"></div>
  </body>
</html>
```

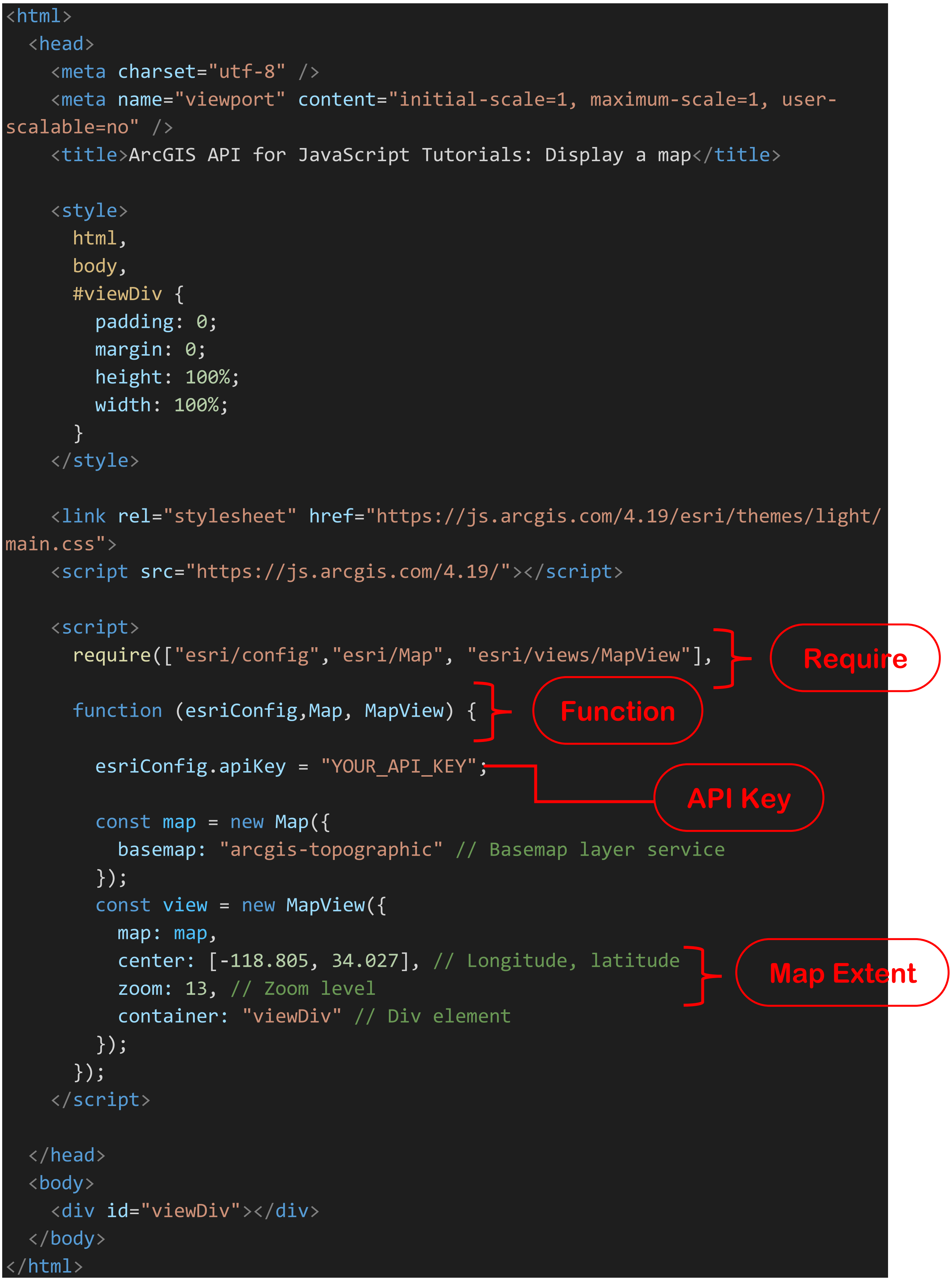
Text become coloured after they are saved as html.

6


ArcGIS API for JavaScript Tutorial
File
C:/Users/Anaba%20Adolsum/Desktop/Web%20Map/Webmap.html
+
—
Esri, NASA, NGA, USGS, FEMA
Powered by Esri

The saved API when displayed in a browser will look as displayed above.

Now to review the code in detail



```
<html>
  <head>
    <meta charset="utf-8" />
    <meta name="viewport" content="initial-scale=1, maximum-scale=1, user-scalable=no" />
    <title>ArcGIS API for JavaScript Tutorials: Display a map</title>

    <style>
      html,
      body,
      #viewDiv {
        padding: 0;
        margin: 0;
        height: 100%;
        width: 100%;
      }
    </style>

    <link rel="stylesheet" href="https://js.arcgis.com/4.19/esri/themes/light/main.css">
    <script src="https://js.arcgis.com/4.19/"></script>

