

# ArcGIS Web Development

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MEAP



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# Welcome

Thank you for purchasing the MEAP for *ArcGIS Web Development*. It's been a great experience to get to this point and I'm excited to make this book a valuable resource when it is released. This book is an intermediate level book for current web developers that want to integrate mapping technologies into their current web development or GIS professionals looking to branch their skillsets to include web development using the ArcGIS API for JavaScript.

A lot of care has been put into making the content of the book as approachable as possible for all readers. Quite a bit of thought went into how to provide technical details that lay a good foundation to build on when using the ArcGIS API for JavaScript.

We're releasing the first three chapters and Appendix A to start. Chapter 1 covers some introductory material on GIS as well as how it relates to building web applications with ArcGIS API for JavaScript.

In chapter 2, we introduce some core concepts of the ArcGIS API for JavaScript and start writing code that builds web applications. We discuss the vector and raster data and how that translates into a web experience as well as cover quite a bit of detail about working with *FeatureLayers* in the ArcGIS API for JavaScript.

Chapter 3 covers some basics of how to work directly with ArcGIS Server REST API and how it may be used to build a custom widget, in this case a legend and table of contents widget. We then dive into an introduction on how to use the Dojo AMD loader for modular JavaScript development. We finish off the chapter by introducing the Geometry Service and how to use it to perform some spatial analysis tasks in the browser.

Appendix A provides resources on the local server environments needed to be able to develop with the ArcGIS JavaScript API as well as a quick explanation of where to find the source code for the book.

Looking ahead, part 2 of the book will cover building a real world application intended to be used on mobile devices to collect some data and save it to ArcGIS Online. We'll briefly cover setting up an ArcGIS Developers account and how to build a *FeatureService* as well as build a version of the app meant for desktop browser use that will show an example of how you might reference collected GIS data to some other types of data sources.

As you're reading, I hope you'll take advantage of the Author Online forum. I'll be reading your comments and responding, and your feedback is helpful in the development process.

— Rene Rubalcava

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# 1

## *GIS as a tool*

### ***This chapter covers***

- What a GIS is and how it's used
- The significance of spatial applications
- Trends for pros and opportunities for beginners
- Parts of a GIS web application

Walk around almost any public space and you'll most likely see people staring at their smartphones, updating their status, or looking for the closest taco joint. You may walk down the aisles of a nonlocal supermarket and notice that one ethnic food aisle is larger than others compared to other markets. You may have shopped for a house online, and you were able to view homes in your area and even had the ability to see nearby schools. When shopping for a car online, you can usually limit the search to within so many miles of a zip code. Formerly, a paper map book was an essential item in every vehicle, but today drivers keep a GPS (Global Positioning System) on the dashboard or have a system that speaks to them, directing them when to turn. If you happen to be following directions on paper, chances are you printed them from an online map. Where we are, and our understanding of location, has an impact on our daily lives. Location has become a key component of the way we get many tasks done. A simple map can be a driving force in delivering information, sometimes in the most subtle ways.

This chapter gives you a quick overview on some key pieces of information for this book.

- The ArcGIS platform.
- Why you should consider learning how to add spatial capabilities to your applications.
- Benefits of the ArcGIS API for JavaScript.
- Dojo Toolkit and how it relates to the ArcGIS API for JavaScript.

- Useful GIS concepts.

There are volumes of books written on the subject of GIS alone, but for our purposes we'll discuss a bit about what GIS means and how location-aware applications impact our daily lives.

## 1.1 GIS: here, there, everywhere

For years, a geographic information system (GIS) was something used by academics and government agencies for studies or infrastructure purposes. GIS is “a system designed to capture, store, manipulate, analyze, manage, and present all types of geographical data.”<sup>1</sup> GIS is the way we work with spatial information. It's also a technology that's been used mainly in the realm of desktop computers, with large enterprise applications that required extensive training. This isn't too far from the case with desktop tools, but that would be another book.

As with most technology today, the World Wide Web has provided us with an explosion of the use of GIS tools. Since the mid-1990s, you can find addresses and get directions from internet websites like MapQuest. Projects like *Google Maps* and *OpenStreetMap* emerged a few years later to bring GIS to the masses, introducing the power of maps to everyday people. Esri, founded in 1969, has grown into a leading company providing GIS tools and services, including a suite of web mapping tools, which is why you're reading this book. Before we take a closer look at Esri's GIS offerings, let's sample the other tools available.

