The Basics of AngularJS

JavaScript is an important language for web developers—one that is nearly impossible to ignore. It's a language that was created for the relatively simple purpose of adding basic interactivity to web pages. However, it has risen to mainstream importance, and it is used today to build large and sophisticated web applications.

Why We Need Frameworks

You may develop some appreciation of why frameworks such as AngularJS exist, by considering that JavaScript was not originally created with today's much more complex requirements in mind. In fact, in many respects, JavaScript was adapted to this purpose because it was there. It was already widely supported in web browsers, and many developers knew how to use it.

JavaScript sometimes gets a bad rap; it isn't everyone's favorite language. I personally enjoy using it and find that I can work around the things that I perceive as shortcomings; nevertheless, I totally understand why some developers don't feel the same way as I do, particularly those who have not had the chance to warm up to its strengths. I think it is fair to say that JavaScript has many great features, but it is equally fair to say that it is missing a few features—ones that developers feel are vital.

Given its humble beginnings and perceived shortcomings, is JavaScript really ideal for developing modern web applications? It certainly is. As a relatively easy-to-learn language with almost ubiquitous support, it is extremely well suited to the task.

Here's a better question: Is JavaScript ideal for developing applications that require modularity, testability, and developer productivity? The short and simple answer to a question such as this is no, not really. At least not "out of the box." The makers of JavaScript simply didn't have these requirements in mind when it was conceived. However, today we have a proliferation of frameworks and libraries designed to help us with such things. The general idea is that we want to be more productive and that we want to write code, often in response to unreasonably tight deadlines, that we can easily maintain and reuse. This is why we need frameworks.

Each framework achieves its (sometimes significantly different) objectives in a variety of ways and to varying degrees. For example, the popular jQuery framework addresses direct Document Object Model (DOM) manipulation extremely well, but it doesn't really help out much when it comes to keeping your code structured and organized.

To be fair, jQuery is more of a library than a full-fledged framework, so this really relates more to my point about varying objectives and degrees.

With regard to front-end web development, AngularJS addresses many, if not all, of the issues developers face when using JavaScript on its own, and it does so in a very elegant and comprehensive way.

There often isn't a right or wrong framework, by the way, because much of what constitutes right may depend on the kind of project on which you are working, your current skills and experience, and your personal preferences. That being said, I personally believe that AngularJS is a great all-around framework, which is definitely among the best available.

What Is a Framework?

Before exploring AngularJS in depth, let us consider exactly what AngularJS is. What do we mean by a "framework," and why would we want to use one? Might it be a good idea not to use one? Might it even be a good idea to develop our own instead?

The dictionary definition tells us that a framework is "an essential supporting structure." That sums up AngularJS very nicely, although AngularJS is much more than that. AngularJS is a large and helpful community, an ecosystem in which you can find new tools and utilities, an ingenious way of solving common problems, and, for many, a new and refreshing way of thinking about application structure and design.

We could, if we wanted to make life harder for ourselves, write our own framework. Realistically, however, for most of us, this just isn't viable. It almost goes without saying that you need the support of some kind of framework, and that this framework almost certainly should be something other than your own undocumented (or less than well understood) ideas and thoughts on how things should be done. A good framework, such as AngularJS, is already well tested and well understood by others. Keep in mind that one day others may inherit your code, be on your team, or otherwise need to benefit from the structure and support a framework provides.

The use of frameworks isn't uncommon; many programmers from all walks of life rely on them. Business application developers use frameworks, such as the Microsoft Entity Framework, to ease their pain and speed up development when building database-related applications. For example, Java programmers use the LibGDX framework to help them create games. (We all need a little help.)

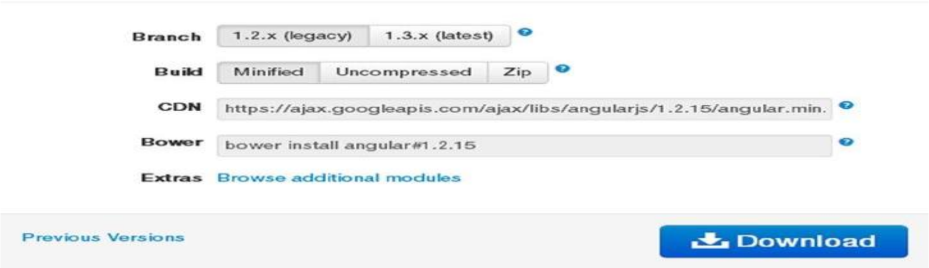
Downloading and Installing AngularJS

Downloading and installing AngularJS is easy, takes very little time, and doesn't require your credit card. It is completely free of charge (under the MIT license).

To download AngularJS, head on over to ***http://angularjs.org*** and follow these steps:

1. Create a folder on your computer called BeginningAngularJS. Inside this folder, create a subfolder called js to contain your JavaScript files.

2. On the AngularJS home page, click the Download button. You will see a dialog box like the one shown in Figure 2-1.



Branch 1.2.x (legacy) 1.3.x (latest)

Build Minified Uncompressed Zip

CDN https://ajax.googleapis.com/ajax/libs/angularjs/1.2.15/angular.min.

Bower bower install angular#1.2.15

Extras Browse additional modules

Previous Versions

Figure 2-1. *The AngularJS download options dialog*

3. You want the 1.2.x-minified version, so make sure that you choose *1.2.X (legacy)* for the branch option and *Minified* for the build option.
4. Click the Download button to start the download process.
5. Once the download has completed, move the downloaded file, ***angular.min.js***, into the js folder that you created earlier (assuming you did not save it there directly).
6. That's it! You just downloaded and installed AngularJS.

Throughout this book, I will assume that you have followed the preceding steps when I refer to file system locations and folder names. If you are comfortable with the Content Delivery Network (CDN), and prefer to use it, feel free to do so. Likewise, if your preference is to use the non-minified version of the AngularJS library, go right ahead. This won't affect the output of any of the code listings (assuming that you have things set up correctly otherwise).

Browser Support

All modern web browsers support AngularJS. This list includes Safari, Chrome, Firefox, Opera, IE9 and later versions, and mobile browsers, including Android, Chrome Mobile, and iOS Safari. Generally speaking, browser support is not an issue; AngularJS is very much here and now.

■ **Note** The ninth and later versions of Internet Explorer are supported. At the time I write this, support for Internet Explorer 8 is about to be dropped.

Your First AngularJS Application

Let’s start our journey toward AngularJS enlightenment by creating a very small and simple application, albeit one that demonstrates little more than how to include AngularJS on a web page, and use it to display the traditional Hello World greeting.

Save Listing 2-1 into your BeginningAngularJS folder.

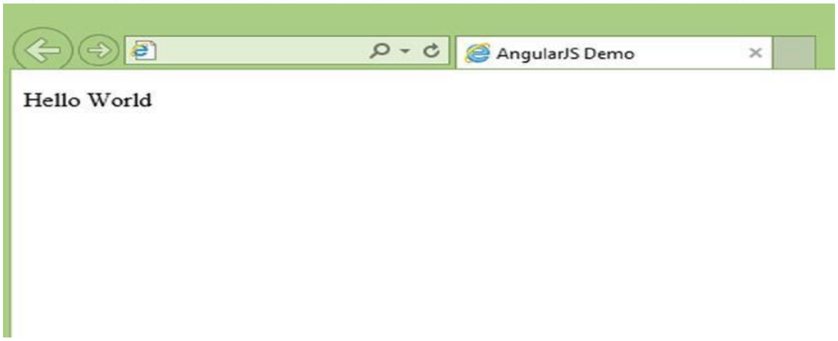
Listing 2-1. Hello World

```
<!DOCTYPE html>
<html ng-app>
<head>
  <title>Listing 2-1</title>
  <script src="js/angular.min.js"></script>
</head>
<body>
  <p>Hello {{'Wor' + 'ld'}}</p>
</body>
</html>
```

While this is about as simple as it gets, there is actually quite a lot going on here. It’s well worth dissecting this and reviewing how each line works, as there are a few important concepts at play—concepts that are fundamental to the way AngularJS works and, therefore, key to how to think in AngularJS.

In the first line of the program, we have the HTML5 doctype. Though this is not strictly necessary for AngularJS to work, it is the doctype you should be using for today’s rich Internet applications.

The second line is where it becomes interesting. We have declared an ***ngApp*** directive within the opening ***HTML*** element. I will expand on this directive (and directives in general) a little bit later in this chapter and then much more in Chapter 5. We use ***ngApp*** to let AngularJS know which element is to be considered the root of the application. As we have declared it within the ***HTML*** element, we are declaring that the whole document is to be “under the control” of AngularJS. Moving down to the fifth line, you can see that we have included the AngularJS library using the script element. If we didn’t include the AngularJS library, we wouldn’t see any AngularJS goodness. Now for something very exciting: if you move down to the eighth line, you will see an AngularJS expression, as delimited by the opening and closing double curly braces—***{{*** and ***}}***. We keep things nice and simple here and concatenate the two string literals ***'Wor'*** and ***'ld'***. AngularJS expressions are powerful, and you will see many of them in this book. Here we use one in a somewhat contrived way, simply to illustrate how they are put into action. The interpolated value is, of course, the string ***World***. When we place an expression between double curly braces like this, we create an expression binding. In a nutshell, this means that the value of the expression is bound. Anytime it changes, the binding will update too. Bindings and expressions will be second nature to you in no time, as these are at the core of how AngularJS works. You can see the result of this in Figure 2-2.


AngularJS Demo

Hello World

Figure 2-2. *The output of our Hello World listing*

I said it was very exciting, didn't I? Well, perhaps I exaggerated a little bit. Nonetheless, it is an AngularJS application, and it gets you started on your journey. We will do something a little more interesting shortly, but let's summarize the key steps we took in Listing 2-1.

- We used the ***ngApp*** directive to inform our page that it should consider itself under the control of AngularJS.
- We then used a script element to include the AngularJS library.
- Just to prove everything was hooked up correctly, we used a simple AngularJS expression binding to do some basic string concatenation.

That wasn't difficult at all, but let's tinker with Listing 2-1 a bit, just to get a little bit more insight into how AngularJS ticks. Listing 2-2 is a revised version.

Listing 2-2. Tinkering with the Hello World Listing

```
<!DOCTYPE html>
<html>
<head>
    <title>Listing 2-2</title>
    <script src="js/angular.min.js"></script>
</head>
<body>
    <p ng-app>Hello {{'Wor' + 'ld'}}</p>
    <p>Hello {{'Wor' + 'ld'}}</p>
</body>
</html>
```

All that we have done here is to move the ***ngApp*** directive out of the opening ***HTML*** element and place it on the first paragraph element. We also added another paragraph element, which is almost identical to the first. However this one is without an ***ngApp*** directive. Save Listing 2-2, and load it up in your browser.

Two interesting things happen:

1. The first interesting thing is that the expression binding in the first paragraph worked just as it did before. Even though we relocated the ***ngApp*** directive, the expression binding is still nested within its boundaries and, therefore, still under AngularJS control.

2. The second interesting thing is that the second paragraph uses an expression too. However, this expression binding simply renders as is; it is not evaluated at all. AngularJS simply isn't interested in it, because it is not contained within the boundaries of an ***ngApp*** directive. In fact, AngularJS has no knowledge of this particular paragraph element or anything contained within it.

In this book, I will always declare the ***ngApp*** directive on the ***HTML*** element. While it is handy to know that you can tell AngularJS to manage only a specific portion of the DOM, I want you to see the effect of it being in the wrong location, or missing altogether. Forgetting to add the ***ngApp*** directive is one of the most common mistakes that beginners make.

This sets us up nicely with some working AngularJS code, but it doesn't really hint much at what makes AngularJS such a powerful framework. Listing 2-3, while still small and simple, starts edging toward this.

Listing 2-3. Live Updates

```
<!DOCTYPE html>
<html ng-app>

<head>
  <title>Listing 2-3</title>
    <script src="js/angular.min.js"></script>
</head>

<body>

  <label>City: </label><input ng-model="city" type="text" /></label>
  <p>You entered: {{city}}</p>

</body>
</html>
```

Here we have declared the expected ***ngApp*** directive and AngularJS script reference with which, it is hoped, you are already comfortable. The two important lines are the two lines contained within the body element. The first declares a standard ***HTML*** text input, but with one very important addition—the ***ngModel*** directive, which we have assigned the value of ***city***. The second line, via an expression binding, uses this value to reference the text that the end user enters into the text field.

Save Listing 2-3 and load it up in your browser. This is where the magic starts to happen. Start typing into the text field and watch as the text in the paragraph below the text field updates in real time. What makes it so magical is the amount of code that it took to achieve this result—not very much code at all, no?

It's not really magic, of course. At least not in the Harry Potter sense. However, something very sophisticated is clearly taking place. Already, we can see that AngularJS must be hard at work for us, monitoring the application for data changes, updating the DOM to show these changes to the end user, and other things that we are yet to encounter. Other frameworks require that you tackle some or all of this work yourself. AngularJS wants you to focus on your primary concern—your application, not its plumbing.

Another interesting point is that we didn't actually write any JavaScript code! You will find that AngularJS has a strong lean toward a declarative, as opposed to a procedural, coding style. Obviously, you have to write JavaScript at some point or other, but AngularJS encourages you to put this in the right parts of your application. As you might expect, a good portion of this book will look at just what constitutes these "right parts."

Declarative vs. Procedural Programming

A classic example of a declarative programming language to which many developers can easily relate is SQL. When you write an SQL query against a database such as MySQL, you don't really do the heavy lifting yourself. Instead, you give rather high-level instructions to the database engine via a relatively simple select statement. You don't worry about how the database engine should pull the data together in the most efficient way, and you don't worry about things such as control flow and looping constructs—you just issue a select statement and expect the database to give you back the data that you want. In a sense, you *declare* what you want, and it does the work for you.

Procedural programming, on the other hand, requires a more detailed and lower-level set of instructions. In the extremely procedural C language, for example, you must take great care to reserve memory, detail the specific instructions you want to be executed, and then worry about freeing up memory, making sure your algorithms perform well and are thoroughly tested, and all sorts of other things.

Declarative programming is much more convenient than procedural programming, because it is often faster and easier. You generally don't have the same kind of granular control that you do with procedural programming, but you often don't need it. In fact, as you will see, AngularJS won't mind at all if you want to adopt a procedural approach when it suits you.

Directives and Expressions

Let's have a look at a few more AngularJS directives. Directives are a great example of the declarative programming style that AngularJS encourages you to adopt. They are also at the heart of AngularJS, and they are a crucial part of how you will deliver a great user experience.

What Is a Directive?

AngularJS uses directives to augment HTML with extra functionality. Essentially, *directives* are a convenient way to declaratively call JavaScript functions. We will look at directives in much more detail in Chapter 5. For now, though, following is a decent overview of directives.

Let’s try out the very handy ***ngShow*** directive. Check out Listing 2-4.

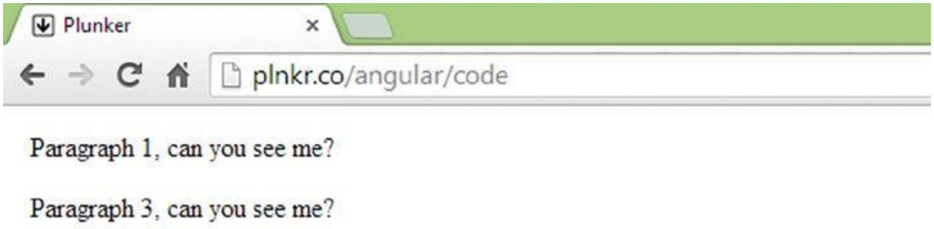
Listing 2-4. A First Look at ***ngShow***

```
<!DOCTYPE html>
<html ng-app>
<head>
    <title>Listing 2-4</title>
<script src="js/angular.min.js"></script>
</head>
<body>

<p ng-show="true">Paragraph 1, can you see me?</p>
<p ng-show="false">Paragraph 2, can you see me?</p>
<p ng-show="1 == 1">Paragraph 3, can you see
me?</p> <p ng-show="1 == 2">Paragraph 4, can you
see me?</p>

</body>
</html>
```

Listing 2-4 shows four paragraph elements, each has been “augmented” by an AngularJS directive that goes by the name of ***ngShow***.

■ **Note** The astute reader may have noticed that I have used the term ***ngShow*** in my writing and the subtly different term ***ng-show*** in my code. Which is correct? AngularJS typically refers to directives in documentation by their case-sensitive, CamelCase name (for example, ***ngShow***) but refers to directives in the DOM by using lowercase, dash-delimited attributes (for example, ***ng-show***).

What does ***ngShow*** do? Much of the answer is in the name. The ***ngShow*** directive will show, or hide, the element on which it is declared, based on the expression provided to it. Load up Listing 2-4 in your browser, and you will see that only the first and third paragraphs appear (as confirmed in Figure 2-3). They only appear because, in both cases, their respective expressions evaluate to the Boolean value of true. The second and fourth paragraphs, however, do not appear because their respective ***ngShow*** expressions evaluate to the Boolean value of false.



Paragraph 1, can you see me?

Paragraph 3, can you see me?

Figure 2-3. *ngShow in action*

The ***ngShow*** directive is very handy. You will use it often for hiding or showing regions of your user interface, based on user input or other conditions.

Another common directive is the ***ngClick*** directive. Just like ***ngShow***, ***ngClick*** expects an expression, but unlike ***ngShow***, this expression is only evaluated when the element it is declared upon is clicked.

Listing 2-5 shows ***ngClick*** in action. Load it up in your browser and press the Increment button a few times.

Listing 2-5. Demonstrating ***ngClick***

```
<!doctype  html>
<html  ng-app>
<head>
   <title>Listing  2-5</title>
   <script  src="js/angular.min.js"></script>
</head>
<body>
     <button ng-click="count = count + 1" ng-init="count = 0">
     Increment
  </button>
  count:  {{count}}
</body>
</html>
```

As you might have guessed, clicking the Increment button causes the value of count to increment. Each time the button is clicked, ***ngClick*** evaluates the expression. As the count variable is used in an expression binding, we can see its value updated in real time.

Here we have also used the ***ngInit*** directive. You typically won't use ***ngInit*** very much, if at all, for reasons that will make more sense when I discuss the MVC (Model View Controller) approach predominantly used in AngularJS applications. However, here we use it to initialize the count variable to 0. You could just as easily have set this value to, say, 10, in order to increment from a starting value of 10 instead of 0.

What Are Expressions?

You've seen a few expressions already, but what exactly are they? Essentially, they are JavaScript expressions, just like the ones you already know and love. However, there are a few important differences.

- In AngularJS, expressions are not evaluated against the global window object; instead, they are evaluated against a scope object.
- You don't get the usual ***ReferenceError*** or ***TypeError*** when trying to evaluate undefined properties. AngularJS expressions are forgiving in that regard.
- You cannot use conditionals, loops, or exceptions. This is a good thing; you don't want complex logic inside expressions. (In Chapter 3, I will discuss where you do want them.)
- You can use AngularJS filters to format data before displaying it. (I cover Filters in Chapter 4.)

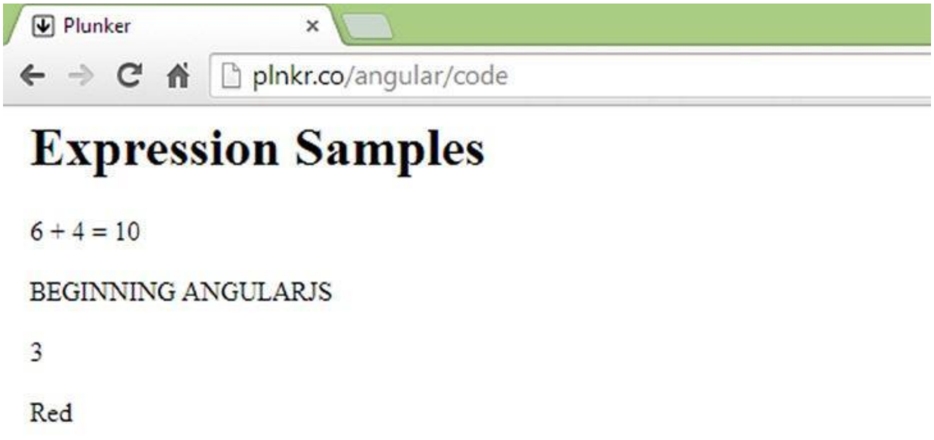
To get a sense of how expressions work and what you can do with them, take a look at Listing 2-6.

Listing 2-6. A Quick Look at AngularJS Expressions

```
<!DOCTYPE html>
<html ng-app>
<head>
<title>Listing 2-5</title>
  <script src="js/angular.min.js"></script>
</head>
<body>

  <h1>Expression Samples</h1>

  <!-- Basic arithmetic -->
  <p>6 + 4 = {{6 + 4}}</p>

  <!-- Using a JavaScript string method -->
  <p>{{"Beginning AngularJS".toUpperCase()}}</p>

  <!-- Searching for an occurence of 'D' -->
  <p>{{"ABCDEFG".indexOf('D')}}</p>

  <!-- Ternary operation -->
  <p>{{1==1 ? "Red" : "Blue"}}</p>
```

```
</body>
</html>
```

There is nothing complex going on here. It’s all run-of-the-mill JavaScript code but now using AngularJS expressions. Figure 2-4 shows the results.



Expression Samples

6 + 4 = 10

BEGINNING ANGULARJS

3

Red

Figure 2-4. *AngularJS expressions in action*

There are definitely a few more things to know about expressions, and we will get to them as you learn more about how we should be structuring and organizing our code. This is exactly what I will discuss in the next chapter.

CHAPTER 2

Introduction to MVC

We have taken a quick look at AngularJS and how to get a simple Angular-based web page up and running, but the reality is that you don't need AngularJS if all you want to do is build a very basic application.

One of the major strengths of AngularJS lies in its ability to help you properly organize and structure your applications, and very small applications tend not to benefit much at all from this. Of course, smaller applications should be properly structured too, but such applications are not as likely to require the rigid underpinnings and formal structure of a medium- or large-sized application. The way you would approach pitching a tent is not the same way you would approach building a log cabin. With that in mind, in this chapter, we will look at what it means to organize and structure an application and how the Model View Controller (MVC) pattern can help you to do both.

Design Patterns

Before we get into MVC, let's talk about design patterns for a moment. After all, MVC is a design pattern, so it would be good to know what design patterns are and why you should care about them. Essentially, a *design pattern* is a documented solution to a recurring problem that programmers have identified—usually in a particular context. Design patterns won't give you the code you need to solve a given problem, but they will propose a well-thought-out and generally accepted approach that you might want to consider adopting yourself.

A good way to think of design patterns is that they are like recipes that have been created by programmers who have spent a lot of time in the trenches. These programmers have found out, often through a combination of talent and old-fashioned trial and error, a lot of really great ways to solve specific kinds of problems. Furthermore, these programmers have decided to share these recipes with everyone else.

There isn't really a formal standard that states how design pattern documentation should be written, but we will examine something fairly typical. You will generally find something along the lines of what I have outlined in Table 3-1 on design pattern documentation.

Table 3-1. *Typical Design Pattern Documentation*

Title	Description
Pattern Name and Classification	A name that helps in referring to the pattern, often with a classification stating the type of pattern it is
Intent	The goal of the pattern and the reason it exists
Motivation	A scenario consisting of a problem and a context in which this pattern can be used
Collaboration	A description of how classes and objects used in the pattern interact
Sample Code	Actual code showing how the pattern can be used in a programming language

Sometimes, you will find a lot more information about a design pattern than what I present here, but usually you will find at least this much to help you understand its purpose and its intended uses.

■ **Tip** There is a school of thought that says that MVC is not a design pattern at all, rather it's an an architectural pattern. There is no right or wrong answer, in my opinion, and the important word here is *pattern*.

After reading through any given design pattern documentation and looking at any associated diagrams (which are usually UML based; see the Tip here), you are typically in a much better position to determine if it is applicable to the particular problem you are trying to solve. Patterns certainly are a tremendously useful resource, but there is one really important thing to understand about them up front: they are not silver bullets. Think of them more like friends that give good advice and not so much like divine intervention when you can't find an answer.

■ **Tip** The Unified Modeling Language (UML) is a general-purpose modeling language used in software development. It provides a standard way to visualize the design of software systems.

Table 3-2. *Singleton Design Pattern Documentation*

Title	Description
Pattern Name and Classification	Singleton: an object creational pattern
Intent	Ensures that a class has only one instance and provides a global point of access to it
Motivation	Sometimes it makes sense to control the creation of certain objects. For example, rather than allow an application to create numerous database connection objects, it may make more sense to allow for a single connection object, which an application can access through a gateway object, that provides access to a single instance.
Collaboration	The Singleton collaborates with external objects.
Implementation	Creates a class that can create a single instance of itself. This should be the only way an instance can be created.
Sample Code	Sample code is shown in Listing 3-1.

Let's work through a scenario. Assume that we found this design pattern documentation through an online search after recognizing an issue within our application. Far too many objects of the same type were being created. Let's further assume that these objects were quite expensive to create, with each object's initialization causing time-consuming and bandwidth-intensive connections to a remote system. We need to fix this.

■ **Note** One of the first and most well received books on design patterns is *Design Patterns: Elements of Reusable Object-Oriented Software* by Erich Gamma et al. (Addison-Wesley Professional, 2015). It's well worth checking this book out, if you want to learn more about design patterns and how to use them.

So, we have read through the patterns documentation, and we want to figure out if and how this particular pattern can be of any use. The Motivation section of Table 3-2 has got our attention—it certainly seems to fit the bill. It's definitely worth further study to see if the code sample that came with it can shed any light on how we could put it into practice.

Let's look at the sample code in Listing 3-1. Don't worry too much if you don't fully grasp what each and every line is doing, as this listing uses some advanced JavaScript techniques that you may not be familiar with yet. Nonetheless, do pay special attention to the comments.