    <script>
      require(["esri/config","esri/Map", "esri/views/MapView"],

      function (esriConfig,Map, MapView) {

        esriConfig.apiKey = "YOUR_API_KEY";

        const map = new Map({
          basemap: "arcgis-topographic" // Basemap layer service
        });
        const view = new MapView({
          map: map,
          center: [-118.805, 34.027], // Longitude, latitude
          zoom: 13, // Zoom level
          container: "viewDiv" // Div element
        });
      });
    </script>

  </head>
  <body>
    <div id="viewDiv"></div>
  </body>
</html>
```

NB: if you already have a webpage, that is, you have already created the structure of an html doc, with pre-existing html tags, head, style, script, and body tags, then you do not need to copy the entire code. You only have to copy the content of those tags from the ArcGIS API site and paste them within the respective tag in your html document.

Have you noticed how, under the script section of the API, the elements in **require( )** and **function( )** are stated in the same order? From the API it can be notice that the base map requires an EsriConfig, a map and a map view. For every element stated in the require parenthesis, there is a relating function for it.

Under the section labelled map extent, the centre refers to the default centre of the map whenever it is opened. The values there represent the longitude and latitude. Therefore, if I wanted the default centre to be Ghana, I would change the centre to 0,0.

Where it is labelled API, you can get the API key from the dashboard, and replace it with the text.

NB: you can read the descriptions from the API site to understand the breakdown of the code.