### 1.1.1 The GIS tools landscape

You have quite a few choices when it comes to developing web mapping applications with JavaScript, including some robust open-source options. Some options come in the form of an API, which is an interface for an underlying web service, like maps and directions.

#### What's a web service exactly?

The World Wide Web Consortium (W3C) defines web services as “a standard means of interoperating between different software applications, running on a variety of platforms and/or frameworks”.<sup>2</sup>

Google and MapQuest provide web mapping APIs that are popular for embedding maps and directions into websites. Microsoft offers a Bing mapping API to showcase its mapping data. Various open-source mapping libraries also have much to offer:

- OpenLayers is one popular open-source mapping library with a large community of users.

<sup>1</sup> [http://en.wikipedia.org/wiki/Geographic\\_information\\_system](http://en.wikipedia.org/wiki/Geographic_information_system)

<sup>2</sup> [www.w3.org/TR/ws-arch/](http://www.w3.org/TR/ws-arch/)

- Leaflet is another mapping library that has grown in popularity due to its ease of use and focus on performance for mobile browsers.
- Modest Maps is a super-lightweight mapping library that displays interactive maps and does it well.

This list is a sampling of open-source options for building web mapping applications, and I encourage you to try them out. The explosion of mapping in the browser has only increased the importance of location for every day users. Personally, when I am out running errands, my phone can keep me updated as to how long it will take me to get home based on my current location and traffic conditions. That is pure location-awareness in action.

GIS plays a large role in many areas of technology today. The basic concept of simply knowing the location of something can be critical in large asset management systems that track construction and maintenance information of certain infrastructures such as water and power can be incredibly beneficial. It is commonly used in crime analyses to assist local law enforcement to focus their resources. GIS is also used to project population growth in urban areas to help determine future infrastructure needs. GIS is constantly used to assist the public when a disaster strikes such as mapping out damage after storms and floods.

Looking at the various web-mapping APIs available to developers other than the ArcGIS API for JavaScript that we discussed earlier in this chapter, such as OpenLayers and Leaflet, you may be wondering which is the better choice; Proprietary or open-source. This decision can be made on many differing factors, but many times it boils down to preference. Are you working with data that is in an existing ArcGIS database? Are you working with services in an existing ArcGIS Server? Is the entire GIS ecosystem being built from scratch? What is the budget? Are there any regulating guidelines on vendors? Do you require on-call customer support? There are varying advantages and disadvantages to each choice. A few of these pros and cons are listed in Table 1.1.

**Table 1.1 Pros and Cons of Proprietary and Open-Source Web-Mapping.**

	<b>Proprietary</b>	<b>Open-Source</b>
Cost	Infrastructure can get expensive. API cost free.	Infrastructure and API cost free.
Community Support	Available in Esri forums.	Quite extensive.
Professional Support	Available with ArcGIS Licensing.	Can be purchased from various providers.

The debate of whether or not to use a proprietary web-mapping API versus an open-source API can get as heated as most open-source debates. In my experience, it has usually boiled down to *what is currently in place and what are we willing to spend to get something done quickly?* This book assumes you as a developer will be working with ArcGIS Server or

ArcGIS Online services and thus, it would be make sense to work with the ArcGIS API for JavaScript.

The focus of this book is the ArcGIS API for JavaScript, which isn't an open-source toolkit, but was developed by Esri, a leader in GIS technologies. It's a powerful library built to interact with ArcGIS Server.

