Community Experience Distilled

Getting Started with Backbone Marionette

Build large-scale JavaScript applications with Backbone Marionette quickly and efficiently

Raymundo Armendariz
Arturo Soto

[PACKT] open source*
community experience distilled
PUBLISHING

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To our wives and families for their love and motivation and to our friends for their help and support.

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I'd like to wholeheartedly thank my parents who have supported me in my professional career. I also want to thank Carol, my girlfriend, who always helps me to make the best decisions. And last but not least, many thanks to my mate Tony, who always helps me out with English!

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Table of Contents

Preface

Backbone Marionette is a composite application library for `Backbone.js`, which aims to simplify the construction of large-scale JavaScript applications. It is a collection of common design and implementation patterns found in the applications that we build with Backbone, and includes pieces inspired by composite application, event-driven, and messaging architectures.

What this book covers

Chapter 1, Starting with Backbone Marionette, is an introduction to what Marionette is and the problems it aims to solve. In this chapter, we also learn about its prerequisites, download sources, and documentation.

Chapter 2, Our First Application, introduces three main concepts of Marionette—the application, controller, and router objects— and details the process of building a small application.

Chapter 3, Marionette View Types and Their Use, digs deep into the view types that Marionette has and how to use them.

Chapter 4, Managing Views, reviews the view management that goes from firing a view, closing it, and re-opening it. We will also introduce some useful objects, such as the `Renderer` object and the `TemplateCache` object, that are very valuable in order to build an application.

Chapter 5, Divide and Conquer – Modularizing Everything, talks about how to modularize an application and break it into small subapplications. Being able to do this will increase its productivity as the modules allow the adding of new functionality without affecting the existing code.

Chapter 6, *Messaging*, explains that in order to build a loosely coupled application, the components need to know very little about each other; however, these components still need to work together. In this chapter, we also learn how to archive this through messages and events.

Chapter 7, *Changing and Growing*, helps us to learn how to manage a problem that comes with large-scale applications: the file explosions, and how to keep a clean structure.

What you need for this book

A modern browser and a text editor are all you need to follow the examples of this book. You will find detailed instructions of how to set up your development environment and also where to get the Marionette and its dependencies in the book.

Who this book is for

If you are a web application developer interested in using Backbone Marionette for a real-life project, this book is for you. Knowledge of JavaScript and working knowledge of `Backbone.js` are prerequisites.

Conventions

In this book, you will find a number of styles of text that distinguish between different kinds of information. Here are some examples of these styles, and an explanation of their meaning.

Code words in text are shown as follows: "The `Marionette.ItemView` is "

A block of code is set as follows:

```
var CategoryView = Backbone.Marionette.ItemView.extend({
  tagName : 'li',
  template: "#categoryTemplate",
});
```

[Warnings or important notes appear in a box like this.]

[Tips and tricks appear like this.]

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1
Starting with Backbone Marionette

This practical guide provides clear steps to the basics of writing scalable applications using `Marionette.js`. As you progress through the initial examples, you will develop an understanding of how the framework components work together to create a composite application. But before we go through in-depth examples, here are some things that you will find in this introductory chapter:

- Description and characteristics of `Marionette.js`
- The role of `Marionette.js` in the Backbone applications
- Benefits of the framework
- An overview of architecture and scalability
- Instructions for installation and documentation

Introducing Marionette.js

A composite application library for `Backbone.js` is `Backbone.marionette`, also known as `Marionette.js`. It gives us the core constructs and simplifies many of the patterns and practices that your JavaScript applications need to be scalable.

Backbone needs Marionette.js

An increasingly popular framework for building single-page and small- to mid-sized applications is `Backbone.js`. It provides a great set of building blocks to organize your frontend development and build applications that support mobile devices. However, it leaves much of the application design, architecture, and scalability to developers. Nevertheless, `Marionette.js` fills in some blanks that `Backbone.js` doesn't provide by itself and gives us conventions that you can take advantage of to build your own custom objects. Simply put, `Marionette.js` makes your life easier when you are developing the Backbone applications.

Key benefits of Marionette.js

Adding a lot of key patterns and tools used to create real-world applications, `Marionette.js` found its place in Backbone. The following are some of the benefits that you can find within this framework:

- Structure, organization, and patterns
- Composite application architecture
- Event-driven architecture with the event aggregator
- Boilerplate for views can be reduced
- Enterprise messaging pattern influence
- Modularization options
- Incremental use; because it's not an all or nothing framework, which means that you can use just the components you need
- Support for nested views and layouts within visual regions
- Built-in memory management and zombie killing in views, regions, and layouts

A lot of application infrastructural components needed to build an application of any module size is provided by `Marionette.js`.