Listing 3-1. A JavaScript Implementation of the Singleton Pattern

```
var Logger = (function() {

  // private variable to hold the only
  // instance of Logger that will exist var
  loggerInstance;

  // Create the logger instance
  var createLogger = function() {
    var _logWarning = function(message) {
      // some complex work coud go here, but
      // let's just fake it


      return message.toUpperCase();
    };

    return {
      logWarning: _logWarning
    };

  };

  return {

    // Here is the crucial part. First we check
    // to see if an instance already exists. If
    // it does, we return it. If it does not, we
    // create it.

    getInstance: function() {
      if (!loggerInstance) {
        loggerInstance = createLogger();
      }
      return loggerInstance;
    }

  };
})();

// Notice how we use getInstance() and we
//  do  not  use  direct  object  creation  with  the
//  new  keyword

var myLogger = Logger.getInstance();
myLogger.logWarning("Memory use nearing
maximum!");
```

This code sample represents a typical code snippet that you might find accompanying design pattern documentation. It just so happens to be written in JavaScript, but it could just as easily have been written in C#, Java, or any other language. (In fact, that is more likely to be the case.)

The essential aspect of Listing 3-1 is that it privately manages a single instance of a ***logger*** object. It isn't possible to create a new ***logger*** object directly. We have to use the ***getInstance*** function to access the already-existing ***logger*** object (or, if it didn't exist already, the newly created ***logger*** object). This is the essence of the pattern, and it seems to be a good solution for the problem we face in our own scenario: our applications issue of numerous objects of the same type being needlessly created, over and over.

Along with a code sample such as this, you are likely to come across a UML diagram showing how objects used in a pattern relate and interact with one another. I will stop short of getting into the nuances of UML, and in the case of the Singleton pattern, by definition, there aren't that many relations and interactions to show.

The usefulness of design patterns can be difficult to overstate. In our scenario, we had a serious problem within our application, and the Singleton design pattern turned out to be a good way to solve it. This is a relatively simple example of using design patterns to find solutions about which we can feel confident. Other programmers have used this approach, and it is one that has come about through collaboration, testing, refinement, and lots of real-world use. That has to be a good thing.

Design patterns are indeed a valuable resource, but you still have to put plenty of thought into how (and whether or not) to use any given design pattern in a particular context. As specific as design patterns may seem in their description and usage, they are still generalized solutions that may or may not apply to your needs. That being said, a well-documented design pattern will help you make these decisions.

■ **Tip** Reading up on design patterns is actually a great way to improve your code. You may have solved a problem in a particular way, only to find that there is a design pattern dedicated to avoiding the approach you took! It might not be good for the ego, but it's a great way to learn.

With this short introduction to design patterns now complete, we can look at the specific pattern that we will use throughout the rest of this book: the Model View Controller (MVC) pattern. You have to learn what MVC is, so that you can apply it within AngularJS. However, we don't actually have to write our own MVC solution, because AngularJS has what you need baked right into the framework.

Model View Controller

hope our quick discussion about design patterns has brought to the front of your mind that there are good ways and not so good ways to design your applications and that there are helpful recipes out there that can help you design better applications. Fortunately, the folks who created AngularJS have already put all of the pieces of the MVC pattern into place for you. As the MVC pattern is an architectural pattern, which is realized through a number of other design patterns, I won't include the rather extensive documentation for it here. Instead, we will focus on the AngularJS implementation of it and consider what it does for us.

Let's talk about the three major parts of the MVC pattern: the model, the view, and the controller. We're not really speaking at a code level here; rather, we are talking at a higher level about how to organize and structure your applications. MVC is often considered an architectural pattern, which is essentially a pattern that addresses some aspect of an application's overall organization and structure.

We will see how MVC comes together in code form later in this chapter, so don't worry too much if it all seems a little abstract as I am discussing it.

■ **Tip** Architectural patterns are often realized through a number of design patterns. As I said earlier, however, the keyword here is *pattern*. It really depends on what level you happen to be speaking (and quite possibly to whom you happen to be talking).

Model

The *model* represents the underlying, logical structure of data in a software application. It's a common mistake to think of the model as the database behind your application, and it is much better to view the model as the body of code that represents the data.

View

A *view* is the body of code that represents the user interface (all of the things that the user can see and to which the user can respond on the screen, such as buttons, dialog boxes, and so on). An application generally has multiple views, and each view often represents some portion of your model.

Controller

You can think of the *controller* as the *intermediary* for the view and the model. Examine Figure 3-1. You can see that the lines of communication correspond to this idea.

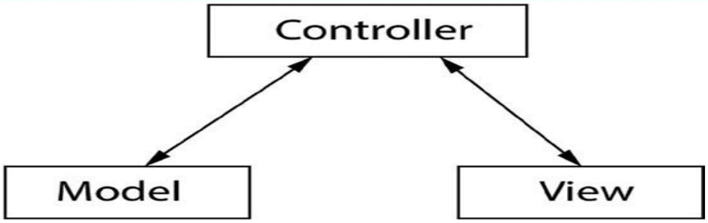


Figure 3-1. *The MVC lines of communication*

A Separation of Concerns

Great! We have some background on the three core components of MVC and how they relate to one another. Though, at this stage, it may not be entirely clear why we should be using it. Now let's take a look at the underlying purpose of this pattern and what sort of problems it solves.

As is clear from the definitions above, the controller is actually keeping the model and the view separated—one has no direct knowledge of the other. This is a fairly common design in software engineering, and the term used to describe it is *decoupling*.

When you organize your applications in this manner, it promotes a principle known as Separation of Concerns. Software that has been built around this principle tends to have distinct parts, each of which looks after a particular concern. MVC is a great way of achieving this Separation of Concerns, and before I end this chapter, we will take a quick first look at how AngularJS helps you build your applications in this manner.

MVC the AngularJS Way

Let's put the theory into practice—at least just a little bit, as this section will not be much more than a drive-by look at the topics that I will cover in much more detail throughout the rest of this book.

AngularJS makes the creation of MVC-style applications relatively straightforward and, in my opinion, quite enjoyable. I will point out at this stage, however, that there are a few more moving parts than you may be used to, and a couple of new concepts that you will need to wrap your head around.

Let's kick things off by looking at how the model, view, and controller manifest themselves in actual code, via a very simple code example. I will use a partial code listing to represent each concern, and then I will pull it all together into a complete code listing. This way, we can isolate the important parts first and then look at them working together as a whole. The code shown in Listing 3-1 is what we will use to represent our model.

```
var employees = ['Christopher Grant', 'Monica Grant', 'Christopher Grant', 'Jennifer Grant'];
```

The ***employees*** variable is simply a hard-coded array of employee names. In the real world, this array would usually be populated from a data store of some kind–an SQL database, for example. We don't need to complicate the listing with data-access code. (I will, however, discuss AngularJS support for accessing data later in the book.) The important thing to understand about this line of code is that the array of employees is what represents our model.

It’s worth making a clarification here, as there is often confusion around the term *model*. Is the model all of the objects that represent the entities in our data store, or is it just the one specific piece of information that we use in a view (employees being an example of the latter)? The short and simple answer is that it depends on the context, although it is quite common to refer to the former as the *domain model* and the latter as the *view model*.

Let’s turn our attention to the view. Here is a very simple example of what an AngularJS view looks like. In AngularJS parlance, we would call this a *view template*. As was discussed earlier, the view is concerned with presentation. More often than not, it represents the presentation of data from our model.

```
Number of Employees: {{ ourEmployees.length}}</h2>
```

This is basically just HTML and an AngularJS expression, and I will cover what’s happening here in a moment. Right now, however, I want you to notice something interesting about Listing 3-2 and Listing 3-3. Neither has any dependency on the other. This is good, and it is in line with our discussions around the desire to achieve a Separation of Concerns. Though it does raise a very interesting question: How does the model data, that is, the employees array, find its way into the view? Let’s investigate this right now.

Listing 3-2 is where the really interesting stuff starts to happen, as the AngularJS MVC framework is starting to emerge. The function ***MyFirstCtrl*** is the controller. It is a common convention in AngularJS to use Pascal case when naming the controller function (that is, to start with a capital letter and use a capital letter for each new word).

Listing 3-2. MVC in Action

```
    function MyFirstCtrl($scope) {

// populate the employees variable with some model data
var employees = ['Christopher Grant', 'Monica Grant', 'Christopher Grant', 'Jennifer
Grant'];

//  Now put this model data into the scope so it can be used in the view
      $scope.ourEmployees = employees;
    }
```

Review Listing 3-2. We assign the model data to the ***ourEmployees*** property that we set on this ***$scope*** object. This is the answer: this is how the model data, the employees array, finds its way into the view. The ***$scope*** object was supplied to our controller function by the AngularJS framework, and all that we needed to do was to populate it with the data that we wanted to make available to the view.

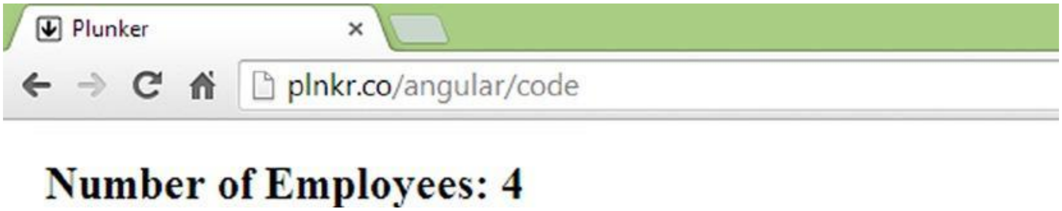
Glance back at the view in Listing 3-2, and notice that the expression uses a reference to ***ourEmployees***. You can think of this expression ***{{ourEmployees.length}}*** as effectively being the same thing as ***{{$scope.ourEmployees. length}}***. Don’t actually use a scope reference in this manner within an expression; it won’t work, as the use of the current scope object is implicit.

Listing 3-3 pulls all of this together into a single MVC example. It’s short and simple, but the essence of AngularJS is on display here.

Listing 3-3. A Complete MVC Example

```
<!DOCTYPE html>
<html ng-app>

<head>
  <script src="js/angular.min.js"></script>
  <script>

    function MyFirstCtrl($scope) {

      var employees = ['Catherine Grant', 'Monica Grant',
        'Christopher Grant', 'Jennifer Grant'
      ];

      $scope.ourEmployees = employees;
    }

  </script>
</head>

<body ng-controller='MyFirstCtrl'>

  <h2>Number of Employees: {{ ourEmployees.length}}</h2>

</body>
</html>
```

The output, as shown in Figure 3-2, is simply a count of the number of employees, courtesy of the ***Array.length*** property.



Number of Employees: 4

Figure 3-2. *Counting the number of employees (output of Listing 3-3)*

Perhaps the most important aspect of Listing 3-3 is how we use a scope object, an instance of which, as we discussed, was passed into our controller function by the framework. It really is quite fundamental to how AngularJS does much of its work. We can already see it being used to decouple the model from the view, but it actually does something a little bit more impressive than keep our code clean and modular. It is also a key player in the framework's ability to keep the model and the view in sync with each other. The changes made to the model were immediately reflected in the view; we did not have to do any Document Object Model (DOM) manipulation.

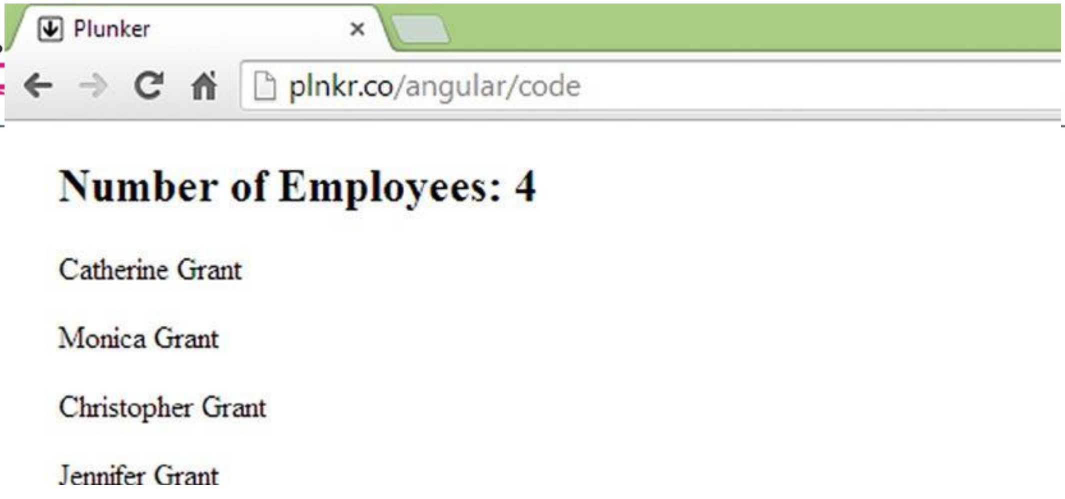
We are nearly at the end of this chapter, but before moving on, I want to show you one more code sample. Listing 3-4 demonstrates another AngularJS approach toward code organization, to keep things clean and crisp.

Listing 3-4. Displaying the Employee Names

```
<!DOCTYPE html>
<html ng-app>

<head>
  <script src="js/angular.min.js"></script>
  <script>

    function MyFirstCtrl($scope) {

      var employees = ['Catherine Grant', 'Monica Grant',
        'Christopher Grant', 'Jennifer Grant'
      ];

      $scope.ourEmployees = employees;
    }

  </script>
</head>
<body ng-controller='MyFirstCtrl'>

  <h2>Number of Employees: {{ ourEmployees.length}}</h2>
  <p                  ng-repeat="employee                   in
  ourEmployees">{{employee}}</p>

</body>
</html>
```

This listing isn't terribly different from Listing 3-3—there is just one additional line of code. Instead of displaying only the number of employees who work for us, we now use the ***ngRepeat*** directive to display the name of each employee who works for us.

The ***ngRepeat*** directive will repeat the instance of the element upon which it is declared (a paragraph element in this case) for each item in a collection. As Figure 3-3 shows, this results in a total of four paragraphs: one for each of the employees in the ***ourEmployees*** array. Consider this a teaser. ***ngRepeat*** is quite powerful, and you will definitely be seeing more of it in coming chapters.



```
Number of Employees: 4

Catherine Grant

Monica Grant

Christopher Grant

Jennifer Grant
```

Figure 3-3. *Introducing ngDirective*

CHAPTER 3

Filters and Modules

When working with data that has been retrieved from a database, you will spend a lot of time working with raw unformatted data. It’s not at all uncommon to come across dates that are formatted unusually, numbers that have far too many digits after the decimal point, and people’s names that are in all uppercase letters. Keep in mind that data is not always stored in the best format for our own applications, and its original purpose might have been to service a totally different kind of application. When presenting data to end users, however, we need a way to deal with such things. Angular JS filters are often a very good way to do just that.

In this chapter, we will look at AngularJS filters, both the built-in variety and custom filters. We will also look at AngularJS modules, which are important in their own right and are a prerequisite for creating custom filters.

Introduction to Filters

AngularJS filters format the value of an expression for display to the end user. They don’t actually change the underlying data, but they do change how it is displayed in the particular case in which the filter is applied.

This is much easier to understand with the help of an example. First, let’s start off with some sample data (see Listing 4-1) to which we can apply some filters.

Listing 4-1. Raw Sample Data

```
<script>
    function MyFilterDemoCtrl($scope) {

        var someData = {
            firstName: 'JENNA',
            surname: 'GRANT',
            dateJoined: new Date(2010, 2, 23),
            consumption: 123.659855,
            plan: 'super-basic-plan'
        };

        $scope.data = someData;

}
</script>
```

Data like this would typically come back from a request to a web service or a database, but we only want some sample data, so that we can learn about AngularJS filters without the additional distraction of data access code. This fictitious data, captured in a JavaScript object we have named ***someData*** in Listing 4-1, represents some customer details. We will use this data as the chapter progresses, starting now with a first look at the AngularJS filter syntax.

The first filter we will look at will address the issue of the ***firstName*** and ***surname*** appearing in uppercase. To improve this slightly, we will change it to lowercase. To achieve this, the main thing to know is that you use the **|** (pipe) character, to invoke a filter. Later in this chapter, we will look at how to improve upon this even further, by leaving the first character in uppercase and converting only the remaining characters to lowercase, a technique known as *title casing*.

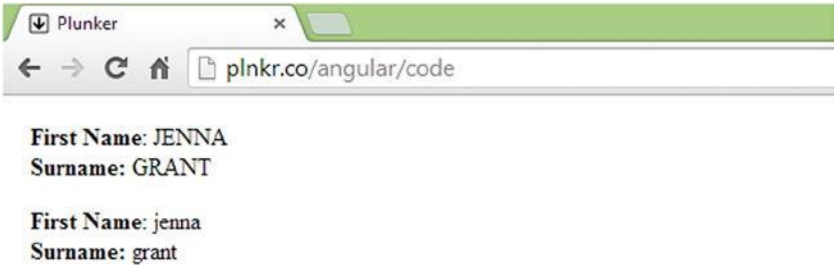
Listing 4-2 shows how this is done. The ***MyFilterDemoCtrl*** controller’s only task here is to make the data available to the view. As you will recall from the last chapter, placing it in the scope does this.

Listing 4-2. Angular Filter Example

```
<!DOCTYPE html>
<html>
<head>
    <title>Listing 4-2</title>
    <script src="js/angular.min.js"></script>
    <script>
        function MyFilterDemoCtrl($scope) {

            var someData = {
                firstName: 'JENNA',
                surname: 'GRANT',
                dateJoined: new Date(2010, 2, 23),
                consumption: 123.659855,
                plan: 'super-basic-plan'
            };

            $scope.data = someData;

}
</script>

</head>
```

```
<body  ng-app  ng-controller="MyFilterDemoCtrl">

<p>
      <!--  Unfiltered  data  -->
      <strong>First  Name</strong>:  {{data.firstName}}<br/>
      <strong>Surname:</strong> {{data.surname}}
</p>

<p>
      <!--  Filtered  data  -->
      <strong>First  Name</strong>:  {{data.firstName  |  lowercase}}<br/>
      <strong>Surname:</strong> {{data.surname | lowercase }}
</p>


</body>
</html>
```

Listing 4-2 shows how easy it is to apply the ***lowercase*** filter. We apply it by stating the value we want to filter, followed by the | (pipe) character and then the name of the filter. The most important aspects of the code are shown in bold. As Figure 4-1 shows, the first paragraph displays the plain unfiltered data, and the second paragraph displays the filtered data.



First Name: JENNA
Surname: GRANT

First Name: jenna
Surname: grant

Figure 4-1. *lowercase filter—before and after*

You won't be very surprised to learn that there is a built-in filter named ***uppercase***, which, unsurprisingly, converts characters to uppercase. AngularJS ships with a set of other handy filters, and we look at these in the next section. However, before we get to them, let's take a step back and consider why we might want to use filters. After all, JavaScript already has what you need to perform these kinds of tasks. For example, we could just as easily have added the code for lowercasing data values directly to the controller, instead of using filters. Listing 4-3 takes this approach, and it produces the very same result as Listing 4-2.

Listing 4-3. Achieving Same Result Without Filter

```
<script>
    function  MyFilterDemoCtrl($scope)  {

        var  someData  =  {
             firstName:  'JENNA',
             surname:  'GRANT',
             dateJoined:  new  Date(2010,  2,  23),
             consumption:  123.659855,
             plan:  'super-basic-plan'
        };

        //  do  the  lowercaing  here  instead  of  using  a  filter
        someData.firstName                                          =
        someData.firstName.toLowerCase(); someData.surname =
        someData.surname.toLowerCase();      $scope.data       =
        someData;

    }
</script>
```

Using the approach taken in Listing 4-3, it is true that we bypass the need for filters, but there are a few things to consider before you choose to adopt this approach. As I discussed in the last chapter, one very good reason to use AngularJS is because you want to organize your code better and follow some common software development best practices.

We have talked about the Separation of Concerns principle, so let us take a moment to consider whether or not formatting tasks, such as changing the case of the text we present to our end users, logically belongs in a controller. Doesn't this seem like a task for which the view should be responsible? In one sense, formatting data for presentation is indeed a view-related concern. However, you could also argue that a controller should bear some responsibility for making sure that data is ready for use in the view.

The developers of AngularJS take a stance on this and say that such concerns are better dealt with as the data flows from the controller into the view. In fact, this is why a filter is called a filter; the data is "filtered" as it travels from the controller into the view.

Some filters can be much more complex than simple case converters. In the lowercase scenario, we were able to use a single JavaScript method call directly in the controller without things looking messy and out of place, but had we wanted to implement title casing (whereby the first letter of each word is in uppercase and the remainder are in lowercase), things would have gotten a lot more involved and required a much more modular solution. Obviously, having to repeat such logic in each controller or application in which you might need it is not a very DRY approach.

■ **Tip** The DRY principle states that *"Every piece of knowledge must have a single, unambiguous, and authoritative representation within a system."* An easier way to say this is simply *"Don't Repeat Yourself."*

While it is true that the filter may be added to the view in multiple places, the underlying implementation of that filter need only be written once.

Of course, it is up to you to decide how to approach any given situation. Filters are simply an option that you have at your disposal. Nonetheless, filters are a great way to keep your code modular and clean, as they make for a good unit of reuse across AngularJS projects. In fact, as there is a vibrant developer community both contributing to and sharing AngularJS filters online. They make for a good unit of reuse for everyone.

Built-in Filters

The empowering aspect of filters is, in my opinion, the ability to create your own filters and share them with the rest of the team (or AngularJS community). That being said, AngularJS ships with a very handy set of filters. We will look at these built-in filters now, starting with the number filter. We will look at how to craft a custom filter before the end of this chapter.

The Number Filter

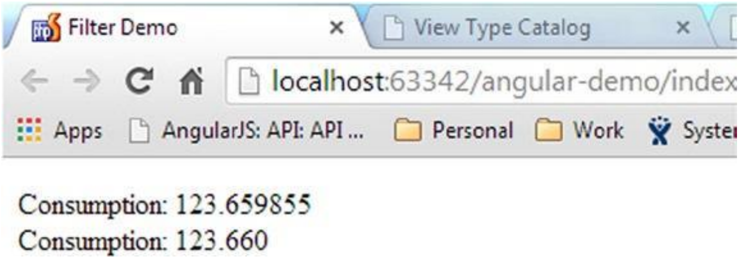
This filter will help us address another issue with our sample data: the overly precise value of the consumption property (which represents the amount of data that the customer has used for this billing period). Let's make this friendlier by rounding the number of places after the decimal point. Listing 4-4 shows how you can achieve this.

Listing 4-4. Rounding Up Values with the Number Filter

```
<!DOCTYPE html>
<html>
<head>
    <title>Listing 4-4</title>
    <script src="js/angular.min.js"></script>
    <script>
        function MyFilterDemoCtrl($scope) {

            var someData = {
                firstName: 'JENNA',
                surname: 'GRANT',
                dateJoined: new Date(2010, 2, 23),
                consumption: 123.659855,
                plan: 'super-basic-plan'
            };

            $scope.data = someData;

}
```

```
</script>

</head>
<body  ng-controller="MyFilterDemoCtrl">

<p>
    Consumption:  {{data.consumption  }}<br/>
    Consumption:  {{data.consumption  |  number  }}
</p>

</body>
</html>
```

Figure 4-2 shows both the unfiltered and filtered data generated within the paragraph element. This is a slight improvement, as now we have just three digits after the decimal point, instead of six.



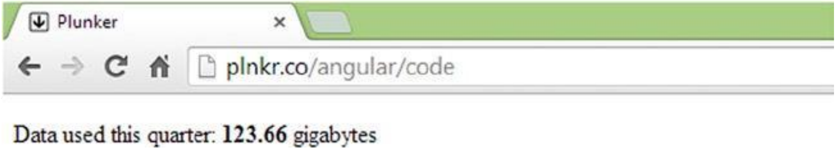
```
Consumption: 123.659855
Consumption: 123.660
```

Figure 4-2. *Rounding up numbers with the number filter*

Of course, two digits would be far better and much more in line with end users' expectations. As it happens, the number filter takes a single parameter, which lets you tell it how many decimal places to round a number to. This raises a question: How do you pass parameters to a filter? Fortunately, it is very easy. You use a colon and then enter the parameter value, as shown in the code snippet below.

```
<p>Data  used  this  quarter:<strong>  {{  data.consumption  |  number:2  }}  </strong>gigabytes</p>
```

If you replace the paragraph in Listing 4-4 with the preceding snippet and load it into your browser, you will see output identical to that in Figure 4-3.



```
Data used this quarter: 123.66 gigabytes
```

As you can see, the number filter, indeed all filters, are quite easy to use. You can very easily change the format of data without actually changing the underlying data source and without cluttering up the view or controller with presentation-related code.

If you are working with data in which pinpoint accuracy is required, you should be very careful when you are performing rounding operations. Due to the way in which computers represent numbers internally, results are not always totally accurate. A discussion of floating-point-number precision is a little out of scope here, but you can use your favorite search engine to learn more, if this is something that might be important to you.

The Date Filter

The date filter is indispensable and extremely flexible. Consider the ***dateJoined*** property of our sample data. It has a value which, depending on the time when you view it, looks something like this: ***2010-03-22T13:00:00.000Z***. You certainly don’t want to be showing it to end users in this format!

■ **Tip**Don’t be fooled by the name. The date filter not only works with dates but also with times.

The date filter’s flexibility is due, in part, to the large number of format parameters you can pass to it and how these can be combined to arrive at nearly unlimited ways of displaying dates and times (or portions of dates and times). Table 4-1 and Table 4-2 show the available parameters. Look over these parameters, and then we will review a code listing that shows some of the commonly used ones in action.