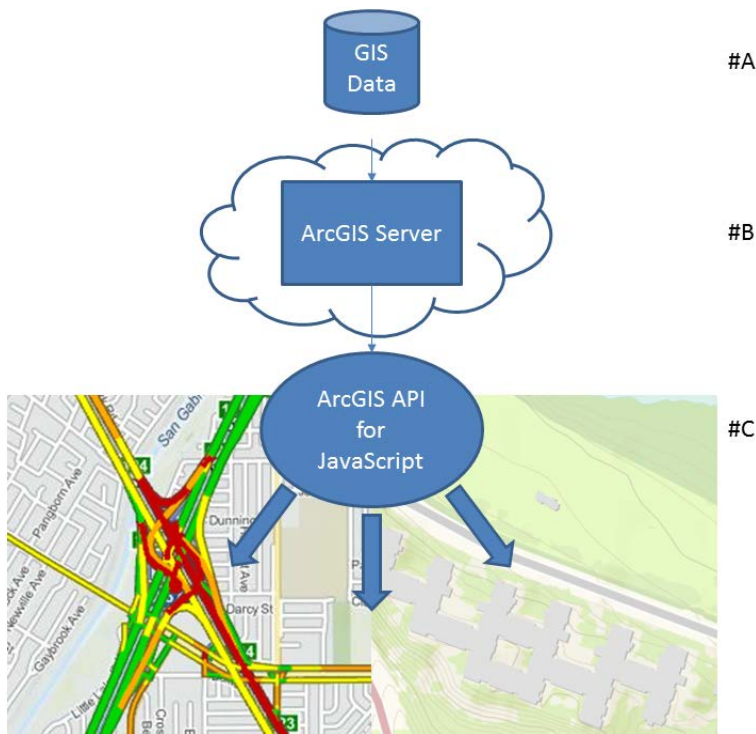
### **1.1.2 Introducing the ArcGIS platform**

ArcGIS is a platform for providing location-based tools and functionality that range from desktop to server and mobile. The ArcGIS API for JavaScript is a powerful library built to interact with *ArcGIS Server*, a gateway to GIS data that can be shared on the web; it provides access to GIS data via web services. I'll discuss these services in more detail later in chapter 2, but for now, all you need to know is that the ArcGIS API for JavaScript is designed to interact with those services so you can build powerful web mapping applications.

**TIP** Before I get into the details of the ArcGIS API for JavaScript, you may want to visit <http://esriurl.com/js> for more information.

The ArcGIS API for JavaScript is a natural choice if you're working with ArcGIS Server. The JavaScript API seamlessly translates the information from ArcGIS Server to provide a rich web mapping experience. Figure 1.1 shows how GIS data that previously was accessible only to a few users can now be shared using ArcGIS Server and the ArcGIS API for JavaScript.





**#A** GIS data usually resides on a database and isn't directly accessible to the web

**#B** ArcGIS Server is a gateway for viewing GIS data in external clients, such as a web browser

**#C** The ArcGIS API for JavaScript does the work of providing map services to the browser

Figure 1.1 Producing maps with ArcGIS API for JavaScript

The purpose of this book is to introduce you to the basics of the ArcGIS API for JavaScript and how use the API to interact with various ArcGIS services. You'll also look at how to interact directly with ArcGIS Server if you need information that you can't easily use the API for.

You'll learn how to extend the API to build your own tools to meet your needs.

The second half of the book covers how to build a more involved web mapping application that collects data in a field application. The term "field," in this context, means "not behind a desk." Field applications present their own unique challenges, which I'll cover in later chapters.

**NOTE** I'll cover aspects of how to use ArcGIS Server services with the API, but I won't cover how to install ArcGIS Server (which isn't required for this book), publish services, or create services using ArcGIS for Desktop.

### **A look ahead**

In chapter 4, you'll set up a free ArcGIS Developer account so that you can create your own services for use in your application. You'll also use free services from ArcGIS Online, a cloud-based version of ArcGIS Server.

For now, let's broaden the discussion to talk more about what spatial applications are, and how the internet has changed what you expect from these applications. As developers (beginner or advanced), what does GIS bring to the table and why should you care?

### **1.1.3 Why care about spatial applications?**

My first car was small, it was old, and it was rusty, but it was mine, and I was excited to have my own ride to school, as I think my parents were as well. The first thing my father gave me when I got my car, after a brief yet stern word of caution about being a safe driver, was an awkward and heavy map book. As a kid, I remember sitting in the backseat of the car on long road trips, and my duty was to periodically flip the pages of an identical map book and point out what town was coming up or how many streets we needed to pass before making a right turn. I used to marvel at the detail each page provided, from the winding roads we'd already traveled to the upcoming hills I could look forward to. The map book was a staple in my travels as well as the travels of many others.

These days you may not rely on spiral-bound bricks of paper to navigate the road, but many people do rely on GPS, either on a smartphone or in the car. If you're using a paper map, you probably printed it from a website and folded it up in your pocket for later use.