A wide set of objects are provided by `Marionette.js` that facilitate the creation of well-structured applications of virtually any size and complexity. It achieves this goal by providing a collection of common design and implementation patterns found in the applications that the creator, Derick Bailey, used to develop the modular Backbone applications.

Building large applications

When planning the architecture for your application, you normally try to think ahead as much as possible, attempting to achieve a decoupled architecture with functionality broken down into independent modules, and to avoid making direct calls between these modules. Therefore, you can add and remove modules without affecting its behavior.

> *"The secret to building large apps is never build large apps. Break your applications into small pieces. Then, assemble those testable, bite-sized pieces into your big application"*
>
> *– Justin Meyer, author of JavaScriptMVC.*

Consider that components tied to each other are difficult to change and scale without affecting each other. A very incremental and modular approach is provided by `Marionette.js`, using the module definition. It relies on the event aggregator to send messages between the modules to coordinate functionality from other parts of the system, without adding direct references to them among many more object types that facilitate the application's design.

Incremental use

This is one of the basic concepts that the creator of `Marionette.js` used to create the framework. An incremental and modular approach is facilitated by `Marionette.js`, providing the application object and the module architecture to scale applications across subapplications, features, and files. All of them are built to stand alone and to work with the core pieces of Backbone to accomplish the application's specific needs.

> *"The key is to acknowledge from the start that you have no idea how this will grow. When you accept that you don't know everything, you begin to design the system defensively ... You should spend most of your time thinking about interfaces rather than implementations."*
>
> *– Nicholas Zakas, author "High-performance JavaScript websites"*

One of the main benefits of `Marionette.js` is that you don't need to use all of its components. A jQuery-jQuery UI comparison can also be applied here. The fact that you use the jQuery calendar by any means forces you to use the entire UI library. The same can be applied to Marionette because the fact that you use just one of its components that makes sense for your application does not obligate you to use the other components of Marionette.

Installing Marionette.js

We will go over how to download and set up a development environment so that you can get started with `Marionette.js` in some easy steps. If you're already comfortable with installing `Marionette.js`, you may want to skip the remaining parts of this chapter. Feel free to jump to *Chapter 2*, *Our First Application*.

Text editor

While building large and scalable applications, you will spend most of your time on a code editor. We recommend that you use an editor that works for you. Notepad++ or Sublime Text are definitely good options. Sublime Text already has a lot of snippets and packages that will help you in your development.

Web browser

Working with complex client-side applications requires a good set of developer tools. For the purpose of this guide, we will use mostly Google Chrome and Mozilla Firefox, but all the code and examples should work in all modern browsers (IE9+, Opera, and Safari).

We will use `jsfiddle.net` in order to show you the running examples. The use of this site is pretty simple and most of the time, you will only need to run the code to see it in action.

Prerequisites

At the time of this writing, the current stable version of `Marionette.js` is v1.3.0 and it relies on the following libraries:

- `JSON2.js`
- `jQuery` (v1.7, v1.8, and v1.9)
- `Underscore.js` (v1.4.4)
- `Backbone.js` (v1.0.0)
- `backbone.wreqr.js`
- `backbone.babysitter.js`

We would like to point that having basic knowledge on Backbone and Underscore will help you to get the best out of this book and to understand the benefits of Marionette over plain Backbone development.

Getting Marionette.js

The best way to get the latest build of `Marionette.js` is by going to the project website, `http://marionettejs.com/`.

They have a **Pre-packaged** option. The `.zip` contains all of the files that you need to get started with `Marionette.js`, including Backbone, jQuery, and other prerequisites. You can also download the `Marionette.js` file without all the dependencies and just use the CDN versions of these libraries if they are available.

Documentation

You can download the documentation for each piece of `Marionette.js` from `https://github.com/Marionette.jsjs/Marionette.js/tree/master/docs`. The documentation is split into multiple files. The annotated source code can be found at `http://marionettejs.com/docs/backbone.marionette.html`. You can find articles, blog posts, presentations, FAQs, and more on its wiki page, `https://github.com/marionettejs/backbone.marionette/wiki`.