Table 4-1. *Date Filter Parameters*

Parameter	Description
yyyy	Four-digit representation of year (for example, ***AD 1 => 0001, AD 2010 => 2010***)
yy	Two-digit representation of year, padded (00–99) (for example, ***AD 2001 => 01, AD 2010 => 10***)
y	One-digit representation of year (for example, ***AD 1 => 1, AD 199 => 199***)
MMMM	Month in year (***January-December***)
MMM	Month in year (***Jan-Dec***)
MM	Month in year, padded (***01-12***)
M	Month in year (***1-12***)
dd	Day in month, padded (***01-31***)
d	Day in month (***1-31***)
EEEE	Day in week (***Sunday-Saturday***)
EEE	Day in week (***Sun-Sat***)
HH	Hour in day, padded (***00-23***)
H	Hour in day (***0-23***)
hh	Hour in AM/PM, padded (***01-12***)
h	Hour in AM/PM, (***1-12***)
mm	Minute in hour, padded (***00-59***)

m	Minute in hour (***0-59***)
ss	Second in minute, padded (***00-59***)
s	Second in minute (***0-59***)
.sss or ***,sss***	Millisecond in second, padded (***000-999***)
a	AM/PM marker
Z	Four-digit (+sign) representation of the time zone offset (***-1200 – +1200***)
ww	ISO 8601 week of year (***00-53***)
w	ISO 8601 week of year (***0-53***)

Table 4-2. *Predefined Date Paramters*

Parameter	**Description**
medium	equivalent to '***MMM d, y h:mm:ss a***' for en_US locale (for example, ***Sep 3, 2010 12:05:08 PM***)
short	equivalent to '***M/d/yy h:mm a***' for en_US locale (for example, ***9/3/10 12:05PM***)
fullDate	equivalent to '***EEEE, MMMM d, y***' for en_US locale (for example, ***Friday, September 3, 2010***)
longDate	equivalent to '***MMMM d, y***' for en_US locale (for example, ***September 3, 2010***)
mediumDate	equivalent to '***MMM d, y***' for en_US locale (for example, ***Sep 3, 2010***)
shortDate	equivalent to '***M/d/yy***' for en_US locale (for example, ***9/3/10***)
mediumTime	equivalent to '***h:mm:ss a***' for en_US locale (for example, ***12:05:08 PM***)
shortTime	equivalent to '***h:mm a***' for en_US locale (for example, ***12:05 PM***)

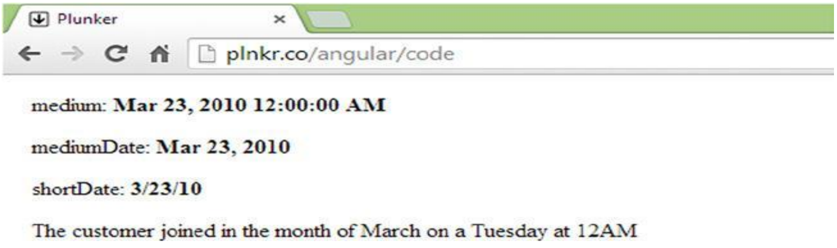
The parameters in Table 4-1 certainly provide the ability to mix and match and create nearly any date and time structure you need, but more often than not, you only need a typical date representation. For this, you can make use of the predefined parameters described in Table 4-2.

Listing 4-5. The Date Filter in Action

```
<!DOCTYPE html>
<html>
<head>
    <title>Listing 4-5</title>
```

```
        <script  src="js/angular.min.js"></script>
        <script>
            function  MyFilterDemoCtrl($scope)  {

                var  someData  =  {
                    firstName:  'JENNA',
                    surname:  'GRANT',
                    dateJoined:  new  Date(2010,  2,  23),
                    consumption:  123.659855,
                    plan:  'super-basic-plan'
                };

                $scope.data  =  someData;

    }
    </script>

    </head>
    <body  ng-app  ng-controller="MyFilterDemoCtrl">
    <p>medium:<strong>  {{  data.dateJoined  |  date:'medium'}}  </strong></p>

    <p>mediumDate:<strong>  {{  data.dateJoined  |  date:'mediumDate'}}  </strong></p>

    <p>shortDate:<strong>  {{  data.dateJoined  |  date:'shortDate'}}  </strong></p>

    <p>This customer joined in the month of {{ data.dateJoined | date:'MMMM'}} on a {{
    data.dateJoined | date:'EEEE'}} at {{ data.dateJoined | date:'ha'}}</p>

    </body>
    </html>
```

In most cases, the predefined date parameters more than fit the bill; though the last paragraph shows that you can also take a more granular approach. You can see the results in Figure 4-4.



medium: **Mar 23, 2010 12:00:00 AM**

mediumDate: **Mar 23, 2010**

shortDate: **3/23/10**

The customer joined in the month of March on a Tuesday at 12AM

Figure 4-4. *Date filter parameters in action*

Notice that to produce the month and the day, we use '***MMMM***' and '***EEEE***', respectively, which both appear in Table 4-1. You will not, however, see '***ha***', as used to produce the time portion (***12AM***) in Table 4-1. You will see an '***h***' and an '***a***', the former being the hour, and the latter being the AM/PM marker. It is perfectly acceptable, and often necessary, to combine date parameters in this manner.

AngularJS Modules

So far, we have not looked at AngularJS modules. Instead, we have placed all of our code within a controller embedded within our HTML file, using the script tag. This approach has its place, but it is usually confined to very small applications and demos (such as the code listings found in books like this). It isn’t the recommended approach to take for serious development.

What Is a Module?

A *module* is a collection of controllers, directives, filters, services, and other configuration information. The main player in all this is ***angular.module***, as it is the gateway into the Module API, the mechanism used to configure angular modules. It is used to register, create, and retrieve previously created AngularJS modules.

This probably all sounds rather abstract, so let’s look at a practical example by walking through the process of setting up a default module for our application. The default module is the module that AngularJS will use as the entry point into your application. (It may even be the only module you use.) Don’t worry if all this doesn’t make a lot of sense at the moment, as we will look at a complete listing and talk more about what is happening when we build our custom filter.

Add the following code to a new JavaScript file, which you can name ***myAppModule.js***.

```
// Create a new module
var myAppModule = angular.module('myAppModule', []);
```

You just created a module. Wasn’t that easy? The ***module*** method was used to create a module named ***myAppModule***.

We also captured the returned object (a reference to the module just created) in a variable, also named ***myAppModule***.

You will notice that we also passed an empty array to the module method. This can be used to pass a list of dependencies; that is, other modules that this module depends upon. We don’t have any dependencies, so we simply pass an empty array instead.

We now have a module and a reference to this module, so now we can configure it with a custom filter, by adding the following code below the previous line of code:

```
// configure the module with a filter
myAppModule.filter('stripDashes', function() {
        return function(txt) {
          // filter code would go here
```

```
            };
});
```

Don’t worry too much about the code within the filter method for now. This is something we will see more of when we build a custom filter in the next section. The important part is that you attached a filter to the module. The filter method lets you name your filter (we called this one ***stripDashes***, because, as you will see in the next section, it strips any dashes that might be contained within strings) via its first argument, and it lets you pass in a function as the second argument. We will explore the purpose of this function shortly.

In a similar way, we can also add a controller to our module. In the preceding code, we used the ***filter*** method to configure a filter. In the following code, we use the ***controller*** method to configure a controller.

```
// configure the module with a controller
myAppModule.controller('MyFilterDemoCtrl', function ($scope) {
            // controller code would go here
        }
);
```

Again, we get to provide a name (***'MyFilterDemoCtrl'***) and pass in a function. This function is basically the same function that we have been using as our controller within the script tags so far, only now it is attached to a module.

If controllers and other logic, such as filters, are created within an AngularJS module, how are they accessed and used? This relates to the AngularJS bootstrapping process.

Bootstrapping AngularJS

We talked briefly about the ***ngApp*** directive earlier in the book, though we didn’t really talk about the role it plays in bootstrapping AngularJS. It might already have occurred to you that AngularJS is hard at work behind the scenes, monitoring form fields, for example, so that it can respond to any changes and immediately update any bindings.

In fact, AngularJS is doing quite a lot behind the scenes, and it all starts to happen once the document is loaded, because it found an ***ngApp*** directive. So far, we have used ***ngApp*** in its simplest form, as an attribute without any value. However, you can specify an AngularJS default module, by providing a value. The following code snippet shows ***ngApp*** with a value of ***'myAppModule'***, which is the name of the module we have just created.

```
<html ng-app="myAppModule">
```

With the ***ngApp*** directive in place, we can save our module, ***myAppModule.js***, into the ***js*** directory. Then we can create a new page, ***index.html***, which will make use of this module. The next two code listings (Listings 4-8 and Listing 4-9) will pull all of this together.

Listing 4-8. ***myAppModule.js***

```
// create a new module called 'myAppModule' and save
// a reference to it in a variable called myAppModule var
myAppModule = angular.module('myAppModule', []);

// use the myAppModule variable to
// configure the module with a controller
myAppModule.controller('MyFilterDemoCtrl', function ($scope) {
        // controller code would go here
    }
);

// use the myAppModule variable to
// configure the module with a filter
myAppModule.filter('stripDashes', function() {
    return function(txt) {
        // filter code would go here
    };
});
```

Listing 4-8 is the module file in which we create a module and then configure a controller and a filter. Notice that we named the JavaScript file ***'myAppModule.js'***; we named the variable, which stores a reference to the module ***'myAppModule'***; and we named the module itself ***'myAppModule'***. This is not an issue, and it does not always have to be the case that naming follows this pattern. The key thing is to recognize that when we talk about the module, we are talking about the object we created and named when we called the ***angular.module*** method. It is this name that we can use to get a reference to the module whenever we need it. To clarify this, Listing 4-9 shows a slightly different approach to setting up and configuring the module.

Listing 4-9. Referring to the Module by Name

```
// Create a new module
angular.module('myAppModule', []);

// configure the module with a controller
angular.module('myAppModule').controller('MyFilterDemoCtrl', function ($scope) { //
        controller code would go here
    }
);

// configure the module with a filter
angular.module('myAppModule'). filter('stripDashes', function() {
    return function(txt) {
        // filter code would go here
    };
});
```

This file does not use a variable to store a reference to the module. Instead, it uses the single argument version of the ***angular.module*** method to retrieve a reference to it. This single argument is the name we gave the module when we created it. It really doesn't make much difference which approach you use, and both are commonly used. I prefer the approach in Listing 4-8, where we store a reference, as there is less repetition of the module name, so fewer chances of typos creeping in. Sometimes, however, you might find you need to get a reference to a module, and the single argument version of the module method might be the only way to get it. Now let's turn our attention to Listing 4-10 and the next step in the process.

Listing 4-10. An ***index.html*** File Set Up to Use ***myAppModule***

```
<!DOCTYPE html >
<html  ng-app="myAppModule">
<head  lang="en">
    <meta  charset="UTF-8">
    <title>Listing  4-10</title>
    <script  src="js/angular.min.js"></script>
    <script  src="js/myAppModule.js"></script>
</head>
<body  ng-controller="MyFilterDemoCtrl">

</body>
</html>
```

With the default module created, all we have to do now is to associate it with our ***index.html*** page. We use ***ngApp*** with the name of the module as its value to bootstrap the whole AngularJS process. Take note that we still have to provide a script reference to the ***myAppModule.js*** file, so that AngularJS can actually find the module we declared in the ***ngApp*** directive.

There is slightly more work in setting up a default module as opposed to lumping everything together in the HTML file, but it's easy enough and soon becomes second nature. You should feel somewhat inspired by the clean look of the ***index.html*** page above. As you will see, having the JavaScript file separated from the HTML is well worth the trouble. However, that is not all that we have achieved. We have also set up our application to use the AngularJS module system, and this enables you to tap into all the benefits that go with it.

Creating a Custom Filter

At last, it's time to look at creating a custom filter. Modules are great, but, while important, they're probably not the most exciting topic! This is perhaps because they don't directly produce any visual output. However, custom filters are more exciting, and we are going to use one to solve another issue that we have with our sample data.

For some unknown reason, some values sent back to us are dash delimited. The back end team has told us that this is the way that the data is stored in the database and that it cannot change it. Nonetheless, we aren't very keen on presenting it to our end users in this format. The plan property is an example of this; it has a value of "***super-basic-plan***". We could easily deal with one case of this without a filter, but we will assume it is a common problem, and we will use a filter to solve it across the whole application.

I find that the best way to go about writing a filter is first to forget about filters. I get the logic working as regular JavaScript, and then I tie it into a filter once I am satisfied. The requirement here is relatively simple: we want to remove any dashes and replace them with spaces. Listing 4-11 shows a basic script that does just what we need.

Listing 4-11. A Simple Replace Dashes Function

```
<script>

    function stripDashes(txt) {
        return txt.split('-').join(' ');
    };

    console.log(stripDashes("super-basic-plan"));
    console.log(stripDashes("something-with-a-lot-more-dashes-plan"));
    console.log(stripDashes("noDashesPlan"));

</script>
```

This function is relatively straightforward. It accepts a single argument—the dash delimited string—and returns the modified string. We have used a few calls to ***console.log*** for the purpose of verifying our expectation that it will strip out all of the dashes and leave spaces in their place. The following output suggests this function is fit for this purpose:

```
super basic plan
something with a lot more dashes plan
noDashesPlan
```

■ **Tip** These days, it is increasingly common for JavaScript programmers to write formal unit tests, but we won't explore that topic very much in this book. Realistically, a few calls to the ***console.log*** method do not constitute proper testing. As you have chosen to read a book about a framework that fully supports unit testing, I strongly recommend that you read up on the topic in the near future.

As the function is working as we expect it to, we are now ready to convert it to an AngularJS filter. The method we use to create an AngularJS filter is named, unsurprisingly, filter. It accepts two arguments: a name for the filter and a *factory* function. We will name our filter ***'stripDashes'***, and we will create a factory function that returns our ***stripDashes*** function. That may have sounded a tad confusing, particularly the bit about factory functions. As usual, a code listing should help clarify. Listing 4-12 is the filter method from Listing 4-9, revised to include the actual filter logic.

Listing 4-12. An Angular Filter Implementation

```
myAppModule.filter('stripDashes', function () {
    // the function we are in returns
    // the function below
    return function(txt) {
        return textToFilter.split('-').join(' ');
    };

});
```

Of particular note here is the fact that the ***filter*** function does not itself implement our logic; rather, it returns a function that implements it. This is why that second argument supplied to the filter method is called a “factory function”; its main purpose in life is to manufacture functions. This can seem a little strange at first, but it is a common design pattern (generally known as the *factory pattern*), and it’s certainly not difficult to implement. It might help if you think about this from AngularJS’s point of view: we don’t want to use a function here and now, but we do want to *return a function* to AngularJS, for it to utilize whenever we invoke the associated filter.

The argument we named ***txt*** represents the expression value that is passed in to this filter function when it is used, that is, it’s the value we are filtering. In Listing 4-13, which uses our new custom filter, you can see that ***txt*** will be the value of ***data.plan***.

Listing 4-13. Trying Out the ***stripDashes*** Filter

```
<!DOCTYPE html>
<html>
<head>
    <title>Filter Demo</title>
    <script src="js/angular.min.js"></script>
    <script
src="js/myModules/myAppModule.js"></script> </head>
<body            ng-app="myAppModule"            ng-
    controller="MyFilterDemoCtrl">     <p>Plan     type:
    {{data.plan}}</p>
    <p>Plan type: {{data.plan | stripDashes}}</p>
</body>
</html>
```

There you have it, a very handy filter that we can reuse across our application. As an additional example, let’s create another filter. As I mentioned earlier in the chapter, we can improve upon the way we handle the f***irstName*** and ***surname*** by using a technique known as *title casing*, instead of simply converting them to lowercase. We can do this by making sure the first character is in uppercase and all of the remaining characters are in lowercase. As before, let’s first write the code that will accomplish this, before we create the filter itself. Have a look at Listing 4-14.

Listing 4-14. A Basic Title Casing Function

```
<script>

    function  toTitleCase(str)
    {
        return  str.charAt(0).toUpperCase()  +  str.substr(1).toLowerCase();
    }

    console.log(toTitleCase("jennifer"));
    console.log(toTitleCase("jENniFEr"));
    console.log(toTitleCase("jENniFEr             amanda
    Grant"));
</script>
```

Let’s have a look at the output of Listing 4-14 and see if it meets our needs.

```
Jennifer
Jennifer
Jenni.amanda  grant
```

It’s a fairly simple function, and it does what we need it to do. That is to say, it will indeed convert the ***firstName*** and ***surname*** to title case. It does so by using the string method’s ***charAt()*** method to access and convert the first character to uppercase (as returned by ***str.charAt(0).toUpperCase()***) and concatenating the resulting value to a lowercased portion of the string that consists of all but the first character (as returned by ***str.substr(1).toLowerCase()***).

However, I don’t like the fact that this function works only on the very first word when it is given a multiple word string as an argument. While we could perhaps get away with this for the cases in which we only want to work with a single word, it is not a very forward-thinking approach. Let’s add the ability to handle multiple words (see Listing 4-15).

Listing 4-15. A Better Title Casing Function

```
<script>

    function  toTitleCase(str)
    {
        return   str.replace(/\w\S*/g,   function(txt){return   txt.charAt(0).toUpperCase()   +   txt.
        substr(1).toLowerCase();});
    }

    console.log(toTitleCase("jennifer"));
    console.log(toTitleCase("jENniFEr"));
    console.log(toTitleCase("jENniFEr              amanda
    Grant"));

</script>
```

The following output shows that this is a better implementation. The last line now shows that each word has had its first character converted to uppercase.

```
Jennifer
Jennifer
Jennifer  Amanda  Grant
```

Of course, the function is now a little more complicated. The trick to understanding it lies in the use of the string object's ***replace()*** method. This method is very powerful, but it does require some knowledge of regular expressions before you can truly master it. A regular expression is a sequence of symbols and characters expressing a pattern to be searched for within a longer piece of text. The first argument to this method is a regular expression, which looks like this: ***/\w\S*/g***. More specifically, in this particular case, it is looking for each individual word. The anonymous function, which is the second argument, is executed for each word that is found. This function uses the same logic you saw in Listing 4-12; therefore, each word now has its first character converted to uppercase and all remaining characters converted to lower case.

Now we will use this approach to create another filter in the module we created in Listing 4-9. We will name this one ***toTitleCase***. This is shown in Listing 4-16.

Listing 4-16. An Angular Filter Implementation

```
myAppModule.filter("toTitleCase",  function  ()  {
    return  function  (str)  {
        return   str.replace(/\w\S*/g,   function(txt){   return   txt.charAt(0).toUpperCase()   +   txt.
        substr(1).toLowerCase();});
    };
});
```

With the filter in place, we can now make use of it. Listing 4-17 shows it in action. In this example, we show the filter working on individual words (***firstName*** and ***surname***), and we also see it in action on a concatenation of ***firstName*** and ***surname***.

Listing 4-17. Using the ***toTitleCase*** Filter

```
<!DOCTYPE html>
<html>
<head>
    <title>Filter Demo</title>
    <script src="js/angular.min.js"></script>
    <script
src="js/myModules/myAppModule.js"></script> </head>
<body ng-app="myAppModule" ng-
controller="MyFilterDemoCtrl"> <!-- Display customer name in
title case --> <p>First Name: {{data.firstName | toTitleCase}}</p>
<p>Surname: {{data.surname | toTitleCase}}</p>
<p>Full Name: {{ data.firstName + data.surname | toTitleCase}}</p>
</body></html>
```

CHAPTER 4

Directives

Most JavaScript frameworks have a “special something” that sets them apart. That special something in the case of AngularJS is undoubtedly directives. The idea that we can use a declarative approach that lets us augment HTML with new capabilities has great appeal. I suspect this has very much to do with clean looks and intuitive syntax, but it might be because it is a fun and enjoyable way to approach client-side web development.

In this chapter, I will recap some of the things we have already been using, by looking at the built-in directives.

You will also have a first look at creating custom directives.

Directives, in Angular JS, are essentially JavaScript functions that are invoked when the Document Object Model (DOM) is compiled by the Angular JS framework. I will touch on what is meant by the DOM being “compiled” when we take a peek behind the scenes later in the chapter, but for now, it is enough to know that directives are “attached” to their corresponding DOM elements when the document is loaded.

■ **Tip** Don’t let the word *compiler* scare you off! It is simply AngularJS terminology for the internal mechanism that is used to associate directives with HTML elements.

Due to this this powerful concept, Angular JS lets you create totally new directives that we can use to encapsulate logic and simplify DOM manipulation—directives that can modify or even create totally new behavior in HTML.

What can we use directives for? As directives can modify or even create totally new behavior, we can use directives for anything from simple reusable blocks of static content right through to sophisticated client-side user interfaces with network and database connectivity—and everything else in between. The built-in directives provide the general level of functionality that you would expect to find—the bread-and-butter directives, so to speak—though custom directives let you push things much further. The only limit is your imagination. (Well, maybe your JavaScript skills have some impact on this too!)

Of course, Angular JS is much more than directives; however, they do seem to be the main attraction. I hope, by the end of this chapter, you will have gained an appreciation of why this is so.

The Basics of Directives

What do directives look like? You are no doubt thinking that you have seen enough in use so far to know the answer to that question. It may surprise you to learn that directives can take on a few different forms. Let's pick on the ***ngController*** directive as an example.

As you know, the ***ngController*** directive looks like the following:

<div ng-controller="myFilterDemoCtrl"></div>

This is a typical directive declaration, and it is by far the most common way to use directives: that is, as an attribute. One potential issue with this approach is that the document that contains it will not validate as HTML5-compliant. If this is a concern to you, or your organization, you can do the following instead:

<div data:ng-controller="myFilterDemoCtrl"></div>

This is very similar to the approach to which we are accustomed, though here we use the prefix ***data:*** before our directive name. Validators are happy with this, because it uses a standard approach to creating custom data attributes.

In both the preceding cases, we invoke the directive using an attribute, though this is not our only option. All of the following methods are also technically possible:

As an attribute:

<span my-directive></span>

As an element:

<my-directive></my-directive>

As a class:

<span class="my-directive: expression;"></span>

As a comment:

<!-- directive: my-directive expression -->

I say "technically possible," because directives authors may or may not have enabled their directives to be used in all possible forms. You will learn more about this when we build a custom directive later in this chapter. In reality, you won't use the last two options, as they exist mainly for use with much older browsers, and you will rarely see them in use in the wild. Still, it's nice to have options, and at least you won't be caught unawares if you should stumble upon any of these.

Using Directives

A directive is rarely an island unto itself. That is to say, directives often need to communicate and interact with the rest of your application. This is usually done through a scope, as you have seen in previous chapters. Let’s start building a small part of an application that shows this idea in action.

Listing 5-1 shows ***product-detail.html***. This is the HTML and CSS code for a product selection page. We will focus our efforts on an exciting new fictitious product: the AngularJS socks. These amazing socks, created specifically to warm the feet of AngularJS developers, come in a variety of colors. The requirement here is to hide the list of available colors until the customer is ready to choose one. The directives we will use to achieve all of this are ***ngClick***, ***ngHide***, and ***ngController***.

The bulk of this code is the CSS, which, for the most part, sets up the colors for the associated ***div*** elements. You will see that, due to the ***ng-hide="isHidden"*** directive placed on each of these ***div*** elements, the page defaults to a state in which the color list is hidden.

Listing 5-1. ***product-detail.html***, a Basic Product Detail
Page ***<!DOCTYPE html >***

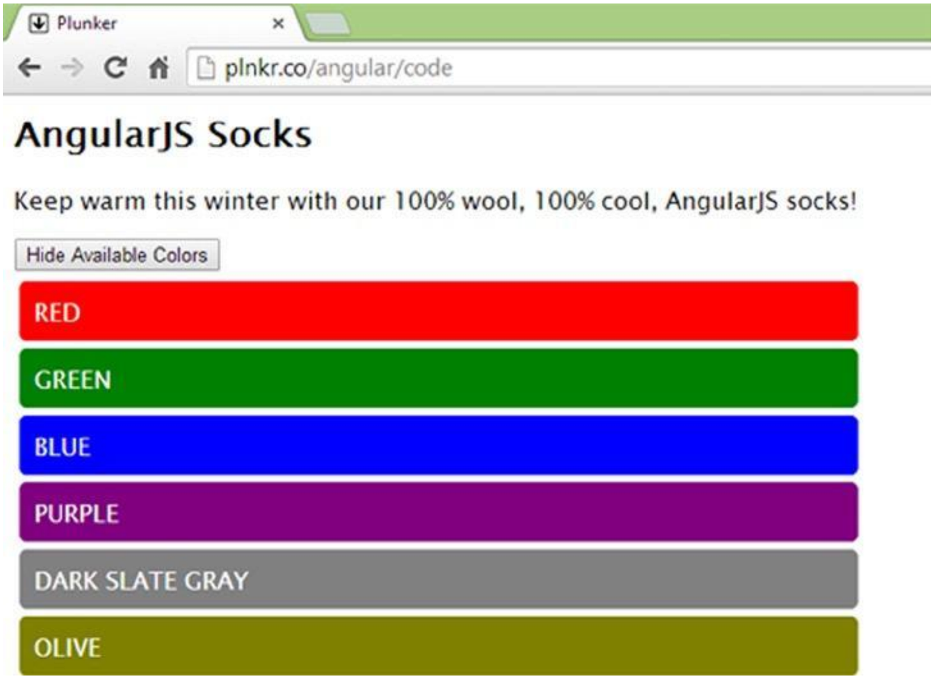
```
<html  ng-app="myAppModule">
<head>
      <title></title>
      <script  src="js/angular.js"></script>
      <script  src="js/myAppModule.js"></script>
      <style>

            body  {
                  font-family:  "Lucida  Grande",  "Lucida  Sans  Unicode",  Helvetica,  Arial,  sans-serif;
            }

            div  {
                  margin:  20px;
                  padding:  20px;
                  font-size:  16px;
                  color:#ffffff;
            }

            #red  {
                  background-color:  red;
            }

            #green  {
                  background-color:  green;
            }
```

```
          #blue {
               background-color: blue;
          }

          #purple {
               background-color: purple;
          }

          #gray {
               background-color: gray;
          }

          #olive {
               background-color: olive;
          }


     </style>
</head>
<body ng-controller="myProductDetailCtrl">

<h2>AngularJS Socks</h2>

<p>Keep warm this winter with our 100% wool, 100% cool, AngularJS socks!</p>

<button ng-click="showHideColors()" type="button">
     {{isHidden ? 'Show Available Colors' : 'Hide Available Colors'}}
</button>


<div  id="red"  ng-hide="isHidden">Red</div>  <div
id="green"   ng-hide="isHidden">Green</div>   <div
id="blue"    ng-hide="isHidden">Blue</div>    <div
id="purple" ng-hide="isHidden">Purple</div>
<div id="gray" ng-hide="isHidden">Dark Slate Gray</div>
<div id="olive" ng-hide="isHidden">Olive</div>

</body>
</html>
```

Figure 5-1 shows how this page looks when it first loads. A product description and a button that will show or hide the available colors when clicked are displayed.