Navigation isn't the only way our information-consuming society uses spatial information in our daily lives. For years, the retail industry has used your location for targeted advertising. From something as simple as the paper advertisements that fill your mailbox, to an application on your smartphone that can give you a coupon for a nearby restaurant without asking for it, location can be a key component to targeting an audience in a meaningful way. We constantly share messages, photos, and videos via mobile devices, and each of these bits of information we share carry with them location information. You can even play games on your smartphone that interact with your location, using real-world streets to direct you to victory. When a new fast-food restaurant is built, time has been put into analyzing the benefits of placing that restaurant at that location. A study was probably done to review the demographics of the area (for example, the average household income), proximity to freeways or major highways, average drive-time from major business areas, and more. Similar analyses also are done when new schools are built or new roads are paved. At the end of the day, location matters.

### **1.1.4 Trends in the GIS industry**

Previously, people who worked in the GIS industry needed the skills not only to analyzing data but also to employ cartography to display the data. Today, GIS professionals are

typically required to have an expanded skillset that allows them to adapt to challenges they face, but they needn't be versed in all aspects of using GIS. Professionals who prefer to focus on one particular aspect of GIS may not have masterful cartographic skills, rock-star spatial analysis skills, or ninja-level developer skills, but familiarity with all these skillsets is helpful. You may already be working in the GIS field or you may be a student looking forward to cutting your teeth in the job market. Or you may already have experience working with web applications and JavaScript and are looking to expand your skillset with a web mapping API. Whatever the case, anyone with a skillset in building location-based web applications can find many opportunities.

A cursory review of recent GIS-related job postings reveals that employers today are looking for employees who not only can analyze and work with data, but who also have programming knowledge. Programming skills could include a language like Python, which has cemented itself in the GIS industry as a staple in automating GIS analysis, thanks to some robust spatial libraries. Skills could also include languages like C# or Java, which are typically used to extend desktop tools or build web services. Employers also need current GIS professionals and developers who can use web technologies to provide quick and efficient access to much of the GIS data that has traditionally been inaccessible to the general public.

The web development aspect of using GIS is an exciting area not only for GIS professionals but also for anyone learning web development with maps. I started working with GIS in early 2002 as a drafting technician recruited into doing GIS technician work to help out with various projects. One of my tasks was manually adjusting hundreds of small boundaries. It was tedious, and I was unfamiliar with the tools, which at that time ranged from somewhat familiar drawing tools to some odd command-line tasks. I was asked to edit script files that added new menus to the software I used, which magically searched a database for related information. I was still green and didn't realize the power of the automation I was working with. Today, a majority of my time is spent doing GIS web development. I attend regular GIS conferences and local events, and I've noticed over the years the growing need for GIS professionals to have a basic understanding of programming to get daily tasks done. I've seen presentations include not only the analytic details of the way a project was completed but also the customizations that were done via programming tasks that were critical in completing the project. These customizations could be automating tasks or developing a web application to allow stakeholders to collaborate during the project lifecycle.

The goal of this book is to give you a solid working foundation of using the ArcGIS API for JavaScript to build web applications that meet the needs of the task at hand. This could be an application that's used by first responders during a natural disaster or a work-order application to keep track of work that's being done. A web application can be used in an office setting or on mobile devices, making it a flexible platform to work on.

Let's shift our focus to the structure of a GIS web mapping application.

## 1.2 Understanding the GIS bits

Various components contribute to building a web mapping application. On their own, each one is critical in the process. As shown in figure 1.2, all these components ultimately lead to one thing: a happy user, which means the data is communicated in a clear manner and provides meaning to the user.

The GIS data is behind the ArcGIS Server. To get to this data, you communicate with the ArcGIS Server via a collection of URL endpoints. You can communicate with these endpoints through a variety of methods, such as Silverlight and Flex, but this book's focus is on the ArcGIS API for JavaScript. This communication process, combined with your impeccable skills, leads to happy users. This method of communication is called a REST API, which will be discussed in more detail in section 1.2.2.