Adding Other Elements to the Base Map

Search Widget

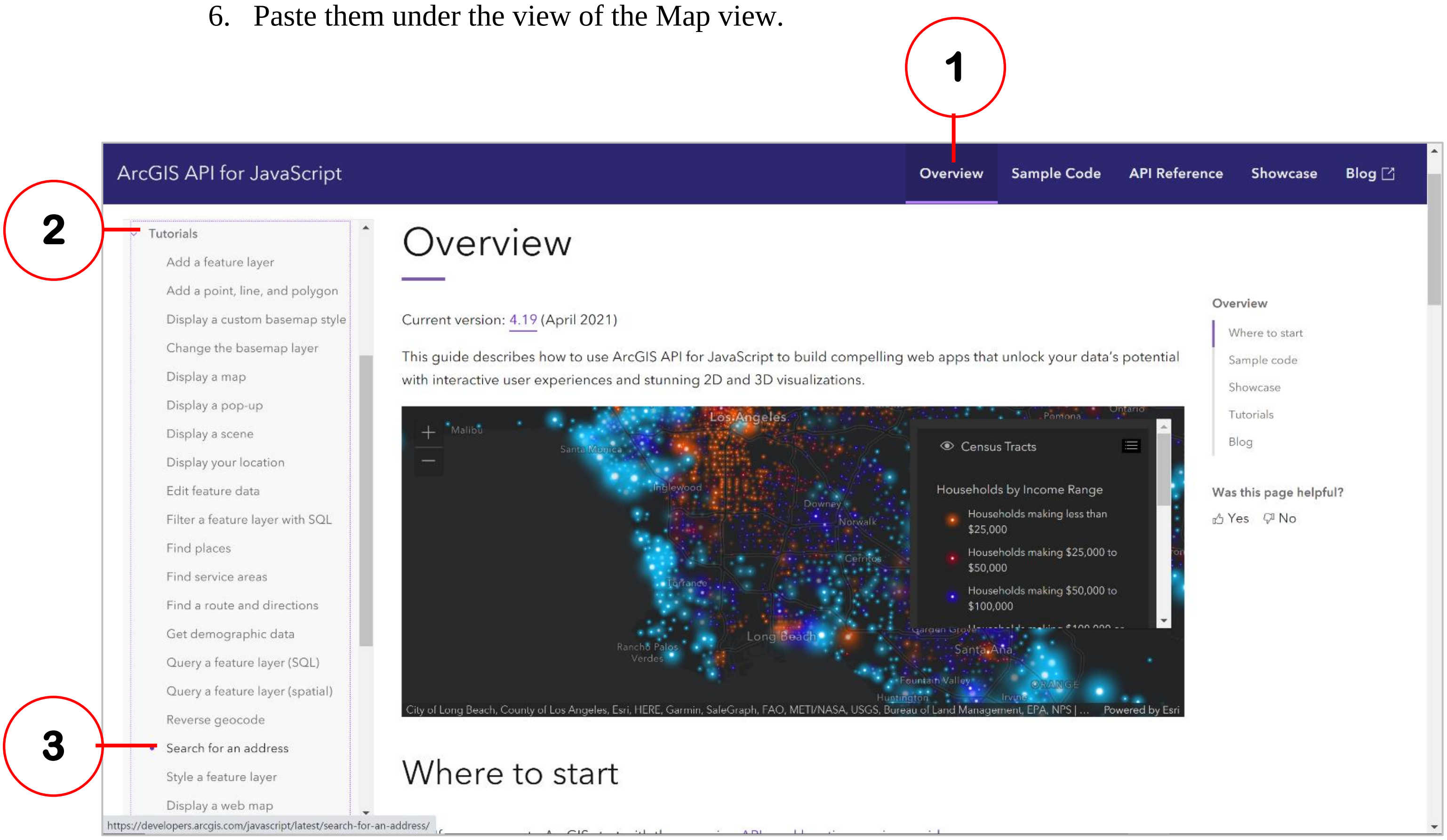
Currently, in our created web map, we do not have a search area. That means we would have to manually pan to find a specific country or region . To add the search bottom,

1. Go to Overview
2. Select Tutorials in the content list
3. Select “Search for Address”

4. Copy the **require** and **function**, and paste them in the require and function of your html doc.

5. Copy the **const search** widget and UI

6. Paste them under the view of the Map view.


1
2
3
ArcGIS API for JavaScript
Overview
Sample Code
API Reference
Showcase
Blog
Tutorials
Add a feature layer
Add a point, line, and polygon
Display a custom basemap style
Change the basemap layer
Display a map
Display a pop-up
Display a scene
Display your location
Edit feature data
Filter a feature layer with SQL
Find places
Find service areas
Find a route and directions
Get demographic data
Query a feature layer (SQL)
Query a feature layer (spatial)
Reverse geocode
Search for an address
Style a feature layer
Display a web map
Census Tracts
Households by Income Range
Households making less than $25,000
Households making $25,000 to $50,000
Households making $50,000 to $100,000
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Was this page helpful?
Yes
No
https://developers.arcgis.com/javascript/latest/search-for-an-address/

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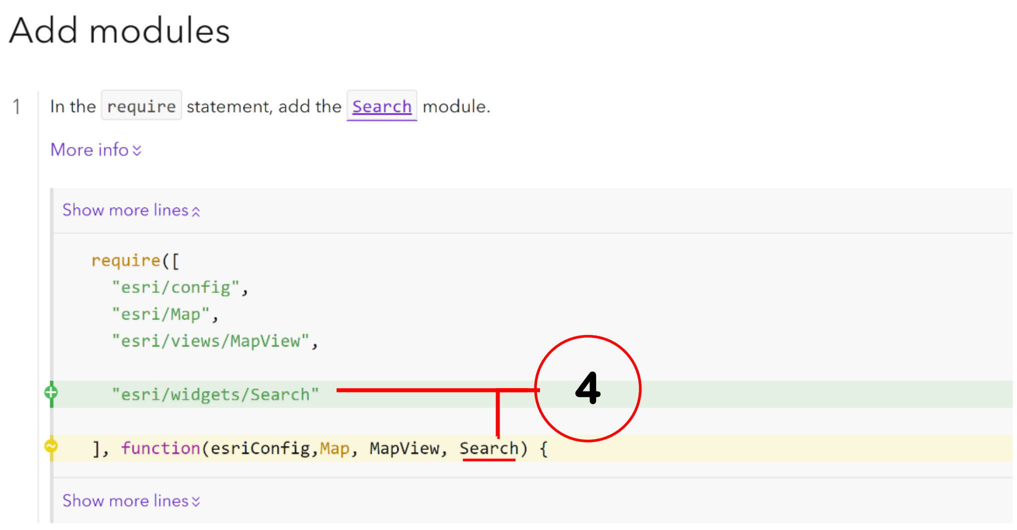
Where to start



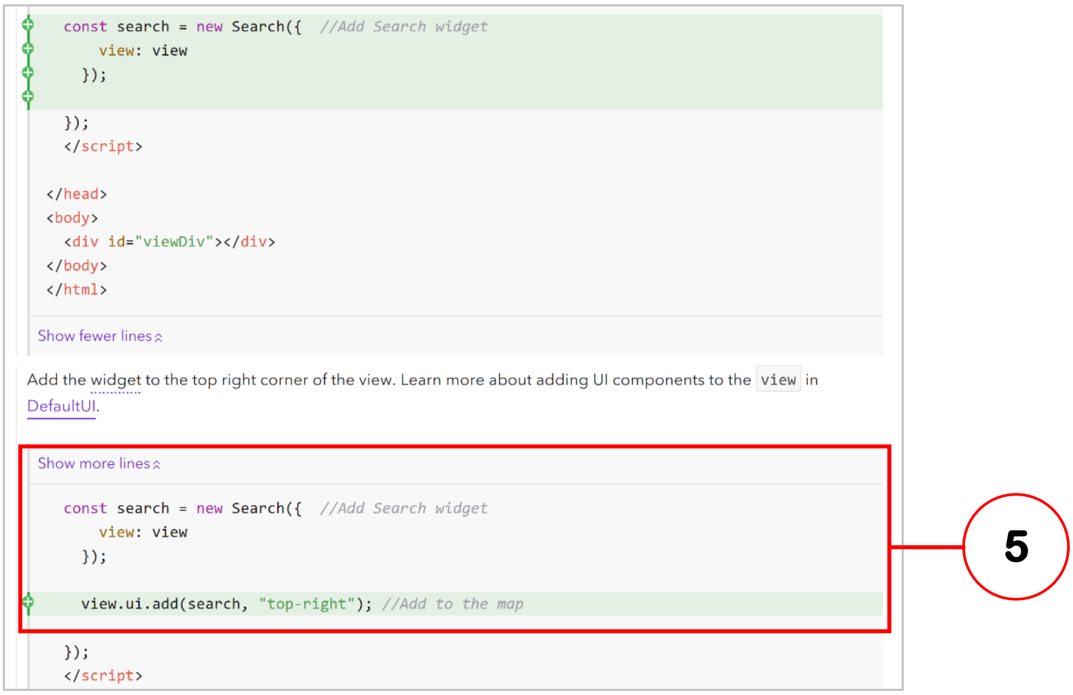
Add modules

1 In the `require` statement, add the Search module.

More info