Figure 5-1. *The default view of product-detail.html>*

As available space on today's screens can be quite limited, it is incredibly useful to be able to hide information and to make it available on demand. Figure 5-2 shows how it looks when the Show Available Colors button is clicked.



AngularJS Socks

Keep warm this winter with our 100% wool, 100% cool, AngularJS socks!

Hide Available Colors

RED

GREEN

BLUE

PURPLE

DARK SLATE GRAY

OLIVE

Figure 5-2. *The Show Available Colors view of product-detail.html*

The interesting thing about this implementation is how the logic is assembled. It's intuitive, and it doesn't leave a trail of messy JavaScript code in its wake. In fact, the ***product-detail.html*** file is primarily HTML and CSS code. Ofcourse, there must be some JavaScript code somewhere. I'm hoping that, with last chapter's coverage of modules in mind (and the ***ng-app="myAppModule"*** directive on the second line), you already know where this JavaScript is. It is tucked away in a module file. Let's have a look at this module now (see Listing 5-2).

Listing 5-2. The ***myAppModule.js*** Application Module

```
// Create the module
angular.module('myAppModule',
[]);

//  configure  the  module  with  a  controller
angular.module('myAppModule').controller('myProductDetailCtrl',  function  ($scope)  {

        //  Hide  colors  by  default
        $scope.isHidden = true;
        //  a  function,  placed  into  the  scope,  which
        //  can  toggle  the  value  of  the  isHidden  variable
        $scope.showHideColors = function () {
            $scope.isHidden  =  !$scope.isHidden;
        }

    }
);
```

It's surprisingly short, mainly because we don't actually do very much heavy lifting ourselves. Instead, we concentrate on managing the state of the ***isHidden*** variable. The ***ngHide*** directive is taking care of how the underlying task is actually implemented.

As you may have come to expect by now, we are utilizing the scope object. Consequently, the ***isHidden*** variable and the ***showHideColors()*** function can be used in the directives expressions. These two actions constitute the wiring up of our logic.

Take a look at the following excerpts from the ***product-detail.html*** file from Listing 5-1. You can see where the ***showHideColors()*** function that we assigned to the scope is used by ***ngClick***

```
<button  ng-click="showHideColors()"  type="button">
    {{isHidden  ?  'Show  Available  Colors'  :  'Hide  Available  Colors'}}
</button>
```

. . . and where the ***isHidden*** variable we assigned to the scope is used by ***ngHide***

```
<div  id="red"  ng-hide="isHidden">Red</div>
```

Why are all of the color ***div***s hidden by default? This is because the expression, ***isHidden***, provided to the ***ngHide*** directive on each of the ***div***s evaluates to true. What is really cool, due to the live updating that Angular JS performs, is that anytime the value of ***isHidden*** changes, ***ngHide*** will respond accordingly. Of course, we want it to change, and that is why we use the Show Available Colors button along with the ***ngClick*** directive.

The button uses the ***ngClick*** directive, and the expression we pass to this directive is a call to our ***showHideColors()*** function. It is this function call that will change the state of the i***sHidden*** variable, thereby causing the ***ngHide*** directive's expression now to evaluate to false. Consequently, the color ***div***s become visible.

An interesting requirement in the case of the button is that we want the text to adapt when the button is clicked. We do this using a particularly helpful technique that can be used within Angular JS expressions. I'm referring to the following line:

{{isHidden ? 'Show Available Colors' : 'Hide Available Colors'}}

This expression uses the ternary conditional operator. It can look a little odd if you haven't seen it before, but it's actually quite easy to use. The first portion, the bit before the ***?*** (question mark), must evaluate to true or false. If it evaluates to true, the statement before the ***:*** (colon) is executed; otherwise, the one after it is executed. In our case, the text appearing on the button will update itself, based on whether or not the color ***div***s are currently hidden, because we use ***isHidden*** to drive the outcome.

For a relatively small amount of code, we get a fairly useful piece of functionality. This shows how directives can be greater than the sum of their parts. It also shows, I hope, that directives can lead to well-encapsulated code that can keep complexity out of sight. We can do even better still, but we will get to that when I cover custom directives in the last section of this chapter.

Built-in Directives

In this section, we will take a look at a few very useful built-in directives. We can't look at all of them here, as it would take far too long. However, I would like to give you a sense of the directives that ship with the framework and some examples of how they work. I won't pay much attention to HTML form-related directives, as these get their own coverage in the next chapter.

ngBind

Much of the time, you don't use ***ngBind*** directly, because the double curly braces achieve the same thing. For example, the following two code snippets are functionally equivalent:

<span ng-bind="2+2"></span>

{{2+2}}

Both ***ngBind*** and the expression syntax ask Angular JS to display the value of a given expression and update the output accordingly when the value of that expression changes.

If we have expressions, why bother to use ***ngBind***? A benefit of using the ***ngBind*** approach relates to the fact that, if a document takes some time to load, your HTML page might temporarily show the raw expressions to your end users. That is to say, they may literally see the ***{{2+2}}*** appear momentarily before Angular JS gets a chance to compile it and show the desired values. Using ***ngBind*** does not have this unfortunate side effect.

You probably don't want to give up using the curly brace syntax, so keep reading. The ***ngCloak*** directive is here to save the day.

ngCloak

If your document is taking time to load, and you are noticing issues with the raw expressions that are appearing, you don't have to use the ***ngBind*** approach mentioned previously. You can use ***ngCloak*** instead. This directive is shown in action following:

```
<p ng-cloak>{{ 2 + 2 }}</p>
```

Here we "cloak" the Angular expression simply by declaring ***ngCloak*** (no value is required for this attribute). The cloaking of the expression happens because ***ngCloak*** applies a CSS rule that hides it, although it is only hidden until Angular JS has determined that it can display the evaluated value.

It is tempting simply to add this directive to the ***body*** element, so that it applies to the whole document hierarchy, but often this is not a good idea. This would prevent the browser's natural desire to render the page progressively. Instead, it is often better to apply it on individual elements. Better yet, if your document is not large enough to be exhibiting this undesirable behavior, don't use it at all!

ngInclude

This handy directive lets you include the contents of another file within your document. Take, for example, the very small file in Listing 5-3, which we have named ***include-me.html***.

Listing 5-3. *include-me.html*

```
<p>Thanks for visiting our website!</p>
```

Now, let's include this file's output at the bottom of ***includes-in-action.html*** (see Listing 5-4).

Listing 5-4. *includes-in-action.html*

```
<!DOCTYPE html>
<html>
<head>
    <title></title>
</head>
<body>
<h1>Includes in Action</h1>

    <p> You should see the inluded files contents below</p> <div
    ng-include="'include-me.html'"></div>

</body>
</html>
```

This directive is easy to use, but there is one potential pain point for the Angular JS beginner. Be aware that ***ngInclude*** expects to be supplied with an Angular JS expression. Remember, an Angular JS expression is a subset of JavaScript, and it follows all the usual rules. A string must either be single-quoted or double-quoted. As the Angular JS expression is itself double-quoted, the string you provide within it must be single-quoted. This is why we use ***"'include-me.html'"***. Using ***"include-me.html"*** simply wouldn't work.

ngShow and ngHide

The ***ngShow*** directive will show or hide the HTML element upon which it is defined. The element is shown or hidden by adding or removing a predefined AngularJS class called ***ng-hide***. The ***p*** element in the following example will be shown only when ***$scope.correctAnswer*** is ***true***.

```
<p ng-show="correctAnswer">That answer is correct!</p>
```

If we assume that ***$scope.correctAnswer*** is ***false***; looking at the source code of the HTML page would reveal that the ***ngHide*** class has been added to the ***p*** element by the AngularJS framework.

```
<p ng-show="isCorrectAnswer" class="ng-hide">That answer is correct!</p>
```

The ***ng-hide*** class is very simple and nothing more than a single CSS rule, as follows.

```
.ng-hide{
  display: none !important;
}
```

As you might imagine, the ***ngHide*** directive does the exact opposite. The following example achieves the same result as the previous example, but by asking the question in a different way. Here, the text within the ***p*** element is hidden when ***$scope.correctAnswer*** is *not* ***true***.

```
<p ng-hide="!correctAnswer">That answer is correct!</p>
```

ngRepeat

The ***ngRepeat*** directive is definitely one of the most useful built-in directives. It is, essentially, a looping construct that instantiates a template once for every item in a collection (for example, an array). It also has a number of useful built-in variables, which are shown in Table 5-1.

Table 5-1. *ngRepeat Built-in Variables*

Variable Name	Type	Description
$index	Number	Iterator offset of the repeated element (0..length-1)
$first	Boolean	True, if the repeated element is first in the iterator

$middle	Boolean	True, if the repeated element is between first and last in the iterator
$last	Boolean	True, if the repeated element is last in the iterator
$even	Boolean	True, if the iterator position ***$index*** is even (otherwise, false)
$odd	Boolean	True, if the iterator position ***$index*** is odd (otherwise, false)

Let's have a look at a code listing (Listing 5-5) that puts ***ngRepeat*** and some of these built-in variables to use.

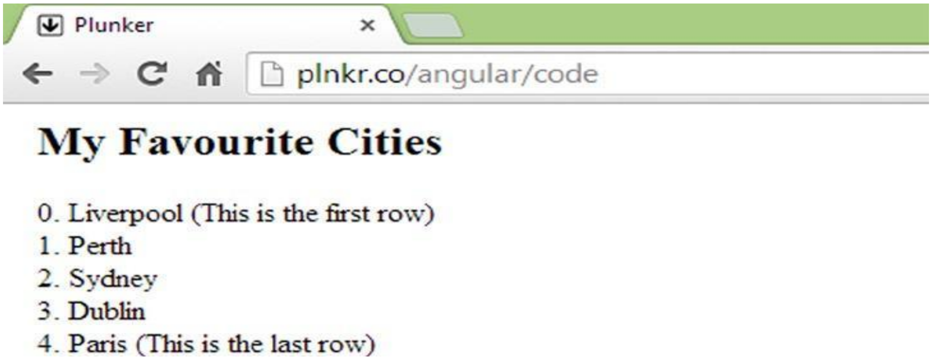
Listing 5-5. Using ***ngRepeat*** with Some of the Built-in Variables

```
<h2>My Favourite Cities</h2>
<div ng-repeat="city in ['Liverpool','Perth','Sydney','Dublin','Paris']">

    {{$index}}. {{city}}
    {{$first ? '(This is the first row)' : ''}} {{$last ? '(This is the last row)' : ''}}

</div>
```

The output can be seen in Figure 5-3. The ***$index*** variable gives us the row numbers, and we use ***$first*** and ***$last*** to output conditionally, whether or not we are on the first or last row, respectively. The most important thing to understand about this ***ngRepeat*** example is the format of the expression with which we provide it.

```
"city in ['Liverpool','Perth','Sydney','Dublin','Paris']"
```

This format follows the *variable in collection* pattern. I chose the name "city" for the variable, and the collection is the array of cities. Another important thing to know about ***ngRepeat*** is that it creates, at each pass through the loop, a new scope object, each one quite distinct from the controller's own ***$scope*** object. In fact, this is why we can have different values for variables, such as ***$index*** and ***city***.



```
My Favourite Cities

0. Liverpool (This is the first row)
1. Perth
2. Sydney
3. Dublin
4. Paris (This is the last row)
```

Event-Handling Directives

We have seen ***ngClick*** already, though Angular JS comes with similar directives for handling the usual browser events, such as ***ondblclick***, ***onblur***, ***onfocus***, and ***onsubmit***. Each directive works pretty much as you would expect and is named using the same format. So, for the list of events I just mentioned, we would have the corresponding Angular JS versions: ***ngDblclick***, ***ngBlur***, ***ngFocus***, and ***ngSubmit***.

You don't have to use these directives, as Angular JS in no way prevents you from using the regular JavaScript event handlers. However, it is generally recommended that you do use them, especially if you want to stay within the Angular JS framework. For example, a big difference between regular events and their Angular JS equivalents is that the equivalents take Angular JS expressions. This means that you have access to the implicitly available ***$scope*** object, among other things.

Creating a Custom Directive

While there are plenty of built-in directives, you will occasionally need to build your own application-specific directives. In this section, we will look at an example that should serve to get you up to speed on the basics of how to do just that. Custom directives can seem a bit intimidating at first, mainly because there are a lot of moving parts.

My aim here is to get you up to speed with the basics and put you in good shape to tackle the more advanced aspects as and when you need them. To achieve this, we will create a custom directive that we will call ***colorList***. This directive will encapsulate much of the code we looked at in Listing 5-1. To recap, this produced a color selection list, which could be activated and deactivated using a button. Listing 5-6 shows how this directive can be used within the ***product-detail.html*** file.

Listing 5-6. The ***colorList*** Directive in Use

```
<!DOCTYPE html >
<html ng-app="myAppModule">
  <head>
    <title>A Custom Directive</title>
    <script src="js/angular.min.js"></script>
    <script src="myAppModule.js"></script>
  </head>
  <body ng-controller="myDemoCtrl">
    <h2>AngularJS Socks</h2>
    <p>Keep warm this winter with our 100% wool, 100% cool, AngularJS socks!</p>

      <div color-list colors="colorsArray"></div>
</body>
</html>
```

As you can see, it's quite easy to use this directive. It looks and behaves in the same way as ***product-detail. html***. It houses a button that is used to show and hide the available colors, but rather than hard-code the

colors using manually crafted ***div*** elements, as we did earlier, we will make this directive much more reusable, by using
a ***colors*** attribute. This allows us to pass in an array of colors, so that we can determine which colors to use on a case-by-case basis.

Like filters and controllers, directives are configured on a module. Let’s examine how this works (see Listing 5-7).
It should look relatively familiar.

Listing 5-7. Configuring a Directive

```
myAppModule.directive('colorList', function () {

    return {

        restrict: 'AE',
        template:
                "<button ng-click='showHideColors()' type='button'>"
              + "{{isHidden ? 'Show Available Colors' : 'Hide Available Colors'}}"
              + "</button><div ng-hide='isHidden' id='colorContainer'>"
              + "</div>"

        }
});
```

We’ll build on this until our directive is fully implemented, but for now, let’s focus on what is achieved in Listing 5-7. Using the ***directive*** method on the module, we have registered a directive with the Angular JS framework.
We named this directive, via the first argument, ***colorList***. The second argument is an anonymous function, which
returns a *directive definition object*. This is a regular JavaScript object that we need to set up with various properties
that tell Angular JS all about our directive. So far, all that we have configured is the ***restrict*** and ***template*** options.
Let’s deal with ***restrict*** first.

The restrict Option

The ***restrict*** option is used to specify how a directive can be invoked. As you saw earlier, there are four different ways to invoke a directive. This corresponds to the four valid options for ***restrict***.

Table 5-3 provides an example of each valid option. As our directive uses the value '***AE***'; this means that it can be invoked as either an attribute or an element. As I mentioned earlier in this chapter, you won’t use the last two options, ***C*** and ***M***, as they exist mainly for use with much older browsers.

Table 5-3. *Valid restrict Options*

Option	Example
A	*<span color-list ></span>*
E	*<color-list></color-list>*
C	*<span class="color-list"></span>*
M	*<!-- directive: color-list -->*

When should you use an element and when should you use an attribute? You can use either, and the end result will be the same. However, the Angular team recommends that you use an element when you are creating a component that is in control of the template and an attribute when you are decorating an existing element with new functionality.

The template Option

As the name suggests, the ***template*** option lets you define a template. The template is appended to your directive declaration by default (though there is a ***replace*** option that allows you to replace the element on which the directive occurs entirely). Let's consider the HTML code that I have provided as the value to the ***template*** option. I have shown this again in Listing 5-8, but, this time, without the string quotations, so it is easier to read.

Listing 5-8. The Value of the ***template*** Option

```
<button ng-click='showHideColors()' type='button'>
 {{isHidden ? 'Show Available Colors' : 'Hide Available Colors'}}
</button>

<div ng-hide='isHidden' id='colorContainer'></div>
```

You will recognize the button and the expression within it. The ***div*** with the id of ***colorContainer*** is new. This is because we will abandon the approach of hard-coding the color ***div***s manually in favor of dynamically appending them to this ***div***, based on array values. We will see this in action shortly.

The link Option

The function that you assign to the ***link*** option is where the main action takes place. This function has access to the current scope (by default) and the element on which the directive was declared (the ***div*** element, in this case). For clarity, let's list precisely what we want this directive to achieve. This will make it easier to follow the rationale behind the implemented logic. The directive should perform the following:

1. Add a button to the page. This button will be a toggle for showing and hiding a list of colors.

2. By default, the color list should be hidden.

3. The colors should be shown as ***div*** elements that can display a color and color name, based on an array of strings corresponding to that color.

4. The color list should be an array containing CSS color name values. This should be available within the directive.

We need a ***link*** function that achieves all but one of these requirements. The first requirement is already met, because the button is defined in the HTML we assigned through the ***template*** option. The second requirement is partially met, but it still needs work. I say *partially* met, because the template also has the ***colorContainer div***, which will be the parent container for our color list. This ***div*** makes use of the ***ngHide*** directive.

Listing 5-9 shows our ***link*** function. This function completes the requirements we listed earlier. I will put this in context with the rest of our custom directive shortly, but for now, see if you can pick out what is happening here.

Listing 5-9. The ***link*** Function

```
link: function ($scope, $element) {

    // set default state of hide/show
    $scope.isHidden = true;
    // add function to manage hide/show state
    $scope.showHideColors = function () {
        $scope.isHidden = !$scope.isHidden;
    }

    // DOM manipulation
    var colorContainer = $element.find('div');
    angular.forEach($scope.$parent.colorsArray, function (color) {
        var appendString = "<div style='background-color:" + color + "'>" + color + "</div>";
        colorContainer.append(appendString);              });

}
```

The first thing to notice about the ***link*** function is that we have access to the element on which the directive is defined and a scope object (via the ***$element*** and ***$scope*** arguments accepted by the function). These are automatically injected into our function by the framework.

The first batch of logic in this function simply sets the default state of the directive such that the color list is hidden. Next, we attach the s***howHideColors()*** function to the scope. The next batch of logic, under the DOM manipulation comment, is the real meat of the directive.

We want to add ***div*** elements dynamically to the ***colorContainer div***, so we create a variable called ***colorContainer***. To achieve this, we used the following statement:

```
var colorContainer = $element.find('div');
```

If you have used jQuery before, this might look familiar. This is because ***$element*** is a jQuery wrapped element and, as such, can use jQuery methods, such as ***find()*** and ***append()***.

With the ***colorContainer*** reference in hand, we can now create the color list by attaching to it a ***div*** for each color in the array. We do this by looping through the colors array, using the handy ***angular.forEach*** method and, at each pass, ***append*** to build the list of colors.

Within the ***forEach*** loop, we do the ***append*** operation by creating a ***div*** element as a string value that is constructed using the current array item (the CSS color name). This is used as both the value of the background-color CSS rule and as the literal text that displays within the ***div***.

```
var appendString = "<div style='background-color:" + color + "'>" + color + "</div>";
colorContainer.append(appendString);
```

Both the HTML page that uses the directive and the module that contains the directive and controller code are shown in Listing 5-10 and Listing 5-11, respectively.

Listing 5-10. ***product-detail.html***, Revised to Use a Custom Directive

```
<!DOCTYPE html >
<html ng-app="myAppModule">
<head>
    <title></title>
    <script src="https://ajax.googleapis.com/ajax/libs/angularjs/1.2.21/angular.min.js"></script> <script
    src="/compass/src/js/myAppModule.js"></script> <style>

        #colorContainer div {
            color: white;
            text-transform: uppercase;
            width: 200px;
            padding: 10px;
            margin:5px;
            border-radius: 5px;
            -moz-border-radius: 5px;
        }
    </style>

</head>
<body ng-controller="myDemoCtrl">
<h2>AngularJS Socks</h2>
```

```
<p>Keep warm this winter with our 100% wool, 100% cool, AngularJS socks!</p>
        <div color-list colors="colorsArray"></div>
</body>
</html>
```

Listing 5-11. The Application Module Containing Our Directive Registration and Our Controller

```
// declare a module
var myAppModule = angular.module('myAppModule', []);

myAppModule.controller('myDemoCtrl', function ($scope) {
        $scope.colorsArray = ['red', 'green', 'blue', 'purple', 'olive']
    }
);

myAppModule.directive('colorList', function ($compile) {

    return {

        restrict: 'AE',
        template: "<button ng-click='showHideColors()' type='button'>"
            + "{{isHidden ? 'Show Available Colors' : 'Hide Available Colors'}}"
            + "</button><div ng-hide='isHidden' id='colorContainer'>"
            + "</div>",
        link: function ($scope, $element) {

            // set default state of hide/show
            $scope.isHidden = true;
            // add function to manage hide/show state
            $scope.showHideColors = function () {
                $scope.isHidden = !$scope.isHidden;
            }
            // add colors divs to the document
            var colorContainer = $element.find('div');
            angular.forEach($scope.colorsArray, function (color) {
                var appendString = "<div style='background-color:" + color + "'>" + color + "</div>";
                colorContainer.append(appendString);
            });
        }
    };
});
```

CHAPTER 5

Working with Forms

Since their introduction in the mid-90s, HTML forms have taken a largely static World Wide Web and turned it into a place of business and a rich source of interactivity and entertainment. Initially, HTML forms were functionally limited and clunky, but the specification evolved, and developers learned to work around the issues. Today, thanks in large part to frameworks such as AngularJS, HTML forms are the underlying reason that web-based applications now rival traditional desktop applications. To put all of this more concisely: HTML forms cannot be ignored!

In this chapter, we will look at how to use AngularJS with forms and how to perform tasks such as model binding and data validation. Fortunately, AngularJS doesn't require that you learn about forms from scratch, as it simply enhances the way forms already work, although these enhancements are not always obvious or intuitive. Before we get into all that, however, let's start with a brief recap of what standard forms offer us.

The *form* Element

The ***form*** element itself is a good place to begin. This element defines the form as a whole, and it is a responsible mechanism for telling the web browser what to do once the user presses the ***submit*** button. For instance, where should it send the data that was collected, and what method should it use to send this data? It does this via its ***action*** and ***method*** attributes, respectively.

```
<form  name="myForm"  action="myserver/someaction"  method="post">
  ...

</form>
```

The form in the preceding code snippet is configured to use the ***post*** method and to submit its data to ***myserver/ somescript.php***. Besides the ***method*** and ***action*** attributes that set these values, there is a ***name*** attribute that we have set to "***myForm***". In AngularJS, it is quite likely that the ***name*** attribute will be far more important to you than the other ***form*** element attributes. Why is this? In short, it is because developers tend to use Ajax to send data to the server, and they often do not rely on the ***form*** element’s attributes to determine how the Ajax operation is carried out. (I discuss this further in the next chapter.) Setting a name on the form will give you access to some very worthwhile AngularJS features, which we will examine shortly.

■ **Tip** Ajax is a group of technologies used in combination. However, JavaScript developers often use the term to refer to the use of JavaScript for exchanging data asynchronously between a browser and server to avoid full-page reloads.

Of course, a form is no good without ***form***-related elements nested within it, so let’s look at these next. We’ll start with the very versatile ***input*** element.

The *input* Element

The ***input*** element is the ***form*** workhorse. You can use it to create text fields, check boxes, radio buttons, and more. It all hinges on what you specify as the value of its ***type*** attribute. Its possible values include the following:

button
checkbox
file
hidden
image
password
radio
reset
submit
text

Following, we will look at the most frequently used of these attributes.

button

This is a simple clickable button that doesn’t actually do anything if left to its own devices. It is usually used along with
JavaScript to implement some sort of custom behavior. Here’s how you create one:

<input name="save-button" type="button" value="Click me"/>

submit

This is a button too. However, unlike ***button***, this has built-in functionality associated with it. This ***submit*** button triggers the browser to gather up and submit all of the form's data and send it along to its destination. The destination is the value of the action attribute that was declared on the ***form*** element. An important point here is that only the data within the form that the ***submit*** button resides in is sent along to the destination. This makes perfect sense when you consider that you can have more than one form on your page. Here's what it looks like:

<input type="submit" name="submit" value="Register"/>

It is the ***value*** attribute that determines the text that appears on the button. The ***name*** attribute can be used as a reference. For example, you might use this in JavaScript code or in the server-side processing logic (such as a PHP script), once the form is submitted. This attribute applies to all of the ***form*** elements and serves the same purpose in each case.

text

By far the most commonly used input type, the ***text*** input creates a single-line box into which the user can enter text.
Here's what it looks like:

<input placeholder="First Name" type="text" name="first-name" size="20"/>

In this example, I used the ***placeholder*** attribute to create a hint as to the expected value of this field. Using ***placeholder*** can be a very efficient way of exploiting available screen space, as it can be used in lieu of a label. The ***size*** attribute dictates the width of the field. I rarely use this attribute, as I tend to use CSS instead, which gives much more precision and control. Here's an example using this approach:

<input placeholder="First Name" type="text" name="first-name" style="width: 220px;"/>

Here, I have used the ***style*** attribute to inline a CSS rule and set the width property to 220 pixels. Inlining the CSS rule like this is good for demonstrations, but, of course, you could (and probably should) use a dedicated style sheet for all of your CSS rules.

checkbox

If you want your users to respond with a yes or no, a true or false, or some other two state values, ***checkbox*** is the input type that you need. The only possible actions are checking or unchecking the box. Here's what the check box looks like:

<input type="checkbox" name="chknewsletter" value="opt-in-newsletter"/>

The ***value*** attribute determines the value that is sent to the server. For example, you can set the value to ***opt-in-newsletter***, and this is the string value that will be sent to the server as the checked value.

Following is another, almost identical, example. In this case, we have added the checked attribute, so that the check box will be in its checked state by default.

```
<input  type="checkbox"  name="chknewsletter"  value="opt-in-newsletter"  checked/>
```

password

The ***password*** field is very similar to the standard text input. It looks like this:

```
<input  type="password"  name="pin"  id="pin">
```

The ***password*** input differs in that the characters entered into it are masked in the browser, so that prying eyes cannot read what is being entered.

radio

The ***radio*** button control is perhaps the trickiest input type. Named after the old-fashioned radio sets, which used buttons instead of a dial (or a scan function such as we have on modern radios), tuning among stations was accomplished by using a series of buttons that were pre-tuned to certain stations. Pressing down on one button caused any other depressed button to pop back up. It is the same with radio buttons on the Web; that is, you can “depress,” or choose, only one button at any given time.