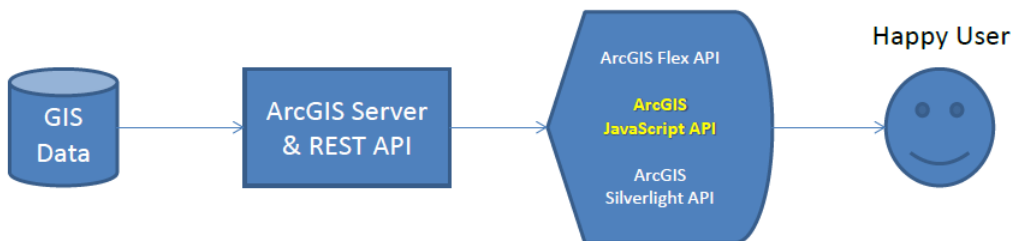


Figure 1.2 The pieces that make up a web mapping application

In this section, I'll introduce you to each of these components of building a web mapping application, starting with the key component: the data.

### 1.2.1 The what and the where of GIS data

Data is the starting point to a successful application. Someone has to compile the data, possibly analyzing and even digitizing (the process of using drawing tools) the data based on external sources. For example, a company or government agency will need to translate old, hand-drawn maps into a digital format, usually parcel or park boundaries. The data often is drawn based on aerial images, such as locations of trees or possible routes to navigate to areas without road access. Infrared aeriels frequently are used to find vegetation, which appears in hues of red in an infrared image. This method is used to look at the way areas of vegetation change over a certain period of time. Without data, you'd have nothing to display in a web mapping application.

This data can be stored in a few formats but usually resides in a database. Regardless of format, it's still data, and it's easier to manage a lot of data when it's kept in a database. This allows it to be searched quickly, backed up, and shared easily. To share this data, you could print out paper maps or you could email it back and forth in a digital format. Although still valid methods of sharing digital GIS data, today users expect to have quicker and easier

access to this type of information (see figure 1.3). This is where the need to share this data to the web comes into play.