```
require([
  "esri/config",
  "esri/Map",
  "esri/views/MapView",

  "esri/widgets/Search"

], function(esriConfig,Map, MapView, Search) {
```

NB: only copy the models for the search widget. We already have the other widgets from our base map.



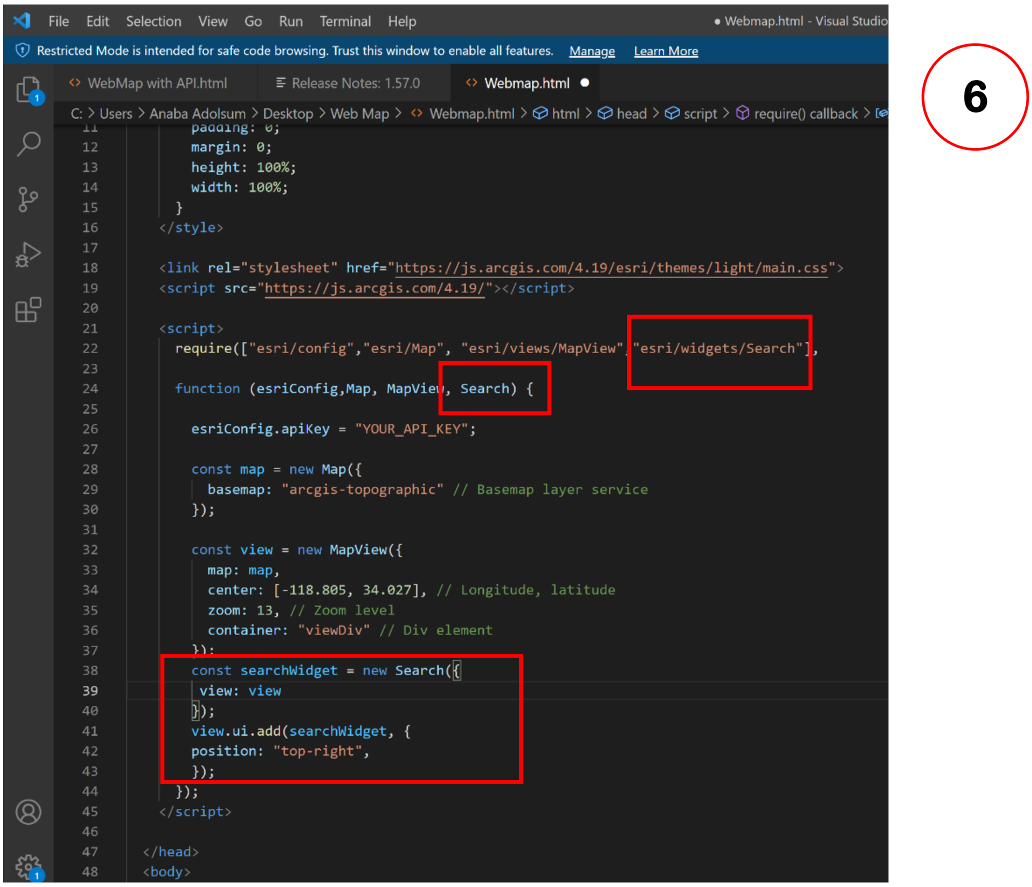
```
    const search = new Search({  //Add Search widget
        view: view
      });

    });
    </script>

  </head>
  <body>
    <div id="viewDiv"></div>
  </body>
  </html>
```

Show fewer lines

Add the widget to the top right corner of the view. Learn more about adding UI components to the `view` in DefaultUI.

Show more lines