For this system to work, though, each ***radio*** button in the group from which you want your users to choose must have the same name. In Listing 6-1, you can see that each ***radio*** button has been given a name of ***"station"***.

Listing 6-1. A Group of ***radio*** Buttons

```
<div>
  <input type="radio" name="station" id="rad1" value="triple-m"/> <label for="rad1">Triple M</label>
</div>


<div>
  <input  type="radio"  name="station"  id="rad2"  value="today-fm"/>  <label  for="rad2">Today
FM</label> </div>


<div>
  <input  type="radio"  name="station"  id="rad3"  value="abc-news"/>  <label  for="rad3">ABC
News</label> </div>


<div>
```

```
  <input type="radio" name="station" id="rad4" value="triple-j"/> <label for="rad4">Triple J</label>
</div>
```

A very important thing to note is that, while the ***name*** attribute has the same value in each case, the ***value*** attribute differs. As the user does not actually enter any text into a ***radio*** button (that’s clearly impossible), there must be a way to assign a meaning to each.

Unlike the ***name*** attribute, the ***id*** attribute should be unique. Here, the ***label*** element, through its ***for*** attribute, relates itself to the input it is labeling. We will look at the ***label*** element again at the end of this section.

The *textarea* Element

The ***textarea*** element is similar to the ***text*** input, but it allows the user to enter multiple lines of text, as opposed to a single line of text. This makes it ideal for larger amounts of text. Unlike the ***input*** element, a ***textarea*** element has an opening **<*textarea*>** and closing **</*textarea*>** tag in which only text content is allowed.

```
<textarea  name="description"></textarea>
```

It’s easy to change the size of a ***textarea*** element by making use of the ***cols*** and ***rows*** attributes, which, as you might imagine, specify the number of horizontal input lines (rows) and the width of the ***textarea*** in terms of columns.

```
<textarea  name="description"  rows="4"  cols="50"  ></textarea>
```

The *select* Element

The ***select*** element is a container for a series of option elements. These option elements display in the browser as a drop-down list. Unless you use the ***multiple*** attribute, this control will allow the user to pick just one item from the list of options. Take a look at Listing 6-2, which shows two ***select*** elements, one with the ***multiple*** attribute specified and one without it specified.

Listing 6-2. Two Very Similar ***select*** elements, Two Very Different Outcomes

```
<!-- this renders as a drop down lst -->
<select  name="favorite-food"  id="favorite-food">
      <option>Eggs</option>
      <option>Fish</option>
      <option>Bread</option>
</select>

<!--  this  renders  as  a  all-in-one  list  -->
<select  name="favorite-food"  id="favorite-food"  multiple  >
      <option>Eggs</option>
      <option>Fish</option>
```

```
    <option>Bread</option>
</select>
```

These are close to identical. The only difference is that the second ***select*** element uses the ***multiple*** attribute.

Figure 6-1 shows the rendered lists.

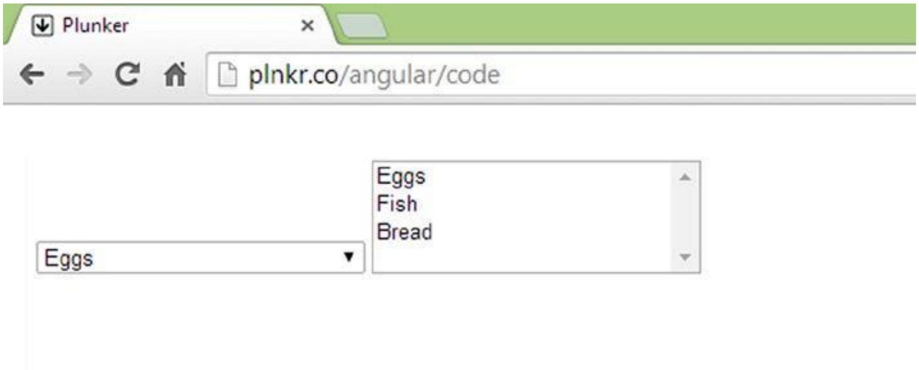


Figure 6-1. *Lists with and without the multiple attribute*

It is common to see the ***select*** element set up such that its first option is the user's prompt. For example, the ***select*** element in Listing 6-3 uses its first ***option*** to display "Choose your favorite food."

Listing 6-3. Using the First ***option*** Element As a Prompt

```
<select name="favorite-food" id="favorite-food"> <option
    value="">Choose your favorite food</option> <option
    value="eggs">I love Eggs!</option> <option
    value="fish">Fish is my fave!</option> <option
    value="bread">Bread rocks!</option>
</select>
```

An important point to observe about Listing 6-3 is that it uses the ***value*** attribute. If the user were to select the option "I love eggs!", the value submitted to the server would be "eggs." The ***option*** used as the prompt has an empty string as its value. This is simply a way to signify the fact that this option isn't really an actual choice; it's merely serving as an instruction to the user.

Model Binding

When we speak about *binding*, we are really just talking about connecting things in such a way that they remain in sync with each other. What *things* are we talking about here? For example, we can bind a model property called ***firstName*** to a text input. This binding would create a special relationship between each, causing the text input to display the value of the model property, and the model property to store the value of the text input.

It's even more than that, however, because it works in both directions and in near real time. Should you change the value in the text input, the model property will immediately update itself to reflect this new value. Should you change the value of the model property, the value in the text input will immediately update itself to display this new value. As this all happens in near real time, changes are visible in the user interface right away.

How do we set up a binding between a model property, such as ***firstName***, and a text input? Well, it's surprisingly easy, thanks to the ***ngModel*** directive.

```
<input type="text" name="firstName" ng-model="firstName"/>
```

Here, we use the ***ngModel*** directive on the input to define a two-way binding. Because we specified ***firstName*** as the value of the ***ngModel*** directive, we connected it to the model property of the same name. A very important aspect of this process is the fact that it all happens against the current scope. In this particular (and common) scenario,

it would be the scope object used in your controller. When ***firstName*** was bound to the text input, it was actually

$scope.firstName that was bound. As discussed earlier in the book, the scope reference is implicit within AngularJS expressions.

Let's look at Listing 6-4 and see some model binding in action. Here is the controller code:

Listing 6-4. Setting Some Model Properties on the Scope

```
angular.module("myapp", [])
.controller("MyController", function ($scope) {

  var person = {
    firstName:"Jimmy",
    age: 21,
    address:{
      street: '16 Somewhere Drive',
      suburb: 'Port Kennedy',
      state:   'Western Australia'
    }
  }

  $scope.person = person;
});
```

Now let's look at Listing 6-5, which shows a portion of HTML code that uses this controller and model.

Listing 6-5. *ngModel* in Action

```
<div ng-app="myapp">

  <div ng-controller="MyController">

    <form name="theForm">
      <input type="text" name="firstName" ng-
      model="person.firstName"/><br/> <input type="text" name="firstName"
      ng-model="person.address.street"/>
    </form>
    <p>
      First name is: {{person.firstName}} <br/>
      Street name is: {{person.address.street}}
    </p>

  </div>
</div>
```

Listing 6-4 and Listing 6-5 show the general principles of binding in action. Pay special attention to the fact that we bound to a model property with a nested object (the ***person*** object's ***address*** property, which is itself an object). Both text inputs properly reflect this hierarchy, as shown in bold in the code listing.

More formally, what I have been discussing in this section is known as *two-way binding*. This distinction is made because AngularJS also supports one-way binding. You have already used one-way binding, and it is used in Listing 6-5. Here is the portion of code in which the one-way binding appears:

```
First name is: {{person.firstName}} <br/>
Street name is: {{person.address.street}}
```

We have already seen this type of binding, though, at the time, we didn't actually use the term *one-way* binding. What exactly do I mean by one-way binding? An easy way to understand this is by considering that a user cannot change a value that is output as plain text content. This is in stark contrast to values that are output to text inputs and other editable ***form*** elements. AngularJS has less work to do with the plain text output, as it does not have to manage the relationship in both directions. Consequently, this is called a one-way binding. AngularJS will not waste resources monitoring static content for changes.

In fact, as an alternative to using the double curly brace syntax, you can instead use the ***ngBind*** directive. The preceding code snippet, rewritten with ***ngBind***, would look like this:

```
First name is: <span ng-bind="person.firtName"></span> <br/>
Street name is: <span ng-bind=" person.address.street "></span>
```

The double-curly-brace approach is more naturally readable, and it requires less typing than the ***ngBind*** approach. However, ***ngBind*** can be useful, as it behaves like the ***ngCloak*** directive, discussed previously in the last chapter, in that content is only visible once AngularJS has loaded.

Here's a good thing to know about how AngularJS treats bindings in the absence of an associated model property: if you refer to a model property in an ***ngModel*** directive and it doesn't actually exist, AngularJS will create it for you. Review Listing 6-6 and Listing 6-7, and then we will have a quick discussion about what this reveals concerning the binding process.

Listing 6-6. Implict Model Binding—HTML Code

```
<div  ng-app="myapp"  ng-controller="MyController">
  <form  name="theForm">
    <div>
      <input  type="text"  name="firstName"  ng-model="firstName">  <br/>
      <input       type="button"       value="Show       first       name"       ng-
    click="showFirstName()"/> </div>

  </form>
</div>
```

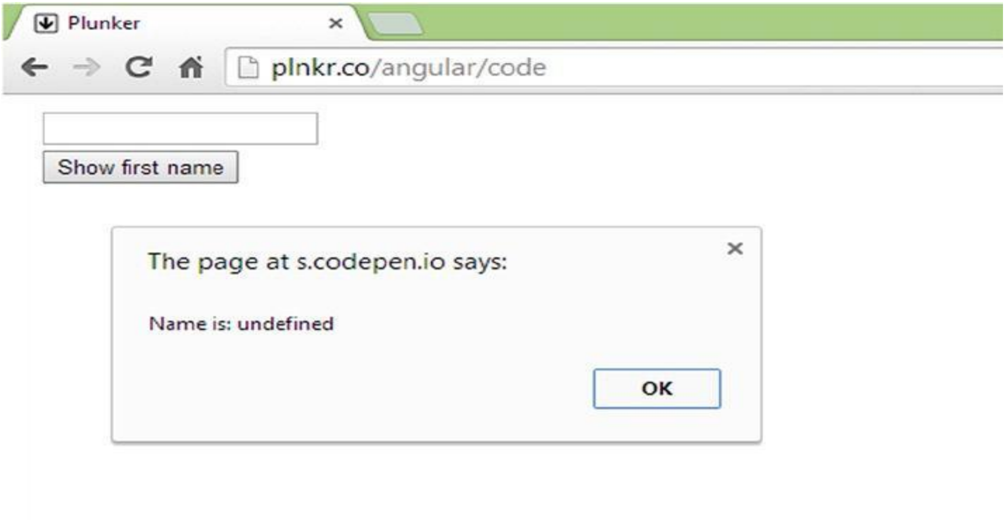
Here is the associated controller code:

Listing 6-7. Implict Model Binding—Controller Code

```
angular.module("myapp",  [])
.controller("MyController",  function  ($scope)  {

  $scope.showFirstName  =  function(){
    alert("Name  is:  "  +  $scope.firstName);
  }

});
```

Unlike in Listing 6-4 and Listing 6-5, the controller shown in Listing 6-7 does not create a model for our view template to use. However, as you can see in Listing 6-6, we clearly refer to a model property called ***firstName*** in the ***ngModel*** directive. Furthermore, we also show its value to the user when the ***Show first name*** button is pressed. How and when is the ***firstName*** model property created?

AngularJS created this model property for us when it came across the ***ngModel*** directive on the text ***input*** element. More accurately, it created it once it encountered a value to which it could bind. When the page first loads, you can click the ***Show first name*** button, and you will get the result shown in Figure 6-2.

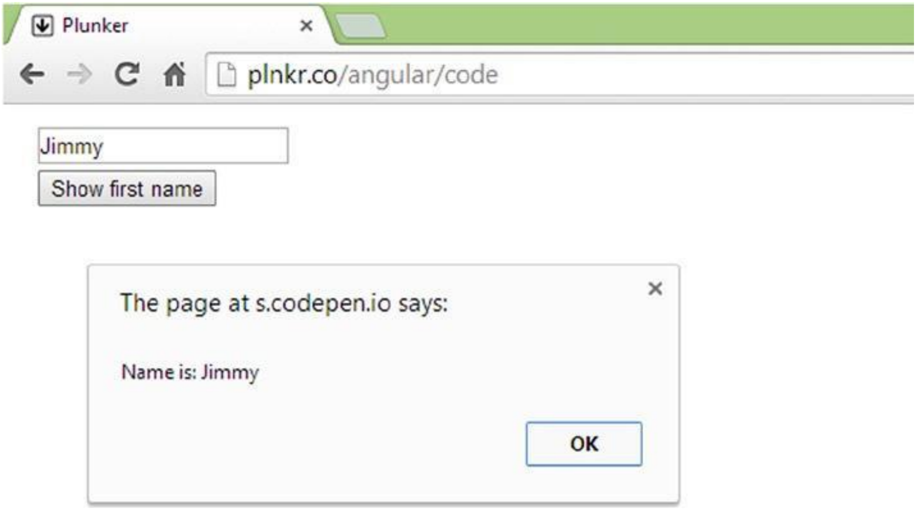


The page at s.codepen.io says:

Name is: undefined

Figure 6-2. *An empty text input—nothing to bind to*

Perhaps, as you might expect, the value of ***firstName*** is displayed as ***undefined***. Currently, there is no such model property, so this makes perfect sense. Now let's enter some text into the text input (see Figure 6-3).



The page at s.codepen.io says:

Name is: Jimmy

Figure 6-3. *Text has been entered into the text input*

This time, the value of ***firstName*** is "Jimmy." As AngularJS is working in real time, once the text was input, it was able to create the binding. It's good to be aware of this behavior. Nonetheless, the fact that it can result in values such as ***undefined*** means that you should code defensively. This is demonstrated in Listing 6-8.

Listing 6-8. Coding Defensively

```
$scope.showFirstName = function(){
  if(angular.isDefined($scope.firstName)){
    alert("Name is: " + $scope.firstName);
  }else{
    alert("Name is empty, please enter a value");
  }

}
```

In Listing 6-8, we first test to see if the model property exists, and we only display it if it does. This listing uses the handy ***angular.isDefined*** method. In this version of the ***showFirstName*** function, the result of ***angular. isDefined($scope.firstName)*** will be true, even if you were to backspace and remove all of the text from the First name field. It will output an empty string as the value, although this is quite different from an undefined value. AngularJS has previously found a value in this text input; consequently, the binding and associated variable has been created and remains in play.

With this knowledge of binding under our belts, let's now move on to using it to create forms. More specifically, we will create a small but, I hope, enlightening user registration form.

AngularJS Forms

With a discussion of standard forms and model binding behind us, we are in good shape to tackle AngularJS forms. Of course, AngularJS forms are really just regular forms enhanced with AngularJS goodness. In this section, we will build a user registration form from scratch and employ it to build up our AngularJS skills.

We will start off simple and enhance it along the way. Let's work with some very basic requirements for this form.

These requirements are shown in Table 6-1.

Table 6-1. *User Registration Form Requirements*

Field Name	Data Type	Notes
First name	Text	Required
Last name	Text	Required
E-mail address	Text	Required Must be formatted as an e-mail Address

Where did you hear about us?	Text One choice from a set of options: Television, Radio, Social Media, and Other	Must match the set of questions asked by Marketing across the various communication channels
Would you like to subscribe to our quarterly newsletter?	Yes or no	Must be unchecked by default
Register	Text	The text that appears on the ***submit*** button

It’s fairly clear from these requirements, in general terms, at least, what we will need to build, in terms of a user interface. Let’s take a look at some first-draft HTML code (Listing 6-9) that reflects something close to what we are targeting.

Listing 6-9. First-Draft HTML Code for a User Registration Form

```
<div  ng-app="myapp"  ng-controller="MyController">
  <form  name="registrationForm">

    <input  type="text"  placeholder="First  Name"  name="firstName"  ng-model="person.firstName"
    required> <br/>


    <input  type="text"  placeholder="Last  Name"  name="lastName"  ng-model="person.lastName"
    required> <br/>
    <input  type="email"  placeholder="Email"  name="email"  ng-model="person.email"
    required> <br/>
    <select  name="channels"  ng-model="person.channels"
      <option  value="">Where  did  you  hear  about
      us?</option>
    </select>
    <br/>

    <input  ng-model="person.newsletterOptIn"  type="checkbox"  name="newsletterOptIn"
           id="newsletterOptIn"  value="newsletterOptIn"/>
    <label  for="newsletterOptIn">Recieve  monthly
      newsletter</label>
    <br/>

    <input  type="submit"  value="Register">

  </form>
</div>
```

For the most part, this is straightforward HTML. The two most important things to note are the existence of the ***ngModel*** directive on each of the ***form*** elements and the fact that we have given the form a name. Giving the form a name means that we can access some interesting AngularJS features, which I will discuss shortly. This form does not yet meet the requirements, but we are well on the way. Figure 6-4 reveals how the form looks right now.

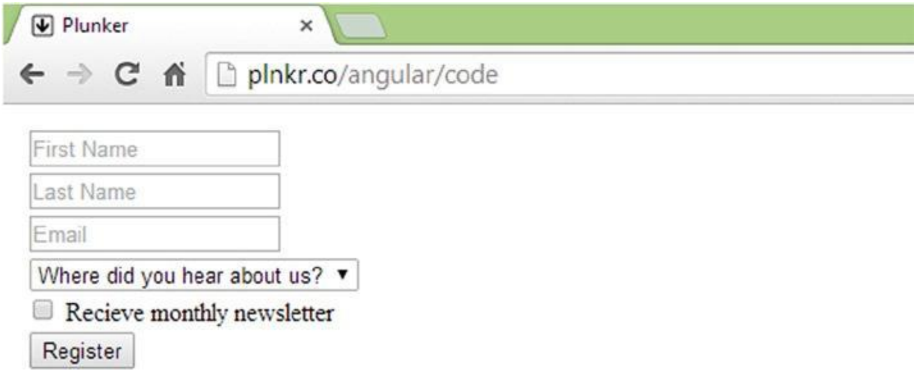


Figure 6-4. *First-draft user registration form*

It's far from perfect, but we are on the right track. Let's work our way through each of the fields, starting with the First name and Last name fields (which are the same in terms of the requirements). Take note that both of these fields make use of the ***required*** attribute. This attribute, which is an HTML5 attribute, not an AngularJS construct, tells browsers to make sure that a value is entered before allowing the form to be submitted. I will talk more about this in the next section, which covers validation in more detail.

Let's move along to the ***Email*** field. This ***input*** element has a type of ***"email"***. This is very similar to a text input, but it is specifically used for capturing e-mail addresses.

```
<input type="email" placeholder="Email" name="email" ng-model="person.email" required>
```

This is not an AngularJS feature; it is part of the HTML5 specification. Compliant browsers will consider this field invalid if it does not contain a properly formatted e-mail address. I will touch on this point again in the upcoming validation section.

The Marketing team has asked us to include some research questions in our registration form. It wants to know among which set of communication channels the user has found our company. So far, we have created the appropriate ***form*** element, shown again in the code snippet that follows. However, we currently present just one option: the prompt for the user.

```
<select name="channels" ng-model="person.channels">
  <option value="">Where did you hear about
  us?</option>
</select>
```

This ***select*** element needs some AngularJS work, because the ***select*** element itself is only half the story. We have to turn to the controller, shown in Listing 6-10, whereby we can create some data for the list of options.

Listing 6-10. The Controller Code Driving the ***select*** Element

```
angular.module("myapp", [])
.controller("MyController", function ($scope) {

  $scope.person = {};

  $scope.person.channels = [
    { value: "television", label: "Television" },
    { value: "radio", label: "Radio" },
    { value: "social-media", label: "Social Media"},
    { value: "other", label: "Other"}
  ];

});
```

The controller, through the ***scope*** object, is making the ***person*** object available to our view template. More specifically, because our ***select*** element needs this data, it adds an array of objects to the model property we use on the ***select*** element's ***ngModel*** directive: ***person.channels***. Another step is required, because we want the ***select*** element to be populated with a set of ***option*** elements, based on the model property we just added to the scope above. For this step, we use the ***ngOptions*** directive. Listing 6-11 shows the revised ***select*** element.

Listing 6-11. Using the ***ngOptions*** Directive to Generate Options

```
<select name="channels" ng-model="person.channels" ng-
options="obj.value as obj.label for obj in person.channels"> option
value="">Where did you hear about us?</option> </select>
```

The ***ngOptions*** directive expects a *comprehension expression*. This expression can seem a little intimidating when you first encounter it, but we can break it down. It is essentially a query that we use to tell AngularJS how to map our model property, the ***person.channels*** array, in this case, onto a set of HTML options. This array contains a set of objects, and AngularJS would like to know which properties of this set should become the option element's value and which should become the content visible to our end user. Here is the expression again:

```
obj.value as obj.label for obj in person.channels
```

It isn't a particularly intuitive syntax, but we can make out the key components. In plain English, this would read something like the following:

> *Use the value property on the option elements value attribute, and use the label property as the text displayed within the option element. Oh, and by the way, I am referring to the objects contained within the person.channels array.*

While we used the ***ngOptions*** directive to generate the option elements, we added the ***Where did you hear about us?*** option manually. Of course, you could add an extra object to the ***person.channels*** array representing this option too, but I prefer this approach, as it better reflects our ambitions about keeping things in the right place. This ***option*** element is just an instruction to the user, and it exists only to serve as part of our user interface; it isn't actually part of our model.

Next up, we have the "Would you like to subscribe to our quarterly newsletter?" question. As this requires a yes or no response, the ***checkbox*** element is well-suited to our needs. The only requirement that we have to address here is that the Marketing team wants this check box to be unchecked by default. We automatically meet this requirement, because check boxes are unchecked by default. However, we will set this explicitly through the binding we have set up on the check box. Here is the check box again:

```
<input ng-model="person.newsletterOptIn" type="checkbox" name="newsletterOptIn"
          id="newsletterOptIn" value="newsletterOptIn"/>
```

In our controller, we simply set the ***person.newsletterOptIn*** property to ***false***. As this is used as a binding, the check box, fully aware of the need to check and uncheck itself in response to ***true*** and ***false*** values, automatically takes on the correct value. Had we wanted the check box to appear checked, we could have set this value to ***true*** instead, which would have caused the check box to appear checked. Of course, it is not a good practice to put the onus on the user to opt out, so we won't do that. Listing 6-12 shows this in action.

Listing 6-12. The Controller Code Driving the Check Box

```
angular.module("myapp", [])
.controller("MyController", function ($scope) {

  $scope.person = {};
  $scope.person.newsletterOptIn = false;

  $scope.person.channels = [
    { value: "television", label: "Television" },
    { value: "radio", label: "Radio" },
    { value: "social-media", label: "Social Media"},
    { value: "other", label: "Other"}
  ];

});
```

This approach is not quite as easy as adding the ***checked*** attribute to the HTML code, but it's not too much extra effort. I chose this approach because it better showcases bindings in action. However, it also has benefits in other scenarios, such as when you have to populate forms with existing data (as with forms that users can come back and update at a later time).

The last ***form*** element is the ***submit*** button. The only thing we have done so far is to change its value to "***register***", as opposed to leaving it with the default "***Submit***" value. The Marketing team has yet to tell us how we
should handle this data with regard to what should happen when a user registers, but I suspect it will have filled us
in on this just in time for the next chapter. For now, though, we can attach a submit handler to our form, so that it is
ready to handle this pending requirement. Here is the revised ***form*** element:

```
<form  name="registrationForm"  ng-submit="person.register()">
```

By using the ***ngSubmit*** directive, we have told the form to use a method on our ***person*** object (the ***register()*** method) when the user submits the form. The revised controller code is shown in Listing 6-13.

Listing 6-13. Adding the ***submit*** Handler

```
angular.module("myapp",  [])
.controller("MyController",  function  ($scope)  {

  $scope.person  =  {};
  $scope.person.newsletterOptIn  =  false;

  $scope.person.channels  =  [
    {  value:  "television",  label:  "Television"  },
    {  value:  "radio",  label:  "Radio"  },
    {  value:  "social-media",  label:  "Social  Media"},
    {  value:  "other",  label:  "Other"}
  ];

  $scope.person.register  =  function  ()  {
          <!--  pending  implementation  -->
   }

});
```

We are closer to fulfilling the requirements, but there is still work to be done. Before we move on to the topic of validation, it's time for a checkpoint. Listing 6-14 shows the HTML code, and Listing 6-15 shows the slightly refactored JavaScript code.

Listing 6-14. The Form Code

```
<div  ng-app="myapp"  ng-controller="MyController">
```

```
  <form name="registrationForm" ng-submit="person.register()">

    <input type="text" placeholder="First Name" name="firstName" ng-model="person.firstName"
    required> <br/>


    <input type="text" placeholder="Last Name" name="lastName" ng-model="person.lastName"
    required> <br/>


    <input type="email" placeholder="Email" name="email" ng-model="person.email"
    required> <br/>


    <select name="level" ng-model="person.levels" ng-options="obj.label as
            obj.value for obj in person.channels">
      <option value="">Where did you hear about us?</option>
    </select>
    <br/>

    <input ng-model="person.newsletterOptIn"                    type="checkbox"
           name="newsletterOptIn" id="newsletterOptIn" value="newsletterOptIn"/>
    <label for="newsletterOptIn">Recieve monthly
      newsletter</label>

    <br/>

    <input type="submit" value="Register" ng-click="person.register()">

  </form>
</div>
```

The only change in the JavaScript code in Listing 6-15 is that the ***person*** object is constructed first and then assigned to the ***$scope*** as the last step. The end result is the same, but this is much more readable.