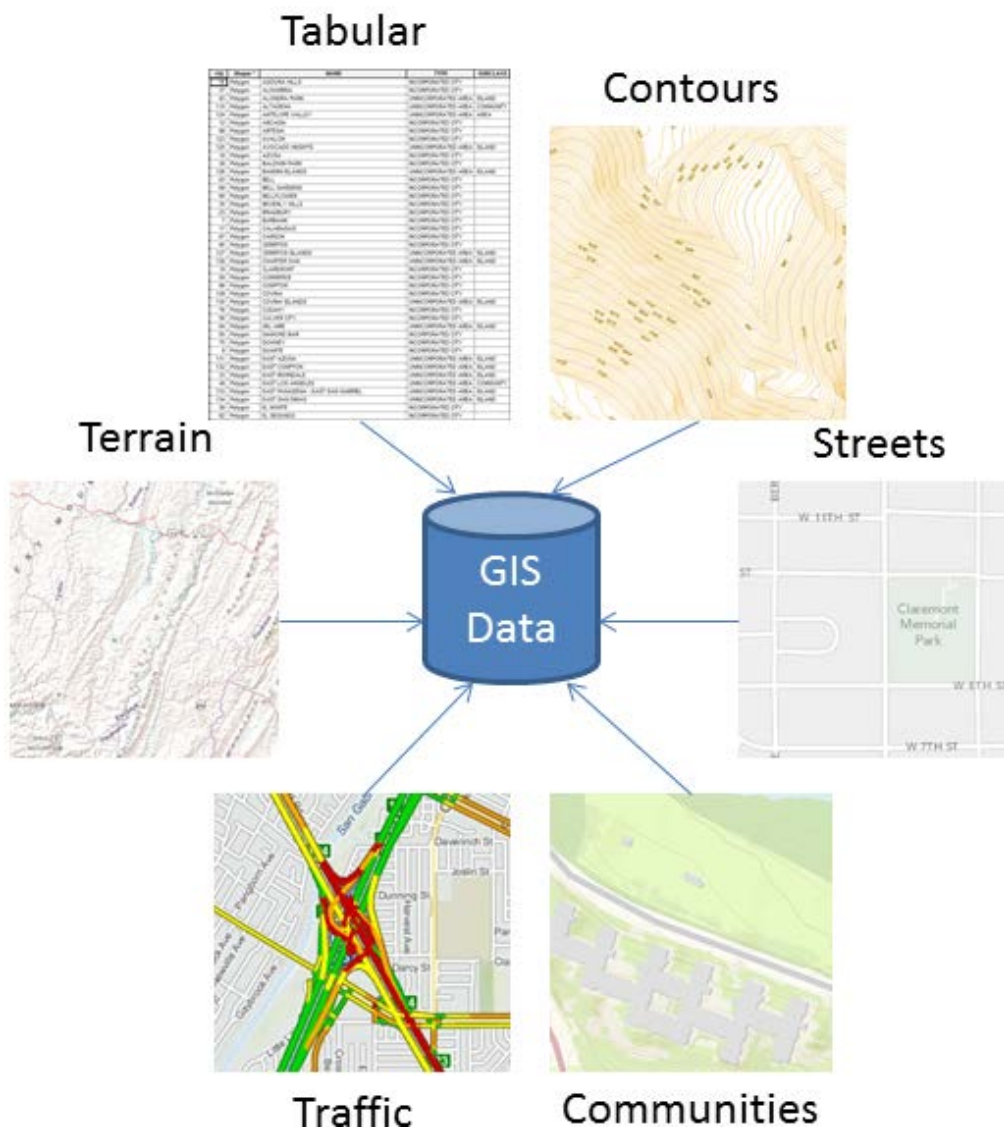


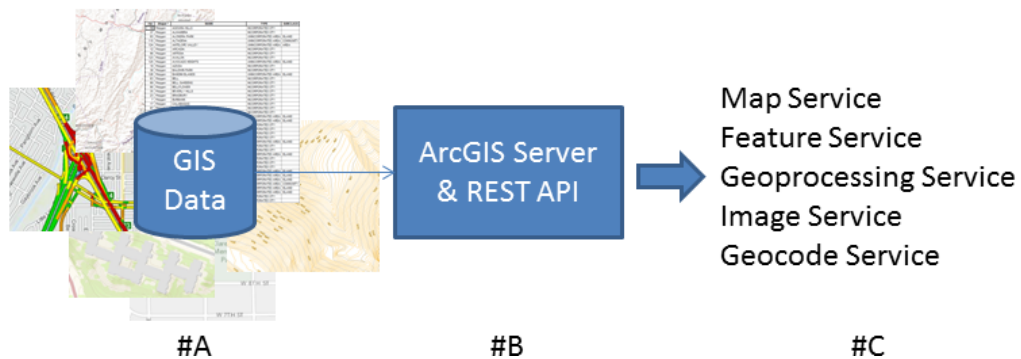
Figure 1.3 ArcGIS Server provides access to GIS data, which is comprised of different types of data, such as tabular, vector, terrain, streets, communities, and so on, via services.

With a wealth of valuable data to be shared, the next critical component of a web mapping application is a *web server*.

### 1.2.2 Serving GIS data: ArcGIS Server and the REST API

A web server's job, as many of you already know, is to serve data from a physical computer out to the World Wide Web so people can view it in their web browsers. An ArcGIS server performs specialized tasks, such as serving aerial imagery, which I'll cover briefly in the next chapter. Sharing data online is done through web services. A *web service* is a *URL*, pronounced *U-R-L*, that returns a web page, an image, or other form of data. This book focuses on data that's accessed via ArcGIS Server services.

ArcGIS Server is enterprise server software that provides a quick method to build web services that serve GIS data. It has more functionality than merely serving data, which I'll cover in later chapters, but all interaction is done through the REST (representational state transfer) API, which is an interface for interacting with the server (see figure 1.4).



**#A** GIS data can contain geometries, imagery, and tabular information

**#B** ArcGIS Server provides access to GIS data via the REST API

**#C** To access and process data on ArcGIS Server, you use the various services provided by the REST API

Figure 1.4 Data served via ArcGIS Server is made available as various services; each service has a specific purpose.

To properly communicate with the ArcGIS Server REST API, you use a specially designed web API—the next component of a web mapping application.

### 1.2.3 Choosing an ArcGIS web API

The ArcGIS Server REST API is the foundation for all the ArcGIS web APIs. A developer has a few choices when deciding to build a web application based on ArcGIS technology:

- *ArcGIS API for Flex*
- *ArcGIS API for Silverlight*

- *ArcGIS API for JavaScript*
- *and others ...*

The *ArcGIS API for Flex*, based on the Flex software development kit (SDK), used to be an Adobe product but has been open sourced in recent years. It's built on top of Flash technology and can be used to build nice, interactive applications. The *ArcGIS API for Silverlight* leverages Microsoft Silverlight to build applications that, similar to the Flex API, can provide fluid and interactive applications.