```
    const search = new Search({  //Add Search widget
        view: view
      });

      view.ui.add(search, "top-right"); //Add to the map

    });
    </script>
```

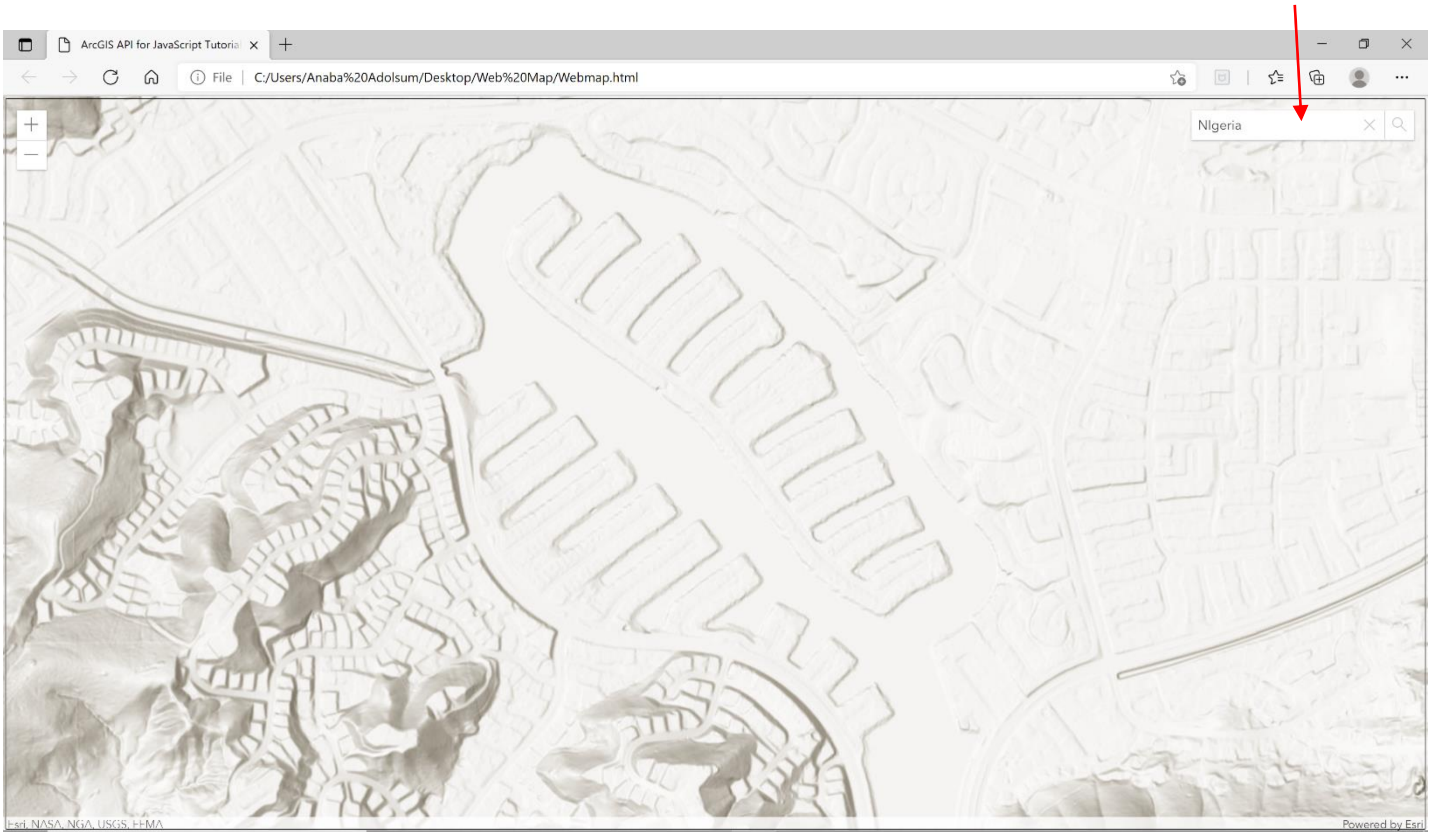


File
Edit
Selection
View
Go
Run
Terminal
Help
● Webmap.html - Visual Studio
WebMap with API.html
Release Notes: 1.57.0
Webmap.html
C: > Users > Anaba Adolsum > Desktop > Web Map > Webmap.html > html > head > script > require() callback >

Restricted Mode is intended for safe code browsing. Trust this window to enable all features. Manage Learn More

```
        padding: 0;
        margin: 0;
        height: 100%;
        width: 100%;
      }
    </style>

    <link rel="stylesheet" href="https://js.arcgis.com/4.19/esri/themes/light/main.css">
    <script src="https://js.arcgis.com/4.19/"></script>

    <script>
      require(["esri/config","esri/Map", "esri/views/MapView","esri/widgets/Search"],

      function (esriConfig,Map, MapView, Search) {

        esriConfig.apiKey = "YOUR_API_KEY";

        const map = new Map({
          basemap: "arcgis-topographic" // Basemap layer service
        });

        const view = new MapView({
          map: map,
          center: [-118.805, 34.027], // Longitude, latitude
          zoom: 13, // Zoom level
          container: "viewDiv" // Div element
        });
        const searchWidget = new Search({
         view: view
        });
        view.ui.add(searchWidget, {
        position: "top-right",
        });
      });
    </script>