Listing 6-15. The AngularJS Code

```
angular.module("myapp", [])
.controller("MyController", function ($scope) {

    var person = {};
    person.newsletterOptIn = false;
    person.channels = [
      { value: "television", label: "Television" },
      { value: "radio", label: "Radio" },
        { value: "social-media", label: "Social Media"},
        { value: "other", label: "Other"}
    ];
    person.register = function () {
        <!-- pending implementation -->
    }

});
```

Validating Forms

We usually want to validate at least some of the data that users enter into our forms. While it is true that validation can and should be done on the server, and that server-side processes are usually capable of handling much more complex validation rules, we still have to perform *first-line-of-defense* validation in the web browser. With JavaScript validation, we can do a lot of the validation up front, before even considering sending it along to the server. This way, we preserve bandwidth and reduce the load placed on our web servers. The fact that JavaScript validation provides instant feedback is a big plus too.

Using AngularJS, it isn't difficult or terribly time-consuming to implement JavaScript validation. The first step has already been taken with our registration form: when we gave the form a name, we enabled access to AngularJS validation features.

Before we look at validation as it applies to specific fields, let's look at what AngularJS does for us in regard to the form as a whole. At this *form-wide* level, AngularJS will give us answers to some important questions: Has the user started entering any data into the form yet? Is the form as a whole in a valid state? and so on.

Table 6-2. *Built-in Form-Level Properties*

Property Name	Description
$pristine	True, if user has not yet interacted with the form
$dirty	True, if user has already interacted with the form
$valid	True, if all of the containing forms and ***form*** elements are valid
$invalid	True, if at least one containing ***form*** element or form is invalid

We also have access to some very handy CSS style hooks. As the form changes state, such as when it moves from valid to invalid, AngularJS will dynamically add and remove CSS classes to reflect the current state. You can create your own set of CSS rules for these classes, thereby styling the form as you see fit for each state. These classes are outlined in Table 6-3. The style hooks and the built-in form properties will make more sense when we see them in action.

Table 6-3. *Dynamically Managed Validation Classes*

Class	Description
ng-valid	Set, if the form is valid
ng-invalid	Set, if the form is invalid
ng-pristine	Set if the form is pristine
ng-dirty	Set, if the form is dirty
ng-submitted	Set, if the form was submitted

If you have already worked with the HTML5 specification, you might be pleased to hear that AngularJS respects attributes such as ***type*** and ***required***. It also adds some directives of its own to support forms and form validation further. Generally, one of the first steps you take when using AngularJS validation is the addition of the ***novalidate*** attribute on your ***form*** element, as shown here:

```
<form  name="registrationForm"  ng-submit="person.register()"  novalidate>
```

Strange that we should use the ***novalidate*** attribute when we actually want to validate. Keep in mind that the ***novalidate*** attribute is not an AngularJS directive; it is a standard HTML attribute that is used to prevent built-in browser validation. The reason we use it is because we want AngularJS to validate our form. Taking the built-in browser behavior out of the equation is the best way to remedy the problems that would otherwise occur. We still get to use the same approach, only with AngularJS running the show instead of the browser.

As we have given our form a name and we have added the ***novalidation*** attribute, it is now primed for validation. Let's look at validation for the First name and Last name fields. These won't be too challenging, as the rule is simply that they are required. The two things that we must do are provide the validation itself and the feedback to the user, if the validation fails. Examine Listing 6-16.

Listing 6-16. Validating Required Fields and Showing Feedback to the User

```
<input type="text" placeholder="First Name" name="firstName" ng-model="person.firstName"
required> <span ng-show="firstNameInvalid">Please enter a value for First name</span> <br/>


<input type="text" placeholder="Last Name" name="lastName" ng-model="person.lastName"
required> <span ng-show="lastNameInvalid">Please enter a value for Last name</span>
```

The validation is straightforward; we simply add a ***required*** attribute to our ***input*** elements. With the addition of this attribute, AngularJS will insist on a value in each of these fields before it will consider the form valid. However, it insists rather quietly, so it is up to us to tell the user if things went wrong and how to fix them. The approach we apply here is to use ***span*** elements containing the validation error messages. We want to keep these hidden until we have to show them. We achieve this through the ***ngShow*** directive. Let's focus on the span we added for the First name field.

```
<span ng-show="firstNameInvalid">Please enter a value for First name</span>
```

As you may recall from our coverage of ***ngShow*** in the last chapter, it expects an expression that evaluates to a Boolean value. Let's turn to the controller code's ***register*** method in Listing 6-17, as this will show us how the ***firstNameInvalid*** variable is manipulated to trigger the showing and hiding of the validation message.

Listing 6-17. The Registration Method with Some Validation in Place

```
$scope.register = function () {

  $scope.firstNameInvalid = false;
  $scope.lastNameInvalid = false;

  if(!$scope.registrationForm.firstName.$valid){
    $scope.firstNameInvalid = true;
  }

  if(!$scope.registrationForm.lastName.$valid){
    $scope.lastNameInvalid = true;
  }

if($scope.registrationForm.$valid){
<!-- pending implementation -->
  }

}
```

When the document first loads, both ***firstNameInvalid*** and ***lastNameInvalid*** evaluate to ***false***. Consequently, the ***ngShow*** directives will keep the ***span*** elements, and therefore the validation messages, hidden. When the user presses the ***submit*** button, we make use of the fact that AngularJS can tell us, on a field-by-field basis, whether or not an input is valid. In the case of the First name field, which we named ***firstName***, in the form which we named ***registrationForm***, we can use ***$scope.registrationForm.firstName.$valid*** to see if this field is currently valid. As you might expect, this ***scope.formName.fieldName.$property*** format applies to the Last name field too.

Both of the conditional statements in the ***register()*** method work the same way; they each check to see if these fields are *not* currently valid. If indeed they are not, then the ***firstNameInvalid*** and ***lastNameInvalid*** variables are set to ***true***. This will cause the ***ngShow*** directive to show the validation error messages.

Moving along to the e-mail address input, the requirement is also that the field is required. In this case, it must also be a value that is a properly formatted e-mail address. This is easy enough to achieve using the HTML5-based approach. Study the following ***input*** element, which will achieve this:

```
<input  type="email"  placeholder="Email"  name="email"  ng-model="person.email"  required>
```

Let's use two more form-level properties that we touched on in Table 6-2. While this is a slightly contrived example, it does show off the use ***$pristine*** and ***$dirty***.

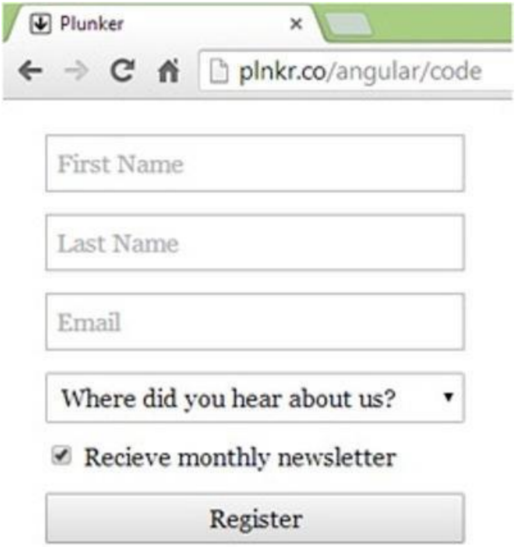
At the top of our form, we will place two ***div*** elements; both of which use an ***ngShow*** directive. The ***$dirty*** property tells us if there has been some interaction with the form. It is ***true*** if at least some data has been entered. The ***$pristine*** property is the opposite. It tells us if there has been no interaction with the form. Only one of these ***div*** elements will be visible at any given time; that is, a form cannot possibly be in both states.

```
<div  ng-show="registrationForm.$pristine">Form  input  has  not  yet  started</div>
<div ng-show="registrationForm.$dirty">Form input has started</div>
```

Next, we will add a ***div*** element underneath our form. This ***div*** element contains the "Thank you" message that we want users to see once they have successfully completed the form. It, too, uses an ***ngShow*** directive. In this case, we rely on the value of the ***doShow*** variable, a variable that we set within the ***register()*** method of our controller, to determine whether or not to show the "Thank you" message.

```
<div  ng-show="doShow">
  Thank  you  for  taking  the  time  to  register!
</div>
```

I will show the complete code listing soon. Just one more thing that we should address before we finish up. At the moment, the form doesn't look too good. As Figure 6-4 shows, it's looking a little cramped and not very presentable. We will turn it into something a little better, as shown in Figure 6-5.

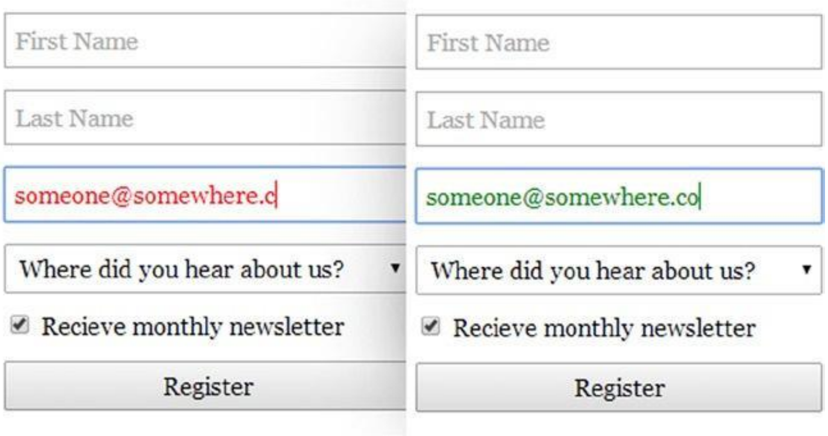


of the CSS, which is shown in Listing 6-18, relates to the look and feel of the form. However, we have also used a few of the AngularJS style hooks that pointed out in Table 6-3. Here is the CSS code with the AngularJS style hooks shown in bold.

Listing 6-18. The CSS, Including the AngularJS-Style Hooks Behind the Form

```
body {
  font: normal 16px/1.4 Georgia;
}

input:not([type='checkbox']), select {
  width: 250px;
}

select, input {
  padding: 5px;
  margin-top: 12px;
  font-family: inherit;
}

input[type='submit'] {
  width: 264px;
}

form span {
  color: red;
}

input[name='email'].ng-dirty.ng-invalid {
  color: red;
}


input[name='email'].ng-dirty.ng-valid {
  color: green;
}
```

It isn’t readily apparent what these last two CSS rules, the style hooks, accomplish, beyond the fact that they both set the CSS color property, one to red and the other to green. Figure 6-6 sheds some light on the matter. When the user begins to type, the input text appears in red, indicating that the e-mail address is not yet valid. Once the e-mail address is recognized as valid, the text becomes green. Figure 6-6 shows how this looks in both states.



First Name | First Name

Last Name | Last Name

someone@somewhere.c | someone@somewhere.co

Where did you hear about us? ▾ | Where did you hear about us? ▾

☑ Recieve monthly newsletter | ☑ Recieve monthly newsletter

Register | Register

Figure 6-6. *E-mail input, with visual real-time validation feedback*

What is particularly interesting about this feature is that it only requires the addition of some very basic CSS. As indicated earlier, AngularJS will dynamically add CSS classes as the form changes from one state to another. In this case, when the page first loads, the e-mail ***input*** element has a few classes set on it. One of them is the ***ngValid*** class. Here is how this particular input is enhanced by AngularJS upon page load:

```
<input type="email" placeholder="Email" name="email" ng-model="person.email"
required="" class="ng-pristine ng-invalid ng-invalid-required ng-valid-email">
```

Pay special attention to the two bolded classes, ***ng-pristine*** and ***ng-invalid***. The former was added because this input has not yet been touched; it is in *pristine* condition. The latter was added because the field is currently invalid. Once the user starts typing his or her e-mail address, AngularJS will update this list of classes on the fly. At the very first keystroke, the input is no longer pristine. As the following code snippet shows, it is now *dirty*.

```
<input type="email" placeholder="Email" name="email" ng-model="person.email"
required="" class="ng-dirty ng-invalid ng-invalid-required ng-valid-email">
```

At this point, our ***input[name='email'].ng-dirty.ng-invalid*** rule kicks in, and the text becomes red. It remains red until such time as the e-mail address becomes valid. When it does become valid, the list of CSS classes is again revised by AngularJS.

```
<input type="email" placeholder="Email" name="email" ng-model="person.email"
required="" class="ng-dirty ng-valid-required ng-valid ng-valid-email">
```

This revision means that our ***input[name='email'].ng-dirty.ng-valid*** rule kicks in. Consequently, the text becomes green. This is quite a powerful technique, because once you know which classes AngularJS is adding and when, you can use these classes as hooks for just about anything you like. Of course, just because you can doesn't mean that you should! There was a little bit of legwork involved in building the validation and validation feedback code into our registration form, but it wasn’t overly complicated. This has been a relatively long chapter, and I recommend that you load up this code in your web browser and favorite IDE; it is well worth doing some experimentation with it.

Listing 6-19. Registration Form—the HTML Code

```
<div ng-app="myapp" ng-controller="MyController">
   <div ng-show="registrationForm.$pristine">Form input has not yet started</div>
  <div ng-show="registrationForm.$dirty">Form input has started</div>
  <form name="registrationForm" ng-submit="register()" novalidate>
    <input type="text" placeholder="First Name" name="firstName" ng-model="person.firstName"
    required /> <span ng-show="firstNameInvalid"><br/>Please enter a value for First name</span>
    <br/>
    <input type="text" placeholder="Last Name" name="lastName" ng-model="person.lastName"
    required /> <span ng-show="lastNameInvalid"><br/>Please enter a value for Last name</span> <br/>
    <input type="email" placeholder="Email" name="email" ng-model="person.email" required
     /> <span ng-show="emailInvalid"><br/>A valid email address is required</span>
    <br/>
    <select name="research" ng-model="person.levels"
            ng-options="obj.label as obj.value for obj in person.channels" required>
      <option value="">Where did you hear about us?</option>
    </select>
    <span ng-show="researchInvalid"><br/>Please tell us where you heard about us</span>
    <br/>
    <input ng-model="person.newsletterOptIn" type="checkbox" name="newsletterOptIn"
           id="newsletterOptIn" value="newsletterOptIn"/>
    <label for="newsletterOptIn">Recieve monthly newsletter</label>
    <br/>
    <input type="submit" value="Register"/>
  </form>
  <div ng-show="doShow">
    Thank you for taking the time to register!
  </div>
</div>
```

Here is the associated controller code:

Listing 6-20. Regsitration Form—the JavaScript Code

```
angular.module("myapp", [])
.controller("MyController", function ($scope) {

  $scope.person = {};
  $scope.person.newsletterOptIn = false;
  $scope.person.channels = [
    { value: "television", label: "Television" },
    { value: "radio", label: "Radio" },
    { value: "social-media", label: "Social Media"},
    { value: "other", label: "Other"}
  ];

  $scope.register    = function () {

    $scope.firstNameInvalid = false;
    $scope.lastNameInvalid = false;
    $scope.emailInvalid = false;

    if(!$scope.registrationForm.firstName.$valid){
      $scope.firstNameInvalid = true;
    }

    if(!$scope.registrationForm.lastName.$valid){
      $scope.lastNameInvalid = true;
    }

    if(!$scope.registrationForm.email.$valid){
      $scope.emailInvalid = true;
    }

    if(!$scope.registrationForm.research.$valid){
      $scope.researchInvalid = true;
    }

if($scope.registrationForm.$valid){
      <!-- pending implementation -->
      $scope.doShow = true;
    }

  }

});
```

CHAPTER 6

Services and Server Communication

In the last chapter, we looked at HTML forms as a means of presenting a user interface for gathering a set of user registration data. However, we didn't look at the next step in the process, that is, sending that data along to a back-end server for processing. In this chapter, we will achieve this by using Angular services. As Angular services are about much more than sending data to servers, we will first look at them at a more general level.

The term *service* is rather overused in the development world, so what do we mean when we talk about Angular services? A good way to think about an Angular service is as a set of tightly related functions, managed by the Angular framework, which are made readily available for use across an application. For example, you might use something as common as a company-wide data service, which enables any part of your application to send and retrieve data to and from a corporate database. A marketing-and-communications-asset library, for example, which lets you locate and retrieve images and image metadata, is much more specific. When speaking of Angular services, however, examples such as these could fool anyone into thinking that services are all about server communication and data access, but they are not. In Angular, getting a reference to the browser's window object can also be achieved by using a service: the built-in ***$window*** service. You can even create animations by using the built-in ***$animate*** service.

If we wanted to, we could create our own JavaScript object and give it a set of methods that performs a range of related tasks. We could call upon this object whenever we needed it and, perhaps naively, describe it as a *service*. This seems to fit closely the description I just gave you of an Angular service, but not quite. So, what is it about an Angular service that makes it so special? While Angular ships with a set of very useful services, some of which we will look at shortly, the answer to this question lies in the fact that it provides us with a framework within which services can be easily managed. I say *easily managed*, because without this framework support, it wouldn't be a trivial task.

If you were to tackle a task like this on your own, and you were serious about it, you would (at a minimum) have to ask and answer the following questions:

□□ When and where is the right place to instantiate my service?

□□ What is the best way to manage service dependencies across my application?

□□ What is the best approach for making sure that my services can be unit-tested and configurable?

□□ How should I handle persisting and sharing services between my controllers?

Using Services

As we mentioned before, Angular ships with a set of useful built-in services. We won't look at all of them in this chapter, but we will look at a few; just enough to get a sense of what is offered and how to put them into action.

The *$window* Service

The ***$window*** service is essentially a reference to the browser's window object. Access to the web browser's window object is globally available in JavaScript using the built-in ***window*** reference, but it is generally considered best practice to avoid it when using Angular, because it can cause testability issues. If instead we refer to it through the ***$window*** service, we keep our options open. For example, if we want to test our service in a non-browser context in which the browser's window object does not exist, we can more easily switch the underlying service provider to one that uses an alternate implementation, one which has all of the same properties and methods as the original.

Unfortunately, the use of service providers and advanced testing techniques is not covered in this book, but the real takeaway here is that, by using a service, we are creating an abstraction that shields us from being intimately tied to a specific implementation. The service simply does what we ask it to do, and users of the service don't have to worry too much about how it does this or even if it changes how it does this.

If you look through Listing 7-1, you will see that we access the ***$window*** service through the controller method's anonymous function. Here, we specify ***$scope*** as the first argument, as we have done on a number of occasions before, and then we *ask for* the ***$window*** service by specifying it here too.

Listing 7-1. The ***$window*** Service

```
<!DOCTYPE  html  >
<html  ng-app="myapp">
<head>
      <title>Angular  Services</title>
      <script  src="js/angular.min.js"></script>
      <script>

            var  module  =  angular.module('myapp',  []);

            module.controller("MyController",  function  ($scope,  $window)  {
                  $scope.winWidth = $window.innerWidth;
            });

      </script>
</head>
<body  ng-controller="MyController">
```

```
        <p>Window  width:  {{winWidth}}px</p>
</body>
</html>
```

An important point here is that we didn’t actually instantiate this service ourselves. The Angular dependency management sub-subsystem took care of that for us behind the scenes. For now, though, it is enough to know that *asking for* a service in this way, as opposed to you declaring and instantiating it yourself within your controller code, is a major benefit. That being said, you will get a little more insight into the mechanism at play here when we create our own service in the next section.

The idea of the window object as a service might seem a little odd at first, but it makes perfect sense. It contains a set of related functions and properties that we want to be readily available across our application. That’s a service! Additionally, because it is a service, we don’t have to be too concerned about how it goes about its work or how we might work with it in other contexts. While it may be early days in your Angular career right now, professional-grade testing is one such context you are likely to encounter in the future.

The *$location* Service

Based on the ***window.location*** object, the ***$location*** service parses the URL in the browser address bar and makes it available to your application. If you make changes to the URL in the address bar, they are reflected in the ***$location*** service, and if you make changes to the ***$location*** service, they are reflected in the browser address bar.

At first glance, it might seem like the ***$location*** service is merely a reference to the browser’s ***window.location*** object, but it is a little more than this. It has tight integration with the Angular framework’s life-cycle events, and it also has seamless support for the HTML5 history API (with automatic fallback support for older browsers). As a general rule, whenever your application needs to respond to a change in the current URL, or you want to change the current URL in the browser, this is the service to use.

■ **Caution** The ***$location*** service will not cause a full-page reload when the browser URL is changed. In order to achieve this, you should use the ***$window.location.href*** property.

Listing 7-2 is a basic example of the ***$location*** service in action. Here, we use it to display the current URL and a list of URL parts.

Listing 7-2. Using the ***$location*** Service

```
<!DOCTYPE  html  >
<html  ng-app="myapp">
<head>
    <title>Angular  Services</title>
    <script  src="js/angular.min.js"></script>
    <script>
        var        module        =        angular.module('myapp',        []);
        module.controller("MyController", function ($scope, $location) {
            $scope.url  =  $location.absUrl();
            $scope.protocol  =  $location.protocol();
            $scope.host  =  $location.host();
            $scope.port  =  $location.port();

        });
    </script>
</head>

<body  ng-controller="MyController">
<p>The  URL  is:  {{url}}</p>
<ul>
    <li>{{protocol}}</li>
    <li>{{host}}</li>
    <li>{{port}}</li>
</ul>
</body>
</html>
```

As we did with the ***$window*** service, we simply *asked for* the ***$location*** service by adding it as a parameter to our controller's anonymous function. In the next chapter, we look at how better to organize our HTML views, and you will see how the ***$location*** service plays a very important role in this context.

Why Use Services?

One thing that might have struck you as you read through these examples is that these particular services don't really add much in terms of functionality. The ***$window*** service, for example, doesn't appear to add much above and beyond what the regular JavaScript ***window*** object has to offer. While some Angular services, such as the ***$http*** and ***$animation*** services (which we will look at in later chapters), are very rich in functionality, what I want to convey in this section is that services are a core aspect of Angular and, regardless of what functionality a given service may offer, the way in which we access a service is consistent and offers important architectural benefits.

The ***$window*** service offers us the benefit of abstraction; we are not tied specifically to the browser's ***window*** object. So, in more advanced scenarios, we can actually switch it to use some other implementation. The ***$location*** service offers similar benefits, and it is also designed to work very well with the Angular routing framework (which we will also be looking at in a later chapter).

Angular services are an important part of how Angular applications are built, because they are a well-architected approach to managing dependencies, and they go a long way toward making applications much more robust.

Creating Services

Angular services provide a mechanism for keeping data around for the lifetime of an application and for communicating across controllers in a consistent manner. As services are implemented as *singletons*, which are objects that are instantiated only once per application, you interact with the same instance of a service every time you use it. Angular is also performance-conscious, so it will create a service only when you need it and not a moment before. This is all great news, but it does mean that we must learn the ground rules when we create our own services.

We'll start off nice and easy with Listing 7-4. All that this service will do is to tell us the current date and the current time, but it's just enough to get an idea of how the plumbing works.

Listing 7-4. A Basic Angular Service

```
<!DOCTYPE html >
<html ng-app="myapp">
<head>
    <title>Angular Services</title>
    <script src="js/angular.min.js"></script>
    <script>
        var module = angular.module('myapp', []);

        module.factory('dateTimeService', function () {

            var dateTimeSvc = {};
            dateTimeSvc.getDate = function () {
                return new Date().toDateString();
            }

            dateTimeSvc.getTime = function () {
                return new Date().toTimeString();
            }
            return  dateTimeSvc;

        }).controller("MyController", function ($scope, dateTimeService) {

            $scope.theDate = dateTimeService.getDate();
            $scope.theTime = dateTimeService.getTime();

        });
    </script>
</head>
<body ng-controller="MyController">
```

```
        <p>{{theDate}}</p>
        <p>{{theTime}}</p>

</body>
</html>
```

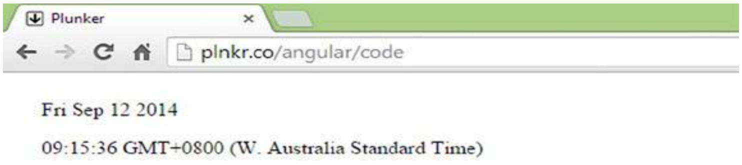
In Listing 7-4, you can see that we use the ***factory*** method on our module. This method takes two arguments, the first of which is the name of our service. We named this service ***dateTimeService***. The second argument is the *factory function*, which returns an object. This object is known as the *service object*, and it represents the service that you will ultimately use in your application.

When the application first needs to use this service, the framework will call the factory function. In this example, the service object that it creates and returns is called ***dateTimeSvc***, and it is this object that is used whenever the service is needed again. In other words, this service object, once created, is common to the entire application. This is a very important point, because it means that changes made to the state of this object remain in play throughout the lifetime of the application.

As the primary purpose of our factory function is to create an object with our service's functionality, we busy ourselves doing just that. We set up an empty ***dateTimeSvc*** object, and then we attach to it the two service methods: ***getDate()*** and ***getTime()***. We finish by specifying ***dateTimeSvc*** as the return value.

With the service in place, it's time to turn our attention to our controller, so that we can find out how to make use of it. The main thing to note about the controller function is that its second argument, the anonymous function, asks for the ***dateTimeService*** in exactly the same way that we have already seen when looking at the built-in services. As we registered our service using the name ***dateTimeService***, Angular has no problem resolving this dependency for us.

Figure 7-1 shows the output of Listing 7-4. The result is simply two paragraphs containing the return values of the calls we made on our service.



```
Fri Sep 12 2014

09:15:36 GMT+0800 (W. Australia Standard Time)
```

Figure 7-1. *The dateTimeService in action.*

it's a fairly bare-bones implementation of a service, but it does cover the basics of service creation. We will see these same principles and steps applied again shortly, but first, we will take a brief detour to look at a related aspect of our upcoming registration form submission task: the Promises API.

Promises

The JavaScript Promises API is an emerging standard, which has been implemented in major browsers. It's a relatively deep topic, but fortunately we don't have to dig very deep in order to start using it. Essentially, a *promise* represents a value that may not be available yet, but one that will be resolved at some point in future.

This value is usually the outcome of an asynchronous task such as an Ajax call to a remote server, for instance, the Ajax call we will use to process our registration form data. Just like those we make to each other and to ourselves, a promise can exist in different states. To start, a promise is in a *pending* state. That is to say, a promise has been made, but that's about it.