The drawbacks to both of these APIs are that they require users to have a browser plugin installed for each of them, and they don't work on the web browsers in mobile devices. This has led many developers to embrace the *ArcGIS API for JavaScript*. JavaScript runs on all browsers, with minor differences, and it also provides a fluid and interactive application.

All these web APIs are translators for the ArcGIS REST API, and they make it easy to interact with ArcGIS Server to provide data-rich web mapping applications. The web APIs may be built on different technologies, but once you learn one API, it's easy to pick up another one without much trouble. This workflow can be seen in figure 1.5.

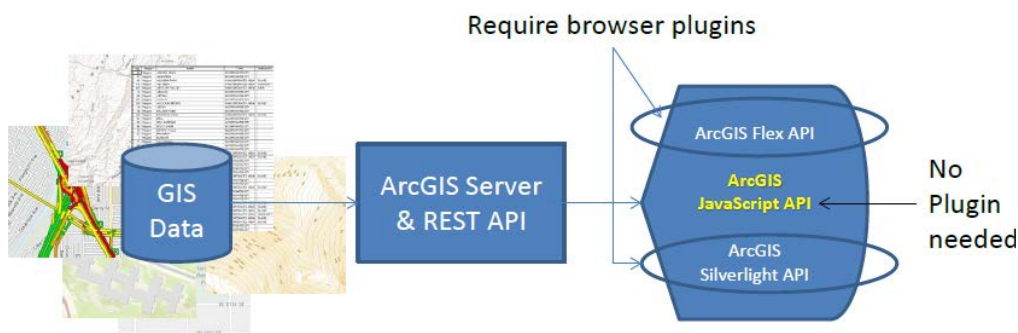


Figure 1.5 The ArcGIS API for JavaScript is the only API that doesn't require a browser plugin.

The ultimate goal of these various components is to make the user of the application happy. Providing an easy-to-use web mapping application that delivers the necessary data for the user to accomplish a task or find the right information without stumbling through the application is the key to a happy user.

Whether you're a seasoned GIS pro looking to enhance your skills with JavaScript or a JavaScript ninja who wants to add GIS web mapping notches to your belt, you'll want to be familiar with a few items before working with the ArcGIS API for JavaScript.

### 1.3 Things to know

No matter your level of competence in either GIS or JavaScript, you should know a few things to work with the ArcGIS API for JavaScript. I'll cover each of these items in detail over chapters 2 and 3, but I want to touch on them briefly in this section to keep things fresh:

- JavaScript stylistics
- GIS concepts

### 1.3.1 JavaScript, Dojo, and Dijit

This book is about using JavaScript to build web mapping applications, after all, but you don't need to be a JavaScript master to use this book. I'm don't explicitly cover what I consider JavaScript best practices when building your applications, but I provide code written in a style I think is best-suited for the task at hand. For example, you may, at times, use a single JavaScript file to build an application; at other times, you may load up to half a dozen JavaScript files.

#### DOJO AND AMD LOADING

The *Dojo Toolkit* is a popular JavaScript library that offers many tools for writing JavaScript, in particular for larger applications. The ArcGIS API for JavaScript is based on Dojo, so it's inevitable that you'll also learn Dojo as you begin using the API.

Dojo provides an extensive suite of tools that you can use in building your web mapping applications. I'll dig deeper into Dojo tools in chapters 2 and 3, but Dojo's use and how it applies to the ArcGIS API for JavaScript are something you should be aware of.

Another typical JavaScript stylistic choice is the way files are loaded. A common and still acceptable way to load JavaScript files to your web page is to use a `<script>` tag, as follows:

```
<script src="file1.js" type="text/javascript"></script>
<script src="file2.js" type="text/javascript"></script>
<script src="file3.js" type="text/javascript"></script>
```

Loading JavaScript files in this manner isn't wrong, and you need at least one `script` tag to load a file. But as you can imagine, as the application grows and the amount of JavaScript files grow, this method could get a bit unwieldy, not to mention that there's no guarantee that the JavaScript files will load in the order in which you place them on the page.