  </head>
  <body>
```

When the script is saved and run from the browser, you will notice a search bottom appears at the top-right corner of the map view, as depicted below:

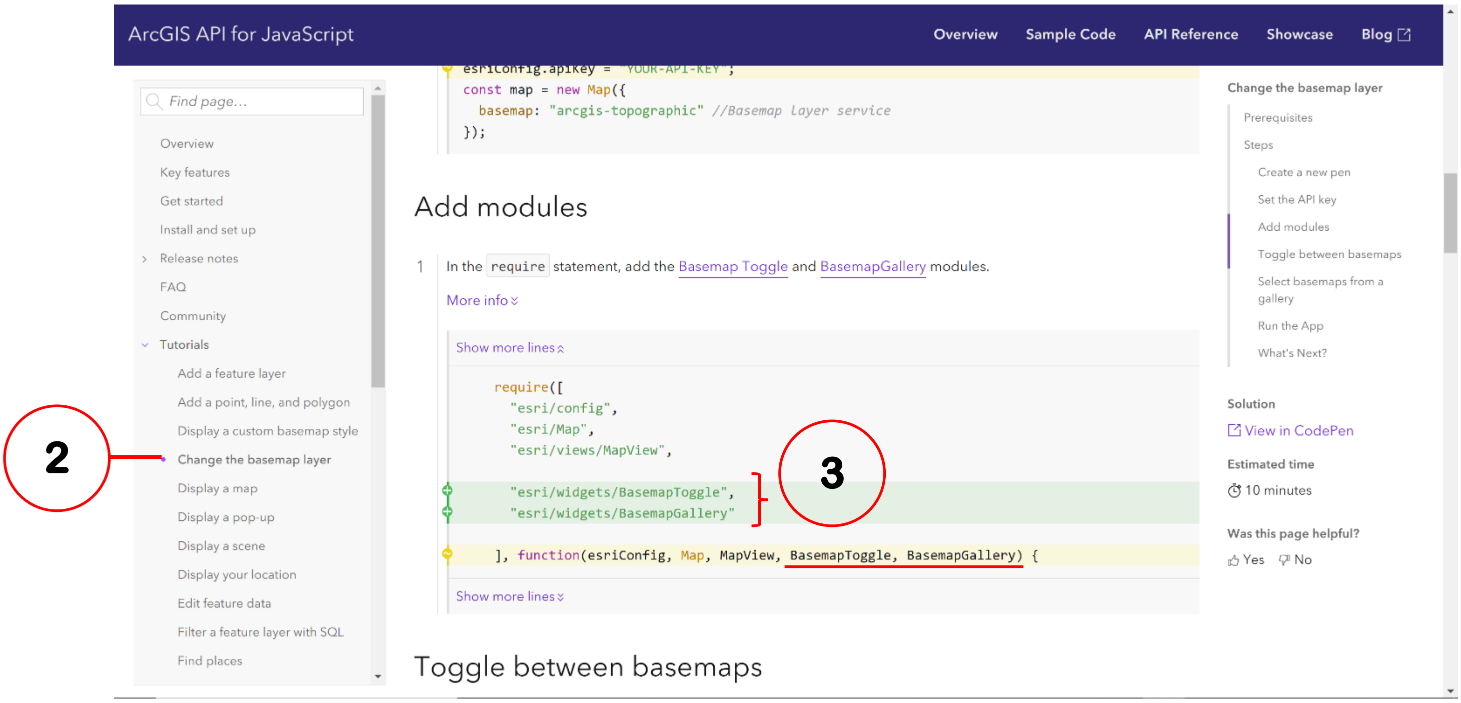

ArcGIS API for JavaScript Tutorial
File
C:/Users/Anaba%20Adolsum/Desktop/Web%20Map/Webmap.html
NIgeria
Esri, NASA, NGA, USGS, FEMA
Powered by Esri

Adding Toggle Base Map Layer

Let’s add one more feature to our map. We are going to add a base map layer, which allows us to change the base map to other satellite sources.

1. Go to the API content list
2. Search and select “Change the base map layer”
3. Copy the **BasemapToggle** and **BasemapGallery require** and **function**, and paste them in the require and function of your html doc.
4. Copy the UI for the BasemapToggle and BasemapGallery, as well as the const for the basemapToggle, and paste it beneath the last set of syntax in the script tag. In this case that is the search UI.

5. Save and view the results of your webmap in the browser.