At some future point, it will become either a promise that has been kept or a promise that has been broken. In the Promises API, we refer to the former as a *fulfilled* promise and the latter as a *rejected* promise.

The general idea is that you create callback functions and attach them to the different possible states of a promise. Figure 7-2 represents the general concept.

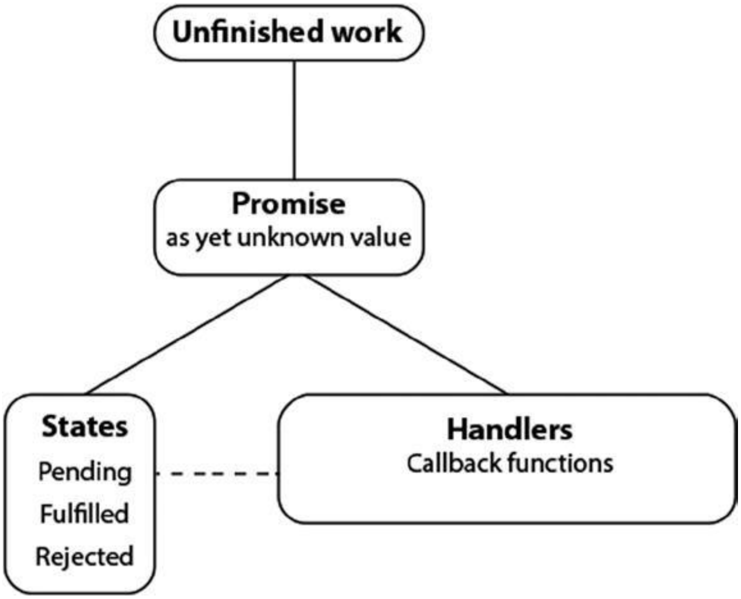


Figure 7-2. *The role of a promise*

The unfinished work represents the back-end processing and network communication that will take place once the user clicks our Register button. Both of these are processes that will take some time, but they will result in an outcome of some kind eventually. In the meantime, we have the promise, an object that represents this as yet unknown value. Furthermore, we have the ability to respond to the states of the promise, using callback functions.

The Promises API is very sophisticated, and it aims to improve on the way this kind of work was managed in the past. One interesting aspect of the API is the fact that you combine multiple promises into one larger promise. This is conceptually like promising your children a trip to the zoo, a toy from the toy store, and then some ice cream on the way home. With promises, you can write very clean and readable code that says, in essence, "When all of these things have happened, do this other thing." We won't get quite as involved as that in this book, but I do encourage you to dig deeper, if you plan to write a lot of potentially unwieldy asynchronous JavaScript code. This is all a little abstract at the moment, but we are now ready to move on and look at server communication.

Server Communication

While we don't have to concern ourselves too much with the back-end process that manages the incoming data, we do have to know how to transmit that data across the network. For this task, we are going to use the Angular ***$http*** service. This service allows you to communicate with a web server via the browser's ***XMLHttpRequest*** object. If you have a jQuery background, this service is similar to the jQuery Ajax method.

Take a look at Listing 7-5, some of which may make sense already, given our coverage of promises in the last section.

Listing 7-5. A First Look at the ***$http*** Service

```
var promise = $http({method: 'POST', url: 'memberservices/register', data: theData});

promise.success(function (data, status, headers, config, statusText) {
      // this callback will be called asynchronously
      // when the response is available
});

promise.error(function (data, status, headers, config, statusText) {
      // called asynchronously if an error occurs
      // or server returns response with an error status.
});
```

As Listing 7-5 shows, the ***$http*** service is a function that takes a single argument, a configuration object. While the configuration object lets you configure many different options, we keep it fairly simple here. We provide an HTTP endpoint via its ***url*** property, and we use the HTTP post method via the ***method*** property. We also use the ***data*** property to pass in the data that we want to send along to the web server. In many cases, this is all that the ***$http*** service needs in order to do its job. However, by using the configuration object, it is possible to configure a wide range of HTTP options as and when you need to do so.

We capture the return value of the ***$http*** service, a promise object, in a variable named ***promise***. As a promise object is a representation of an event that can potentially have different outcomes, we use its ***success*** and ***error*** methods to cater to either possibility. Both of these methods accept callback functions as arguments, and each of these functions has the same signature.

```
function(data, status, headers, config, statusText) { }
```

The callback function arguments are outlined in Table 7-1. However, we will mainly be concerned with the first two, data and status, both of which we will see in action shortly.

Table 7-1. *The Arguments Provided to the Success and Error Functions*

Name	Type	Description
data	string|Object	The response body transformed with the transform functions
status	Number	HTTP status code of the response
headers	function([headerName])	Header getter function
config	Object	The configuration object that was used to generate the request
statusText	String	HTTP status text of the response

Let's take the ***$http*** service and use it within our own service, a service we will call ***memberDataStoreService***. We will use this new service to handle our registration form data, but this service could go on to perform other membership-related tasks, such as handling logins and the ability to change passwords. We will keep it simple here, though, and focus only on the registration. Take a look at Listing 7-6.

Listing 7-6. The ***memberDataStoreService*** Service

```
var  module  =  angular.module('myapp',  []);

module.factory('memberDataStoreService',  function  ($http)  {

var  memberDataStore  =  {};

memberDataStore.doRegistration  =  function  (theData)  {
                              var promise = $http({method: 'POST', url: 'memberservices/register', data: theData});
            return promise;
}

return    memberDataStore;

});
```

There are a few things to note about Listing 7-6. We register our service using the name ***memberDataStoreService***, and we make sure that our factory function has access to the ***$http*** service. Next, we create a ***memberDataStore*** object. This is to be the return value of our factory function and the object to which we can attach all of our service methods.
As previously mentioned, we will limit it to just the one here, the ***doRegistration()*** method.

The ***doRegistration()*** method has just one argument: the data required to perform a registration. This is the data that is collected from the user via the registration form. Here's the interesting part: this method returns the promise object that was created by the call to the ***$http*** service. We very much want our service to take care of the connection to the web server and data transmission, but we very much do *not* want it poking its nose into our user-interface concerns. Using a promise, as you will see next, we can manipulate the user interface from within our controller code instead.

We are now ready to look at a more complete code listing. Listing 7-7 is a reworking of the registration form we built in the last chapter. This time, it makes use of our ***memberDataStoreService***.

Listing 7-7. Making Use of Our Custom Service

```
<!DOCTYPE html>
<html ng-app="myapp">
<head lang="en">
    <meta charset="UTF-8">
    <title>Registration Form</title>
    <script src="js/angular.min.js"></script>
    <script>
        var module = angular.module('myapp', []);

        module.factory('memberDataStoreService', function ($http) {

            var memberDataStore = {};

            memberDataStore.doRegistration = function (theData) {
                var promise = $http({method: 'POST', url: 'memberservices/register', data: theData});
                return promise;
            }

            return  memberDataStore;

        }).controller("MyController", function ($scope, memberDataStoreService) {

            $scope.person = {};
            $scope.person.newsletterOptIn = true;
            $scope.person.channels = [
                { value: "television", label: "Television" },
                { value: "radio", label: "Radio" },
                { value: "social-media", label: "Social Media"},
                { value: "other", label: "Other"}
            ];
            $scope.register = function () {

                $scope.firstNameInvalid = false;
                $scope.lastNameInvalid = false;
                $scope.emailInvalid = false;
                $scope.researchInvalid = false;

                $scope.showSuccessMessage = false;
                $scope.showErrorMessage = false;

                if (!$scope.registrationForm.firstName.$valid) {
                    $scope.firstNameInvalid = true;
                }

                if (!$scope.registrationForm.lastName.$valid) {
                    $scope.lastNameInvalid = true;
                }

            if (!$scope.registrationForm.email.$valid) {
                $scope.emailInvalid = true;
            }

            if (!$scope.registrationForm.research.$valid) {
                $scope.researchInvalid = true;
            }

            // If the registration form is valid, use the
            // memberDataStoreService to submit the form data if
            ($scope.registrationForm.$valid) {

                var promise = memberDataStoreService.doRegistration($scope.person);

promise.success(function (data, status) {
$scope.showSuccessMessage = true;
                });

promise.error(function (data, status) {
$scope.showErrorMessage = true;
                });

                $scope.doShow = true;
            }
```

```
          }

      })

</script>

<style>
      body,  input,  select  {
            font:  normal  16px/1.4  Georgia;
      }

      input:not([type='checkbox']),  select  {
            width:  250px;
      }

      input,  select  {
            padding:  5px;
            margin-top:  12px;
      }

      input[name='email'].ng-dirty.ng-invalid-email  {
            color:  red;
      }

            input[name='email'].ng-dirty.ng-valid-email  {
                  color:  green;
            }

form  span,  .error  {
color:  red;
            }

      </style>

</head>
<body>
<div>
      <div  ng-controller="MyController">

            <form  name="registrationForm"  ng-submit="register()"  novalidate>

                  <div  ng-show="showSuccessMessage">
                        Thank  you  for  taking  the  time  to  register!
                  </div>

                  <div class="error" ng-show="showErrorMessage">
                        There appears to have been a problem with your registration.<br/>
                  </div>


                  <input type="text" placeholder="First Name" name="firstName" ng-
                  model="person.firstName" required/> <span ng-show="firstNameInvalid"><br/>Please enter
                  a value for First name</span> <br/>


                  <input type="text" placeholder="Last Name" name="lastName" ng-
                  model="person.lastName" required/> <span ng-show="lastNameInvalid"><br/>Please enter a
                  value for Last name</span> <br/>


                  <input type="email" placeholder="Email" name="email" ng-model="person.email"
                  required/> <span ng-show="emailInvalid"><br/>A valid email address is required</span>
                  <br/>


                  <select name="research" ng-model="person.levels"
                          ng-options="obj.label as obj.value for obj in person.channels" required>
                        <option value="">Where did you hear about us?</option>
                  </select>
                  <span ng-show="researchInvalid"><br/>Please tell us where you heard about us</span>
                  <br/>


                  <input ng-model="person.newsletterOptIn" type="checkbox" name="newsletterOptIn"
                          id="newsletterOptIn" value="newsletterOptIn"/>
                  <label for="newsletterOptIn">Recieve monthly newsletter</label>
                  <br/>

                  <input type="submit" value="Register"/>

            </form>

      </div>
</div>
</body>
</html>
```

There is a fair bit going on here, much of which was covered in the previous chapter and some of it earlier in this chapter. However, pay particular attention to the code shown in bold. You will see that we now *ask for* the ***memberDataStore*** service when we set up our controller. Nearer to the end of the controller method, you will see the actual call to our new ***memberDataStoreService*** service. Following (Listing 7-8) is that section of code again:

Listing 7-8. Using the ***memberDataStoreService***

```
//  If the registration form is valid, use the
//  memberDataStoreService to submit the form data
if ($scope.registrationForm.$valid) {

      var promise = memberDataStoreService.doRegistration($scope.person);

promise.success(function (data, status) {
$scope.showSuccessMessage = true;
      });

promise.error(function (data, status) {
$scope.showErrorMessage = true;
      });

      $scope.doShow = true;
}
```

There is no point submitting invalid data, so we first check to make sure that the user properly completed all of the required fields. Assuming that the user did, we can now send the data on its way, using the ***memberDataStoreService.doRegistration*** method. Note that the argument to this method is ***$scope.person***. This contains the validated data captured during the form entry process.

Of course, this isn't the end of the process, as we still have to await the outcome of our attempt to submit the data. This attempt will either be successful or it will fail, and we cater to both possibilities, using the promise object's ***success*** and ***error*** methods. Both of these methods refer to some additional HTML elements that we have placed at the top of the HTML form. Following (Listing 7-9) is that section of code again:

Listing 7-9. Honing In on the Success and Error Messages

```
<div ng-show="showSuccessMessage">
      Thank you for taking the time to register!
</div>

<div class="error" ng-show="showErrorMessage">
      There appears to have been a problem with your registration.<br/>
</div>
```

Both of these ***div*** elements make use of the ***ngShow*** directive. Only one or the other will be displayed once the promise is resolved. The success method will set the ***showSuccessMessage*** to ***true*** or the error method will set the ***showErrorMessage*** to ***true***.

What we have done so far is almost enough. However, we should enhance this to provide a slightly better user experience. Let’s add a visual cue, so that the user is aware that some work is in progress once he/she clicks the Register button. The first thing we will do is to add a small loading animation next to our registration form’s Register button.

The other thing we will do is use the ***ngDisabled*** directive on the Register button. The ***ngDisabled*** directive is very useful. If the value of its expression is ***true***, it will set the ***disabled*** attribute on the element to which it is applied. Here, we use it to prevent the user from attempting to click the button more than once.

You can see these revisions in Listing 7-10 and Listing 7-11. Take note that the animation in Listing 7-10, a ***.gif*** image file, is inside a ***span*** whose visibility is determined by an ***ngShow*** directive.

Listing 7-10. Adding a Loading Animation and Disabling the Register Button

```
<input          ng-disabled="working"          type="submit"
value="Register"/> <span ng-show="working" style="padding-
left:10px;">
    <img src="images/loading.gif"/>
</span>
```

Listing 7-11 shows the changes we have made to the ***register()*** function.

Listing 7-11. Indicating That Work Is in Progress

```
// If the registration form is valid, use the
// memberDataStoreService to submit the form data
if ($scope.registrationForm.$valid) {

    $scope.working = true;
    var promise = memberDataStoreService.doRegistration($scope.person);

promise.success(function (data, status) {
$scope.showSuccessMessage = true;
    });

promise.error(function (data, status) {
$scope.showErrorMessage = true;
    });

    promise.finally(function () {
        $scope.working = false;
    });
    $scope.doShow = true;
}
```

The first thing we do is to set ***$scope.working*** to ***true***. So, thanks to ***ngShow***, as soon as the user hits the Register button, the loading animation appears (see Figure 7-3). Of course, when the work is done, we want it to go away again. In order to achieve that, we simply set ***$scope.working*** to ***false***. This also takes care of enabling and disabling the Register button.

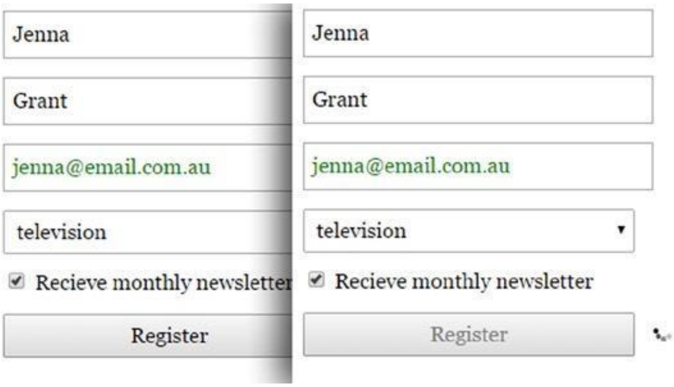


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Figure 7-3. *Clicking on the Register button*

We can't place this code in the ***success*** method, because, if an error occurs, our form will be trapped in its *working* state. This would lead to a somewhat conflicted user interface. We could put the code in both the ***success*** and ***error*** methods, however. That would work, though a much better way is to use the promise object's ***finally*** method. This is a cleaner way to handle this kind of task, the kind of task you want performed regardless of whether or not the promise was rejected or fulfilled.

Handling Returned Data

It is common for asynchronous communications to be a little more involved than simply sending data on its way. Some scenarios require us to process data with which the web server might respond. A username lookup service, for example, might require us to inspect a returned value to see if a given username exists within the system. How would we access this data? What about error handling? How do we find out if and what went wrong? We look at these considerations next.

Accessing Returned Data

It might be a simple transaction identifier or a large data set containing some or all of a customer's purchasing history; it doesn't really matter. Either way, this information, the server's response, is represented by the ***data*** argument with which we expect our ***success*** method’s callback function to be supplied. Listing 7-12 shows how we might go about displaying a transaction number to our user.

Listing 7-12. Handling Request Data

```
promise.success(function (data, status) {

    $scope.successMessage = "Your transaction identifier is " + data.transactionID;
    $scope.showSuccessMessage = true;

  });
```

This example assumes that we received a JSON response from the server and that this response was structured something like ***{"transactionID": "12587965"}***. Of course, in your own projects, you will come across many different structures and even different formats, such as XML.

Handling Errors

It’s an unfortunate fact of life that things do not always go well. Our applications are going to produce errors for a wide variety of reasons. Some might be network-related and quite possibly outside of our control. Others might be coding errors or configuration issues—things well within our control. Regardless of the origin of an error, we should respond appropriately. A good place to do so is in the promise object’s ***error*** method (see Listing 7-13).

Listing 7-13. Handling Errors

```
promise.error(function (data, status) {

if (status === 0) {
     $scope.errorMessage = "network or http level issue"; }
else {

     $scope.errorMessage = "response HTTP status is " + status;
}
     $scope.showErrorMessage = true;
});
```

This time, we make use of the ***status*** parameter. This will tell us how the server responded, by supplying us with an HTTP status code. Status codes between 200 and 299 are considered successful, so you won’t see any in this range inside an ***error*** callback. If the server didn’t respond at all, due to some kind of network or HTTP-level issue, you will get 0 as a result.

Listing 7-13 isn’t a very sophisticated way to handle errors from a user perspective, but it is somewhat useful for “at a glance” debugging purposes. Ideally, though, you would evaluate your particular scenario and determine whether or not there is any way to recover from, or more gracefully handle, your own errors

.

CHAPTER 8

Organizing Views

AngularJS excels when it comes to the creation of *single-page applications*, or *SPA*s, as they are commonly called. This kind of application has become increasingly common, given the advances in HTML5 and the availability of faster Internet connections. With an SPA, we can provide a much more responsive user experience, decrease the load on our web servers, and benefit from other advantages, such as the ability to cater better to users who might have to work offline. However, there is a potential issue with a web site or web application that downloads a lot of its content during a single-page request—organizing and managing that content.

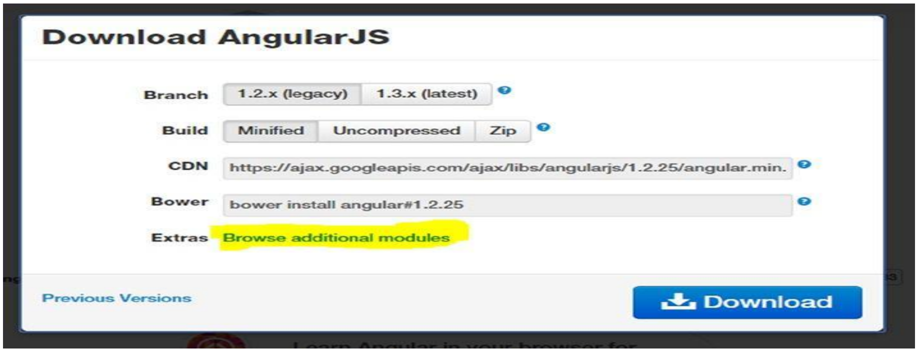
With Angular, we can manage this situation neatly and easily, using the Angular routing system. As you will see, this approach makes for a very flexible and powerful solution to the problem of managing applications that are required to deliver large amounts of content (and functionality) in the context of a single-page application.

Ideally, we should be able to tell our application where our content resides, and, moreover, when users request it, it should just find it and load it for them with a minimum of fuss and complexity. This is where the Angular routing system comes into play.

By the end of this chapter, you should feel comfortable with the most important parts of the Angular system—the ***$route*** service and its related provider and directives. Before we look at any of this, however, we have to download and install the ***ngRoute*** module.

Installing the ngRoute Module

As the Angular routing system is defined within an optional module called ***ngRoute***, we must download this module before we can get started. To do this, go to ***http://angularjs.org***, click Download, select the version you require (the code listings in this chapter use the 1.2.5 version), and click the Browse additional modules link displayed next to Extras, as shown in Figure 8-1.



Download AngularJS

Branch: 1.2.x (legacy) | 1.3.x (latest)

Build: Minified | Uncompressed | Zip

CDN: https://ajax.googleapis.com/ajax/libs/angularjs/1.2.25/angular.min.

Bower: bower install angular#1.2.25

Extras: Browse additional modules

Figure 8-1. *Downloading additional modules*

A page listing various Angular modules appears. You want to download the ***angular-route.js*** file (or the minified version, ***angular-route.min.js***, if you prefer) into your *angularjs* folder.

In Listing 8-1, you can see an example of how I added a script element for the ***angular-route.js*** file within a new HTML file.

Listing 8-1. Adding a Reference to the ***ngRoute*** Module

```
<!DOCTYPE html>
<html ng-app="myApp">
<head>
<title></title>
<script src="angular.js"></script>
<script src="angular-route.js"></script>
</head>
<body>
<!-- body code here -->
</body>
</html>
```

That's it—that's how you install the Angular routing system. Now let's start looking at what you can do with it.

Using URL Routes

You'll learn about routes through a small web site that we will create as we proceed through the chapter. Though it's a small web site, it will be more than able to demonstrate the power of the routing system. It will consist of a home page, an about page, and a contact page. In a traditional static HTML web site, we would structure this content as three separate HTML files, no doubt using the same navigation elements and other common features across each of the three pages. In this chapter, however, we are going to learn how to do something similar, but using the Angular routing system to *inject* these pages into a single container, or *parent*, view page.

Technically speaking, we could come up with a solution that does not require the use of the Angular routing system or learning anything new at all. For example, we could use ***ngShow*** and HTML ***div*** elements to manage the visibility of our content and rely on the use of ***$scope*** variables in our controller(s) to switch various pages on and off or perhaps load them on demand. There are other possibilities too, many of which revolve around the use of the versatile ***ngInclude*** directive. However, due to the added complexity and code required within controllers, these techniques can become cumbersome and increasingly difficult to manage as web sites get larger. What we really want is a clean and simple way to separate the task of selecting content from the controller, so that the application content can be driven from any part of the application. This is what routes allow us to do.

Defining Routes

At the heart of the routing system is the ***$route*** service. This service allows you to create a set of mappings between URLs and view file names. These mappings, usually known as URL routes or simply routes, work closely with the value returned by the ***$location.path()*** method. When this value changes such that it matches one of the routes, the corresponding view template (described by the route) will be loaded and displayed. Listing 8-2 shows a basic route.

Listing 8-2. A Simple Route

```
$routeProvider.when('/about',
                          {
                               templateUrl:  'pages/about.html',
                               controller:  'aboutController'
                          });
```

Don’t worry too much if this code listing doesn’t make total sense. This is just a first glance at what a route looks like. To begin, let’s consider the purpose of the two arguments passed to the ***$routeProvider.when()*** method. The first is the path that we want the routing system to look for, and the second is an object that provides details of what it should do if it comes across it. These details, the template to load and the controller to use, are all that this particular route needs. Translating this code snippet into plain English, it might read something like this:

> *When the URL has the path /about, load the view template /pages/about.html, using the aboutController.*

Let’s put some context around this with a more complete example. Listing 8-3 is the parent page of the small web site that we will be creating. This file, ***index.hmtl***, is the entry point into the web site. The view templates, ***home.html***, ***about.html***, and ***contact.html***, will be loaded into this page by the routing system as and when they are required. We will also have another view template, ***routeNoteFound.html***, and this will be explained shortly.

Listing 8-3. *index.html*, the Entry Page for Our Demo Web Site

```
<!DOCTYPE  html>
<html  ng-app="app">
<head>
     <link  rel="stylesheet"  href="//netdna.bootstrapcdn.com/bootstrap/3.0.0/css/bootstrap.min.css"/>
     <link  rel="stylesheet"  href="//netdna.bootstrapcdn.com/font-awesome/4.0.0/css/font-awesome.css"/>
     <script  src="angular.min.js"></script>
     <script  src="angular-route.js"></script>
     <script>
```

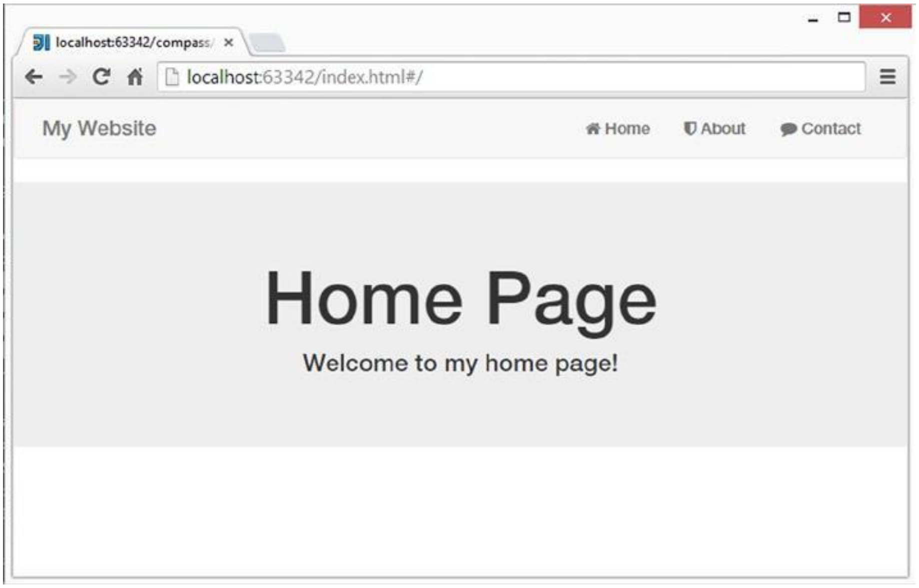
```
        var app = angular.module('app', ['ngRoute']);
        app.config(function ($routeProvider) {

            // configure the routes
            $routeProvider

                    .when('/', {
                      // route for the home page
                        templateUrl: 'pages/home.html',
                         controller: 'homeController'
                    })
                    .when(' pages/about', {
                      // route for the about page
                        templateUrl: 'pages/about.html',
                         controller: 'aboutController'
                    })
                    .when('pages/contact/', {
                      // route for the contact page
                        templateUrl: 'pages/contact.html',
                         controller: 'contactController'
                    })
                    .otherwise({
                      // when all else fails
                        templateUrl: 'pages/routeNotFound.html',
                         controller: 'notFoundController'
                    });
        });

app.controller('homeController', function ($scope) {
$scope.message = 'Welcome to my home page!';
        });

        app.controller('aboutController', function ($scope) {
            $scope.message = 'Find out more about me.';
        });

        app.controller('contactController', function ($scope) {
            $scope.message = 'Contact us!';
        });

        app.controller('notFoundController', function ($scope) {


            $scope.message = 'There seems to be a problem finding the page you wanted';
```

```
                $scope.attemptedPath = $location.path();
            });

        </script>
</head>
<body  ng-controller="homeController">

<header>
        <nav  class="navbar  navbar-default">
            <div  class="container">
                <div  class="navbar-header">
                    <a        class="navbar-brand"        href="/">My
                Website</a> </div>

                <ul  class="nav  navbar-nav  navbar-right">
                    <li><a  href="#"><i  class="fa  fa-home"></i>  Home</a></li>
                    <li><a   href="#about"><i   class="fa   fa-shield"></i>   About</a></li>
                    <li><a        href="#contact"><i        class="fa        fa-comment"></i>
                    Contact</a></li>
                </ul>
            </div>
        </nav>
</header>

<div  id="main">
        <!--  this  is  where  content  will  be  injected  -->
        <div  ng-view></div>
</div>

</body>
</html>
```

We will come back to this code listing shortly, but for now, take note that we have made sure to add a script reference to the ***ngRoute*** module, and we have declared our dependency on it with the following line. Omitting either of these will result in a non-starter.

```
var  app  =  angular.module('app',  ['ngRoute']);
```

Figure 8-2 shows the result of my efforts on this demo web site. Each part of the web site has essentially the same look and feel, because the view templates, as you will soon see, ultimately become part of this single page. Factoring out these aspects of the code, all we really have here is the JavaScript code, which we will get to shortly, and a header containing some navigation links. What we don't see is any actual content. Near the end of the listing, however, we encounter the ***ngView*** directive. This directive is an important part of the routing system, and its job is to include the rendered template of the current route into the main layout file, which, in this case, is ***index.html***. Every time the current route changes, the included view will change, based on how we have configured our routes.