The ArcGIS API for JavaScript uses a particular method called asynchronous module definition, or AMD, which *loads your* JavaScript files on an as-needed basis. The reason for using it boils down to the fact that the ArcGIS API for JavaScript is built with the Dojo Toolkit. Dojo uses AMD to build applications, so AMD loading is another method you'll learn to build your applications. A quick example of AMD loading is shown here:

```
define('custom.module', ['dojo/_base/array'], function(arrayUtil) {      #A
    var sqItems = function(items) {
        return arrayUtil.map(items, function(item) {
            return item * item;
        });
    };
    return sqItems;
});
```

**#A Defines custom module and uses AMD to load other JavaScript files**



I'll cover more details of the AMD loader in chapter 3 when you build a custom widget.

### USING DIJIT

Dojo has a library called *Dijit*, which is used to build JavaScript components that provide an interface in a web application. The interface could be a form to enter information or it could be a calendar date-picker. A process is in place for building these custom components, which are commonly referred to as widgets. Using Dojo, a developer can create custom widgets using the Dijit libraries base set of tools that simplify the process and make writing reusable widgets much easier as an application grows. I'll cover custom widgets in chapters 3 and 4.

### 1.3.2 Introducing a tad of GIS

I'm focusing on building web mapping applications using the ArcGIS API for JavaScript, and although knowledge of GIS isn't a requirement to get into this subject, I want to review a few GIS concepts here:

- Interactive maps

An *interactive map* serves a specific purpose: *a map is there to show you where.*

Show you where what? Maps communicate location information: it could be streets, it could be neighborhoods, it could be homes for sale or how much income people make in certain cities, but the information revolves around *where* this information is displayed. As shown in figure 1.6, when you're looking for a particular answer, sometimes you need to ask, Where are you?

## Where are you?



Figure 1.6 A map can communicate many things but often asks a simple question.

- Maps and layers

You'll learn about the parts of a map and how to use layers in chapter 2, but for now, all you need to know is that the map is the starting point for relaying information. For example, a point on the map could represent the location of a gas station, a series of lines on the map could show a city's road network, or polygons on the map could display voting areas.

- GIS data analysis

A GIS helps you answer questions about the information you're working with. How close am I to a certain location? How do I find a house that's closest to schools, shopping centers, and where I work? Using the ArcGIS API for JavaScript, you can do interesting analyses. I won't cover anything too extensive, but the capability is there should you need it, and you'll learn how to access the tools to do so.

### **1.3.3 Interacting with the ArcGIS REST API**

The engine that keeps the ArcGIS API for JavaScript running is the ArcGIS REST API, which I discussed in section 1.2.2. I'll cover how to access the ArcGIS REST API to meet needs you might have that aren't provided in the ArcGIS API for JavaScript in chapter 3. What it boils down to is being able to use the ArcGIS REST API to find out more information about the data you're working with. You can think of it as metadata about your services. In this case, metadata includes information about a map service, such as what data is in the service, whether the data made up of points, lines, or polygons, or all of the above. Is the map service compatible with your other map services? What is the default look of your map service?

In terms of being able to fill possible gaps in functionality of the ArcGIS API for JavaScript, in chapter 3 you'll build an extension in JavaScript that will display a legend that allows you turn individual layers on and off. This is a handy tool that isn't provided out of the box with the ArcGIS API for JavaScript. These types of custom tools that require you to interact with the ArcGIS REST API aren't always necessary, but when they are, you'll be grateful to have a basic understanding of working with the ArcGIS REST API to cover your bases.

## **1.4 Summary**

In this chapter, I discussed the prevalence of spatial applications in our everyday lives. From how we shop to where we live, location plays a vital role in our society.

I discussed various options available for building web mapping applications, each with its own merits. In this book, the focus is on the ArcGIS API for JavaScript, which is best suited for working with ArcGIS Server map services.

Trends in the GIS industry have shown a sharp increase for GIS professionals to have familiarity with a programming language, even if it's to supplement GIS analyses and automate workflows. This opens up the opportunity for non-GIS professionals to dive into building web mapping applications that leverage the power of GIS data.

I also covered the basics of accessing GIS data through web services, which you can use to build web mapping applications.

And last, I did a quick overview of concepts that you'll know by the end of this book, such as JavaScript, the relevant parts of the Dojo toolkit, the bits of GIS in your web maps, and what to look forward to when working with the ArcGIS REST API.

In chapter 2 you'll learn how to use the ArcGIS API for JavaScript to work with various map services, query data from these services, and filter that data.