```
esriConfig.apiKey = "YOUR-API-KEY";
const map = new Map({
  basemap: "arcgis-topographic" //Basemap layer service
});
```

Add modules

1 In the `require` statement, add the Basemap Toggle and BasemapGallery modules.

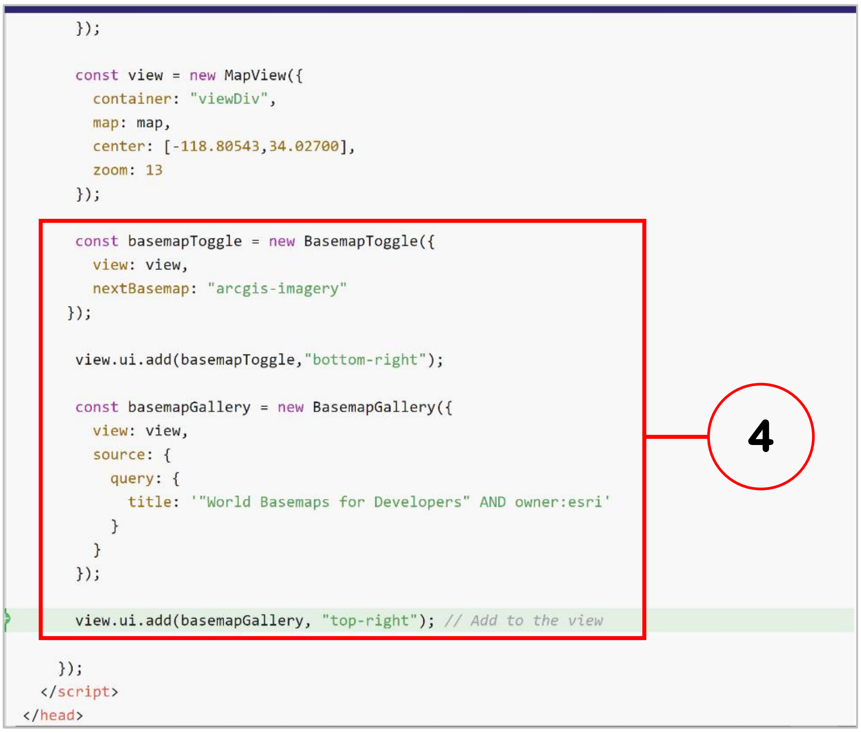
More info

Show more lines

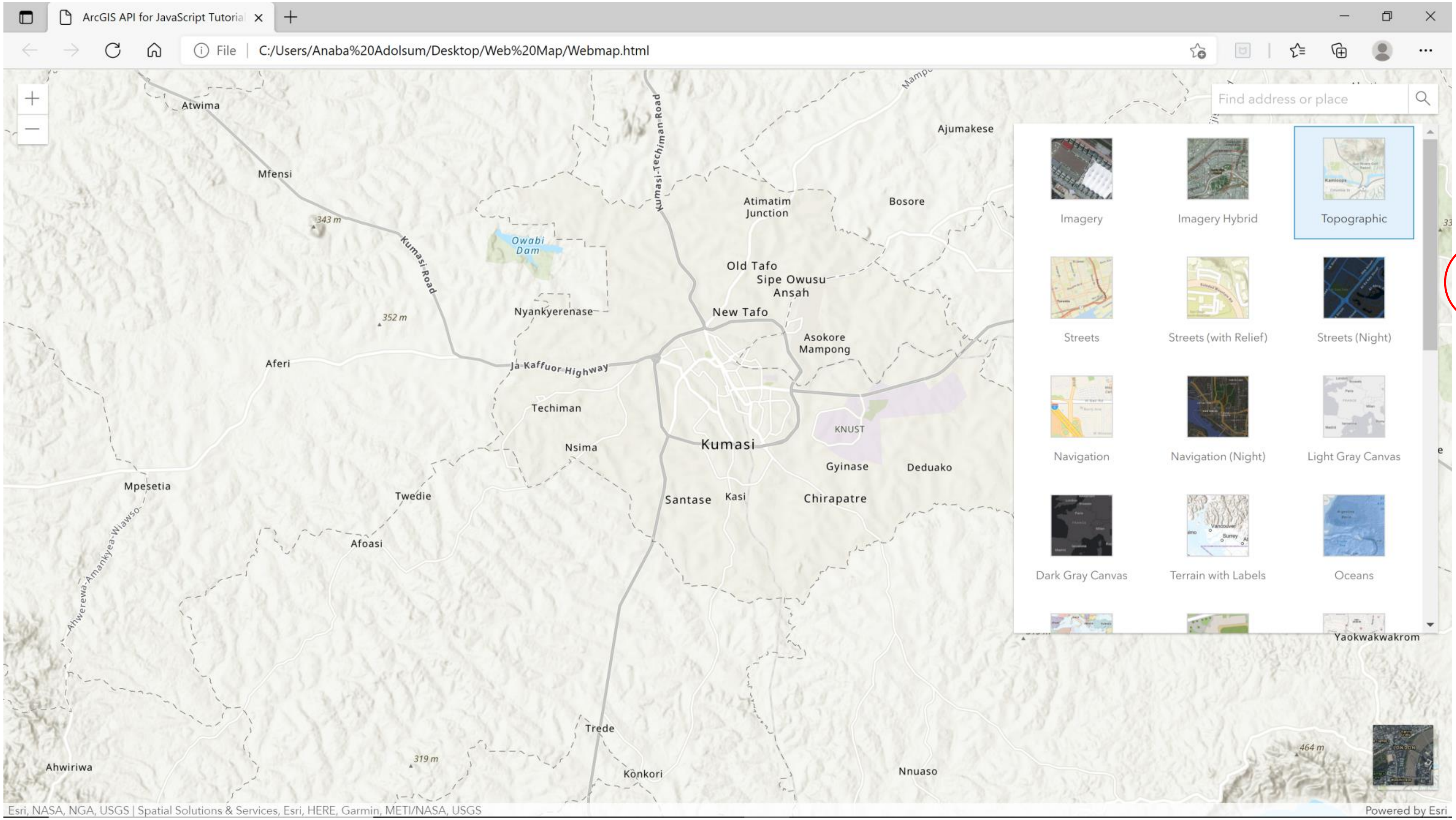
```
require([
  "esri/config",
  "esri/Map",
  "esri/views/MapView",