Home Page

Welcome to my home page!

Figure 8-2. *Demo web site home page*

We have declared ***ngView*** as an attribute on a ***div*** element; consequently, this ***div*** element is where our content is going to be injected. Let's examine the four view templates that contain this content. These are shown in Listing 8-4, Listing 8-5, Listing 8-6, and Listing 8-7.

Listing 8-4. The HomePage, ***home.html***

```
<div class="jumbotron text-center">
    <h1>Home Page</h1>

    <p>{{ message }}</p>

    <div>
    </div>
</div>
```

Listing 8-5. The About Page, ***about.html***

```
<div class="jumbotron text-center">
```

```
        <h1>About  Page</h1>

        <p>{{  message  }}</p>

        <div>
        </div>
</div>
```

Listing 8-6. The Contact Page, ***contact.html***

```
<div  class="jumbotron  text-center">
        <h1>Contact  Page</h1>

        <p>{{  message  }}</p>

        <div>
        </div>
</div>
```

Listing 8-7. The Route Not Found View Template, ***routeNotFound.html***

```
<div  class="jumbotron  text-center">
        <h1>This  is  not  good</h1>

        <p>{{message}}</p>
        <pclass="has-error">{{attemptedPath}}</p>

</div>
```

Each of these view templates will look the same, differing only in the content displayed once they are brought into the parent page via the ***ngView*** directive. Note the use of the ***jumbotron*** and ***text-center*** classes. These are Bootstrap-defined classes that help us with the layout. In the case of the ***routeNotFound.html*** view template, I have also used the Bootstrap ***has-error*** class to color the attempted path red, to highlight the erroneous input.

As I mentioned, every time the current route changes, the included view (the injected content) will change, based on how we have configured our routes. What would cause the current route to change? In our example, it would occur anytime our user interacted with the navigation links in our ***index.html*** file. So that we can hone in on these, I have repeated them again in Listing 8-8.

Listing 8-8. The Navigation Links in Our Entry Page, ***index.html***

```
<ul  class="nav  navbar-nav  navbar-right">
                        <li><a  href="#"><i  class="fa  fa-home"></i>  Home</a></li>
                        <li><a   href="#about"><i   class="fa   fa-shield"></i>   About</a></li>
```

```
        <li><a      href="#contact"><i      class="fa      fa-comment"></i>
        Contact</a></li>
</ul>
```

You will notice that these links are declared using a # character, just like those used in HTML when addressing named anchors. By default, when specifying links for the routing system, you should use this style of link, because only the portion after the first # character is considered during the matching process. With this matching process in mind, let's have a look at some sample URLs and consider how the ***$location*** service can break them down into distinct components (see Table 8-1).

Table 8-1. *How the $location Service Works with URLs*

http://localhost:63342/index.html#/	
$location.path()	***/***
$location.url()	***/***
$location.absUrl()	***http://localhost:63342/index.html#/***
http://localhost:63342/index.html#/about	
$location.path()	***/about***
$location.url()	***/about***
$location.absUrl()	***http://localhost:63342/index.html#/about***
http://localhost:63342/index.html#/contact?someParam=someValue	
$location.path()	***/contact***
$location.url()	***/contact?someParam=someValue***
$location.absUrl()	***http://localhost:63342/index.html#/*** ***http://localhost:63342/index.html#/contact?someParam=someValue***

Table 8-1 shows a few of the ***$location*** services methods acting on various URLs, though right now, we are mainly concerned with the ***path()*** method. It is this method that the routing system is using to determine whether or not the routes we configure are a match. Let's focus our attention back on ***index.html***, or, more specifically, the route configuration we have in place. Listing 8-9 shows this portion of the file.

Listing 8-9. The ***index.html*** Route Configuration

```
var  app  =  angular.module('app',  ['ngRoute']);
  app.config(function  ($routeProvider)  {

      //   configure the routes
      $routeProvider
```

```
                .when('/', {
                            //  route  for  the  home  page
                            templateUrl:
                            'pages/home.html',
                    controller:  'homeController'
                })
                .when('/pages/about', {
                            //  route  for  the  about  page
                            templateUrl: 'pages/about.html',
                    controller:  'aboutController'
                })
                .when('/pages/contact/', {
                            //  route  for  the  contact  page
                            templateUrl: 'pages/contact.html',
                    controller:  'contactController'
                })

                .otherwise({
                            // when  all  else  fails
                            templateUrl:  '/pages/routeNotFound.html',
                    controller:  'notFoundController'
                });
  });
```

It is worth repeating the fact that we declared a dependency on the ***ngRoute*** module when we created our application module, because its absence is the source of many problems for Angular beginners. Next, we use our application module's ***config()*** method to set up our route configuration. While the ***config()*** method can be used for other configuration purposes, here we use it solely to set up the routing system. We do this using the ***$routeProvider*** parameter that we specified on its anonymous function argument. It is through the ***$routeProvider*** that we tell the routing system how we want it to behave.

The route provider's ***when()*** method adds a new route definition. As we discussed, this is achieved through the two arguments that we pass to it. In Listing 8-9, the first ***when()*** method is used to create a route for our home page. *When the routing system can make a match against the value of* **location.path()** *and '/', it will inject the template* **'home.html'** *into the* **ngView** *directive and make* **homeController** *its controller.*

The next two route definitions use ***'/pages/about'*** and ***'/pages/contact'***, and the same logic applies. Of course, in these cases, the view templates and the controllers used are different. Pay special attention to the forward slashes in these routes. For example, the following two routes, ***'/pages/about'*** and ***'pages/about'***, are not the same. Note that the latter is missing the forward slash. Without the forward slash, you run the risk of creating a Not Found error when navigating the web site. Keep in mind that the URL is evaluated relative to the value returned by the ***$location.path()*** method.

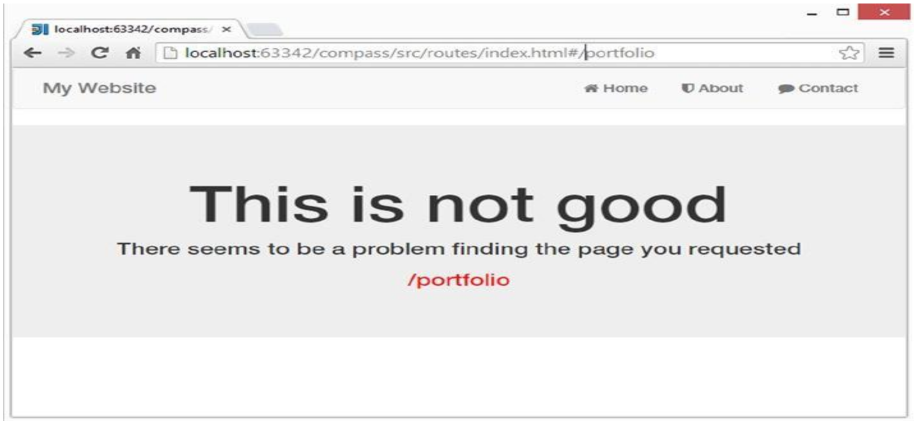
Sometimes, a match cannot be made. This is where the ***otherwise()*** method comes in. If you were to type a nonexistent URL into the browser's address bar, you would cause the ***otherwise()*** method to execute and display the ***'routeNotFound.html'*** view template. Of course, only a single argument is required in this case, as a URL makes no sense in this context.

We also specified a controller to use with each of our route definitions. Listing 8-10 shows this again. All but the last one do nothing more than set a value ***$scope.message***, so that we can distinguish one page from another.

Listing 8-10. The Controllers for Our View Templates

```
app.controller('homeController',  function  ($scope)  {
      $scope.message = 'Welcome to my home page!';
  });

  app.controller('aboutController',  function  ($scope)  {
      $scope.message = 'Find out more about me.';
   });

  app.controller('contactController',  function  ($scope)  {
       $scope.message = 'Contact us!';
  });


  app.controller('notFoundController', function ($scope) {
      $scope.message = 'There seems to be a problem finding the page you wanted';
      $scope.attemptedPath = $location.path();
```

You may have correctly surmised that the last controller complements our ***otherwise()*** route definition. Using ***$location.path()***, this controller does something slightly more interesting; it sets a value for ***$scope.attemptedPath***, so that we can display the invalid URL. This is the URL that could not be matched. Figure 8-3 shows how this looks.



This is not good

There seems to be a problem finding the page you requested

/portfolio

If you load and view the ***index.html*** file at this stage, you will have a fully working, albeit minimal, web site. Take some time to follow the links back and forth, observing the structure of the URLs and entering random URLs to see the ***otherwise()*** method in action. Once you are ready, we will move on and build up your knowledge of the routing system further.

Route Parameters

The URLs we have used to define our routes so far have been relatively simple but somewhat inflexible. This is because the match against ***$location.path()*** has had to be exact. This is perfectly fine in many cases, but not when we want to add parameters to our URLs. Examine the following three route definitions.

```
$routeProvider.when("/product/123", { templateUrl: "product.html" });
$routeProvider.when("/product/789", { templateUrl: "product.html" });
$routeProvider.when("/product/926", { templateUrl: "product.html" });
```

All of these use a fictitious product catalog view template, ***product.html***, but each has a slightly different URL. They each have a different series of numbers representing a product id. If we have 50 more products, each also represented by its own unique id, are we supposed to create 50 more route definitions? Of course not. Fortunately, we can deal with this situation, and others like it, using route parameters.

Route parameters are much more flexible than the fixed, or static, routes that we have seen so far. To demonstrate how they work, we are going to add a very simple contact form to our contact view template and use a route parameter to help us determine the initial state of its subject field. Here (Listing 8-11) is the revised contact view template:

Listing 8-11. The Revised Contact View Template

```
<div class="jumbotron text-center">
    <h1>Contact Page</h1>

    <form style="width:25%;margin:auto;" role="form">
        <div class="form-group">
            <input ng-model="subject" type="text" class="form-control" id="subject"
        placeholder="Subject"> </div>
        <div class="form-group">
            <textarea class="form-control" id="message"
        placeholder="Message"></textarea> </div>

        <button type="submit" class="btn btn-default">Send
    Message</button> </form>

</div>
</div>
```

There’s nothing too fancy going on here; it’s just a basic form with two fields. We aren’t really interested in submitting this form, so we won't pay any attention to the usual things (such as field validation and submitting it to a server). The important thing to take note of is the fact that we have a binding, named ***subject***, in place on the subject field. The object of this exercise is to pre-populate the subject field, based on how the user ended up at this view template. This will make more sense when you look at Listing 8-12. This is the ***about.html*** file we saw earlier, but modified to support this feature.

Listing 8-12. The Revised About View Template

```
<div class="jumbotron text-center">
    <h1>About Page</h1>

    <p>If you want to learn more about us <a href="#/contact/learn">please let us know</a>.</p>

    <p>If you want a free quote give us a call or inquire through <a href="#/contact/quote"> our
    contact form</a>.</p>
</div>
```

Again, there is nothing too fancy going on here, just a couple of paragraphs of content containing a couple of links. Take a close look at these links, though, as they contain our route parameters. Both of these links have two segments: the first one has the segments ***contact*** and ***learn***, and the second one has the segments ***contact*** and ***quote***. In both cases, the second segment acts as the route parameter under the route definition we examine next (Listing 8-13).

Listing 8-13. Additional Route Definition for the Contact View Template

```
//  route for the contact page with subject param
    .when('/contact/:subject',            {
        templateUrl:  'pages/contact.html',
        controller: 'contactController'
    });
```

The second segment in this route acts as a reference to whatever value is actually supplied as the second segment of a matching URL. Table 8-2 should shed some light on possible values for the ***subject*** route parameter, and it shows a couple of non-starters.

Table 8-2. *Possible Values for the subject Route Parameter*

URL	Match?
/contact/quote	Yes. The route parameters value is ***quote***.
/contact/learn	Yes. The route parameters value is ***learn***.
/contact/	Too few segments, no match
/contact/learn/more	Too many segments, no match

How can we do something useful with this? The first step is to extract the value of the route parameter. What we will use it for here is a simple comparison that will help us determine the text with which we want to pre-populate the subject text field. This is shown in Listing 8-14, which is a revision of the ***contactController*** code.

Listing 8-14. The Revised ***contactController***

```
app.controller('contactController', function ($scope, $routeParams) {

var subject = '';
if ($routeParams ['subject'] == "learn") {
     subject = 'I want to learn more about your services';
} else if ($routeParams ['subject'] == "quote") {
     subject = 'I would like to get a free quote';
}

$scope.subject = subject;
          });
```

Extracting the value is easy, provided that we make the ***$routeParams*** service available to the controller, as we do here. We then create the variable ***subject***, initializing it to an empty string. The conditional logic revolves around the value of the route parameter, and here you can see this value being retrieved via its name (also ***subject***). Indexing into the ***$routeParams*** service in this way tells us the value that was actually used in the URL. As to how it got into the URL, let’s look at the changes I made to the ***about.html*** view template (see Listing 8-15).

Listing 8-15. Creating URLs That Contain Route Parameter Values

```
<div class="jumbotron text-center">
     <h1>About Page</h1>
     <p>If you want to learn more about us <a href="#/contact/learn">please let us know</a>.</p>
     <p>If you want a free quote give us a call or inquire through <a href="#/contact/quote"> our
     contact form</a>.</p>

</div>
```

Here you see the two links that will take us to the contact view template. Both ***/contact/learn*** and ***/contact/ quote*** are a match for ***/contact/:subject***. Of course, the route parameter ***subject*** is given a different value for each: ***learn*** for the former and ***quote*** for the latter. Listing 8-16 shows the new routes configuration.

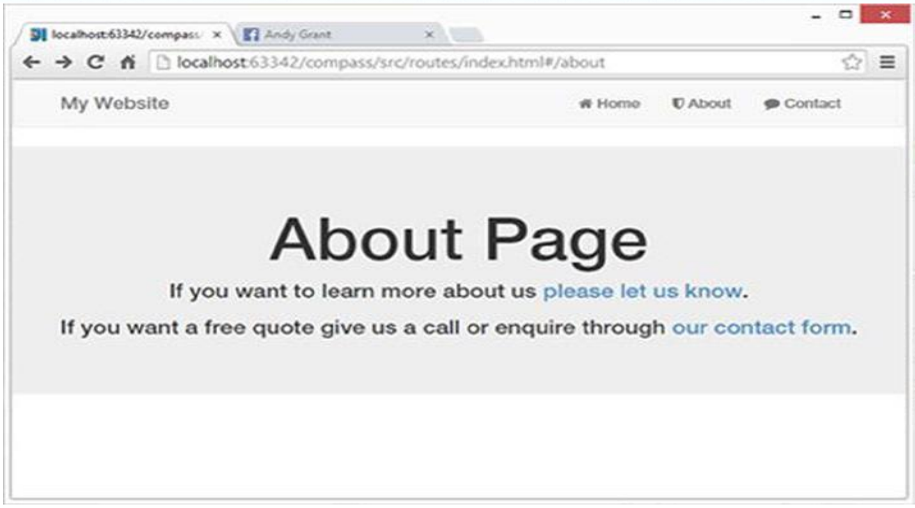
Listing 8-16. The Revised Routes Configuration

```
app.config(function ($routeProvider) {

  // configure the routes
```

```
   $routeProvider

      //  route  for  the  home  page
          .when('/', {
             templateUrl:  'pages/home.html',
             controller:  'homeController'
          })

      //  route  for  the  about  page
          .when('/about', {
             templateUrl:  'pages/about.html',
             controller:  'aboutController'
          })

      //  route  for  the  contact  page
          .when('/contact', {
             templateUrl:  'pages/contact.html',
             controller:  'contactController'
          })

      //  route  for  the  contact  page  with  subject  param
          .when('/contact/:subject',                {
             templateUrl:   'pages/contact.html',
             controller: 'contactController'
          })

      //  when  all  else  fails
          .otherwise({
             templateUrl:  'pages/routeNotFound.html',
             controller:  'notFoundController'
          });
});
```

You can see that the new route definition is in play now. You can also see that the original route remains in play too. We still need this, so that we can continue to navigate to the contact view template *without* a route parameter. An alternative is to remove it and simply make sure that we always use a route parameter. It all depends on what you want to achieve. In this case, it made sense to leave it as a general purpose fallback.

Figure 8-4 and Figure 8-5 show the updated ***about.html*** and ***contact.html*** view templates. Figure 8-5 is the result of following the link in the second paragraph of the ***about.html*** view template. You will see that its subject field is pre-populated with the text *“I would like to get a free quote*.”

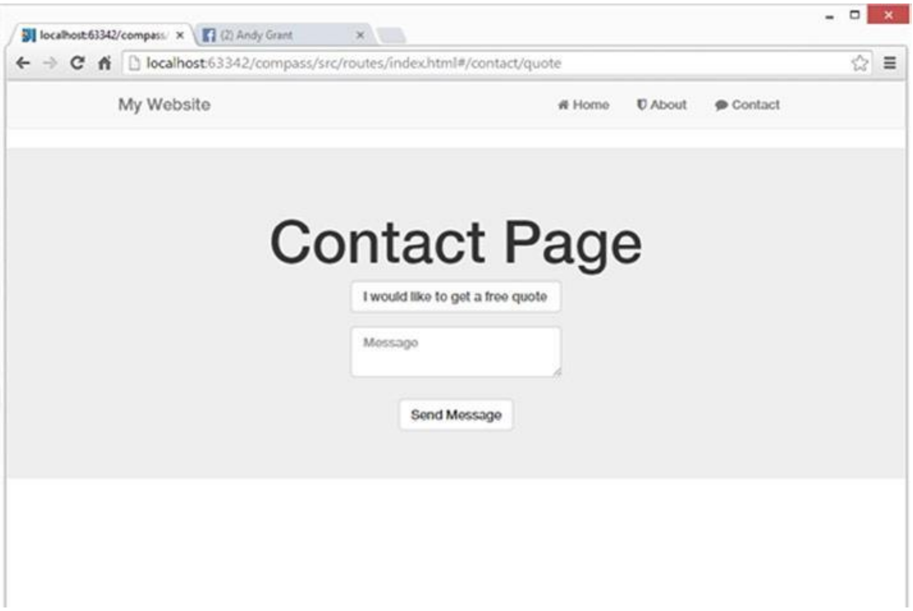


About Page

If you want to learn more about us please let us know.

If you want a free quote give us a call or enquire through our contact form.

Figure 8-4. *The updated about.html view template*



Contact Page

I would like to get a free quote

Figure 8-5. *The updated contact.html view template*

Eager vs. Conservative Routes

Routes such as ***'/contact/:subject'*** are known as *conservative routes*. That's really just a way of saying that the route would match, say, ***'/contact/howareyou'*** but would not match ***'contact/how/are/you'***, as the latter has far too many URL segments. A conservative route is really quite strict about what it considers to be a match. To explain how an *eager* route works, let's start by considering a URL that contains segments that describe a product, more specifically, a shirt that is available in various sizes, styles, and colors.

/product/123/medium/blue/loosefit
/product/698/large/green/snugfit

Knowing what we already know, this is not a problem for us; we can use a conservative route. Such a route would look like this:

```
when('/product/:id/:size/:color/:fit',  {
                    templateUrl:  'pages/product.html',
                    controller:  'productController'
                });
```

Inside our controller, we can do just as we did earlier and use ***$routeParams*** to access each value. ***$routeParams['color']*** would give us the color, and ***$routeParams['size']*** would give us the size, for example. However, this is still a conservative route. To match, it needs a URL with all five segments. With an eager route, you
can do something like this:

```
when('/product/:id/:data*',  {
                    templateUrl:  'pages/product.html',
                    controller:  'productController'
   });
```

Note that the use of the asterisk that suffixes the data parameter essentially says "match any path that has at least three segments, of which the first segment is product." The second segment will be assigned to the route parameter ***id***, and the remaining segments will be assigned to the route parameter ***data***.

■ **Tip** An eager route parameter is denoted by a colon, followed by a name, and then finally an asterisk. The key difference between an eager route parameter and a conservative route parameter is that the latter will match one segment, and the former will match as many segments as possible.

Route Configuration Options

We haven't looked at everything there is to know about the Angular routing system, though we've certainly reviewed enough to get you off to a good start. Before I finish this chapter, I'd like to leave you with a reference to some additional configuration options, as shown in Table 8-3, if only to give you a sense of what else is available.

Table 8-3. *Route Configuration Options*

Name	Description
controller	Specifies the name of a controller to be associated with the view displayed by the route
controllerAs	Specifies an alias to be used for the controller
template	Specifies the content of the view. (This can be expressed as a literal HTML string or as a function that returns the HTML.)
templateUrl	Specifies the URL of the view file to display when the route matches. (This can be expressed as a string or as a function that returns a string.)
resolve	Specifies a set of dependencies for the controller
redirectTo	Specifies a path to which the browser should be redirected when the route is matched. (This can be expressed as a string or a function.)
reloadOnSearch	When ***true*** (the default value), the route will reload only when the values returned by the ***$location*** search and hash methods change.
caseInsensitiveMatch	When ***true*** (the default value), routes are matched to URLs without considering case.

One particularly interesting alternative is the ***template*** option (see Listing 8-17). It's similar to the ***templateUrl*** option, but it differs in that it allows you to create the template right there in the route configuration options (as opposed to using a view template file). It's certainly not the way to do things in most cases, but it can be useful when you don't want or need a dedicated view template.

Listing 8-17. The Template Option

```
.otherwise({
      template:  '<h1>Oops</h1>'  +
                 '<p>Sorry,  page  not  found</p>'
 });
```

Using ***template***, Listing 8-17 shows this approach in action. As you can see, we do not specify a path; instead, we use a string value consisting of some HTML. As I mentioned, you generally would not want to use this approach unless you had a particular reason to apply it. The main reason I am presenting it here is to clarify the difference between ***template*** and ***templateURL***.

As revealed in Table 8-3, besides accepting a string value, ***template*** and ***templateUrl*** can both accept a function as a value. This function must itself return a string. Both of the route definitions that follow are functionally equivalent.

```
when('/portfolio', {
        templateUrl: function () {return 'contact.html';},
        controller: 'contactController'
          });

when('/portfolio', {
        templateUrl: 'contact.html',
        controller: 'contactController'
          });
```

Of course, there's probably not much point in using the function-based alternative in this example. It's easier and much clearer to use the string-based approach. The real strength of the function-based approach is that it can be dynamic.

The example in Listing 8-18 does it much more justice. Here, we assume that we have ten portfolio pages, each one featuring a different piece of work. Each piece of work has its own view template, named ***portfolio1.html***, ***portfolio2.html***, ***portfolio3.html***, all the way through to ***portfolio10.html***.

Listing 8-18. A Dynamic ***templateUrl*** Value

```
when('/portfolio', {
     templateUrl: function () {
          // create a number between 1 and 10
          var num = Math.floor((Math.random() * 10) + 1);
          //  use this number to produce a path
          //  to one of the ten view templates return
          'pages/portfolio' + num + '.html';
     },
     controller: 'contactController'
});
```

The function assigned to ***templateUrl*** is now a bit more interesting. This function creates a random number between 1 and 10, and it appends this number to the end of the file name. Each time the function runs, a different file name is created. Consequently, a potentially different portfolio view template is displayed each time.

HTML5 Mode

I made the point earlier in the chapter that, by default, links are declared using a # character. The # character is only there because we don’t want the browser to fire off an actual HTTP request to the server. For example, if we removed it, a URL like the one following would create a request to the server.

http://mydomain/index.html/about

However, if we keep the # character as we do in the following URL, the browser will not fire off an HTTP request to the server, because the # character is telling it that we are seeking content on some part of the same page—the page that is currently loaded.

http://mydomain/index.html#/about

In reality, this whole approach is really just a workaround for non-HTML5 browsers. It works well, and it is perhaps the best approach to use if you are unsure who your target audience might be. However, a cleaner option exists. You can enable HTML mode. In this mode, the # character is not needed. A couple of reasons to do this might be that you want prettier URLs and much more SEO-friendly URLs.

Enabling HTML5 mode is not terribly difficult, but it does require some web server configuration and a relatively good understanding of how browsers and web servers handle links. I chose to remain in default mode, so as not

to muddy the waters in this introductory book, but you should be aware of this option, and I encourage you to investigate further.