  "esri/widgets/BasemapToggle",
  "esri/widgets/BasemapGallery"

], function(esriConfig, Map, MapView, BasemapToggle, BasemapGallery) {
```

Show more lines

Toggle between basemaps



```
    });

    const view = new MapView({
      container: "viewDiv",
      map: map,
      center: [-118.80543,34.02700],
      zoom: 13
    });

    const basemapToggle = new BasemapToggle({
      view: view,
      nextBasemap: "arcgis-imagery"
   });

    view.ui.add(basemapToggle,"bottom-right");

    const basemapGallery = new BasemapGallery({
      view: view,
      source: {
        query: {
          title: '"World Basemaps for Developers" AND owner:esri'
        }
      }
    });

    view.ui.add(basemapGallery, "top-right"); // Add to the view

  });
</script>
</head>
```



5

The final output of your map should look like this. With a search bottom, a basemap gallery and a map toggler.

NB: if your Basemap gallery does not show, or it says Basemaps unavailable, then it means you haven't specified your API key in the html code.

To get the API key, go to the dashboard, and under the dashboard, select API key. You can either create a new API Key or use an existing key.

Notes

To add extra elements, you have to find the necessary API's and perform the same routine as indicated in the manual.

If you do not know the exact location of a particular feature search for it or use the API Reference.

And kindly take note of the order and positions of all API's being copied and pasted. Also pay attention to the comma's (,), full stops (.) and parenthesis being used by the JavaScript API.

Final Script

The final script for the guide should be as displayed below:

```
<html>
  <head>
    <meta charset="utf-8" />
    <meta name="viewport" content="initial-scale=1, maximum-scale=1, user-
scalable=no" />
    <title>ArcGIS API for JavaScript Tutorials: Display a map</title>

    <style>
      html,
      body,
      #viewDiv {
        padding: 0;
        margin: 0;
        height: 100%;
        width: 100%;
      }
    </style>
  <link rel="stylesheet" href="https://js.arcgis.com/4.19/esri/themes/light/
main.css">
  <script src="https://js.arcgis.com/4.19/"></script>

  <script>
   require(["esri/config","esri/Map", "esri/views/MapView","esri/widgets/Se
arch", "esri/widgets/BasemapToggle","esri/widgets/BasemapGallery"],

   function (esriConfig,Map, MapView, Search,BasemapToggle, BasemapGallery)
 {

    esriConfig.apiKey = "AAPK9078fe7292874081bd3dd0b07b0768daHx0KK_w9Fr-
uCXHnozxVvzlRVxWaONFz6UDDXf17ZwKqIn_9da7appkGbHh7Y64F";

    const map = new Map({
     basemap: "arcgis-topographic" // Basemap layer service
    });

    const view = new MapView({
     map: map,
     center: [0, 8], // Longitude, latitude
     zoom: 9, // Zoom level
     container: "viewDiv" // Div element
    });
    const searchWidget = new Search({
     view: view
    });
    view.ui.add(searchWidget, {
    position: "top-right",
    });
    const basemapToggle = new BasemapToggle({
    view: view,
    nextBasemap: "arcgis-imagery"
    });

    view.ui.add(basemapToggle,"bottom-right");

    const basemapGallery = new BasemapGallery({
    view: view,
    source: {
     query: {
      title: '"World Basemaps for Developers" AND owner:esri'
     }
    }
   });

   view.ui.add(basemapGallery, "top-right"); // Add to the view
```

```
    });
    </script>

  </head>
  <body>
    <div id="viewDiv"></div>
  </body>
</html>
```