Derick Bailey, the creator of Marionette, has created a sample application that can be used as a reference for building the Backbone applications with `Marionette.js`. The name of the application is `BBCloneMail` and it is a great example to demonstrate a composite application. You can find `BBCloneMail` online at `http://bbclonemail.heroku.com` and the source code at `http://github.com/derickbailey/bbclonemail`.

Summary

In this chapter, we looked at some of the core concepts and benefits that `Marionette.js` offers for building scalable applications. We also provided links to find, download, and install the basic tools needed to perform your development. In the next chapter, you will be introduced to the components or building blocks that make up the `Marionette.js` applications.

2
Our First Application

In the previous chapter, we learned what Marionette is, where to find the source code and documentation, and other useful resources that will help us to learn more about Marionette. But we believe the best way to learn something is by putting it into practice. So in this book, we will build an application with moderate complexity, that is, it is complex enough to break the Hello World! barrier, allowing us to discover the benefits that Marionette has to offer, but simple enough to complete it with in this book. We will show some standalone code snippets to introduce you to each new concept; however most of the time we will stick to the application code.

In this chapter, we will review how to set up your development environment in order to build our first application. We will also learn three important parts of `Marionette.js`: the marionette router, marionette controller, and marionette application.

Introduction to what we are building

The application that we will be building in this book is a website for a book store. We should be able to perform the following actions on the website:

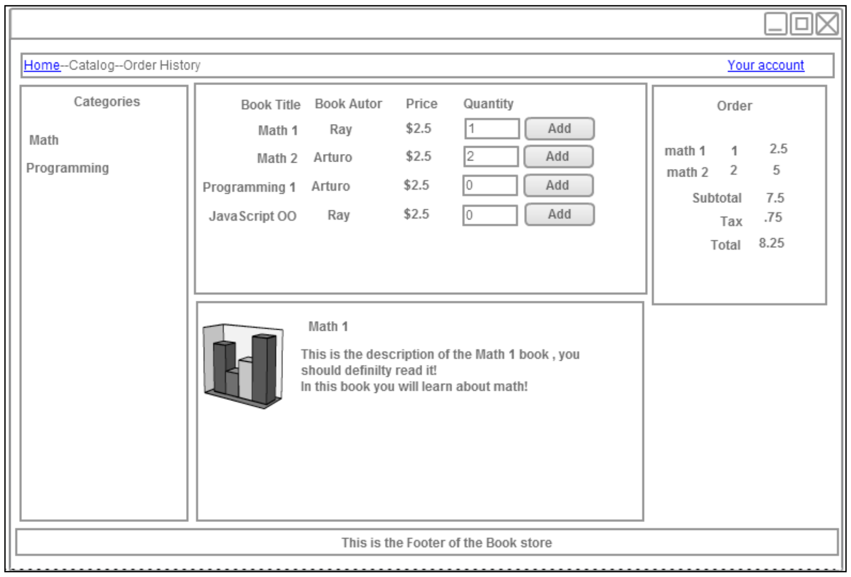
- Display a list of book categories
- Select a category and display the related books
- Present a description, price, and other important details of the book
- Add books to the shopping cart
- Display the shopping cart items

The website that we are going to build is just an example application. It's mandatory to follow the structure proposed in this book, as every application has different needs. Nevertheless, it's a good starting point and our idea is to show how each component of Marionette solves a problem and how to make its components work together.

Also, keep in mind that we will give attention to the Marionette components of the code, explaining in detail their benefits, and to adding them to the application. However, we will not dive deep into Backbone details such as `Backbone.Model` and `Backbone.Collection`, which are the core components of Backbone, as knowledge of this is already assumed.

One of the concepts that Marionette adds to Backbone is that of an application object—`Backbone.Marionette.Application`. We will start this book with this topic because the object will be the container of all of your Backbone views and models. One of its responsibilities is, before the user starts interacting with the website, it must initialize some of the components, such as the `Backbone.Router` component, that will be listening to the route (URL) changes of our application. This object provides some handy methods to perform this initialization. But, before we dig deeper into details, let's first take a look at what we are building.

The following screenshot helps us to illustrate the structure of the book store application that we are going to build:



Book Title	Book Autor	Price	Quantity	
Math 1	Ray	$2.5	1	Add
Math 2	Arturo	$2.5	2	Add
Programming 1	Arturo	$2.5	0	Add
JavaScript OO	Ray	$2.5	0	Add

math 1	1	2.5
math 2	2	5
	Subtotal	7.5
	Tax	.75
	Total	8.25

Math 1

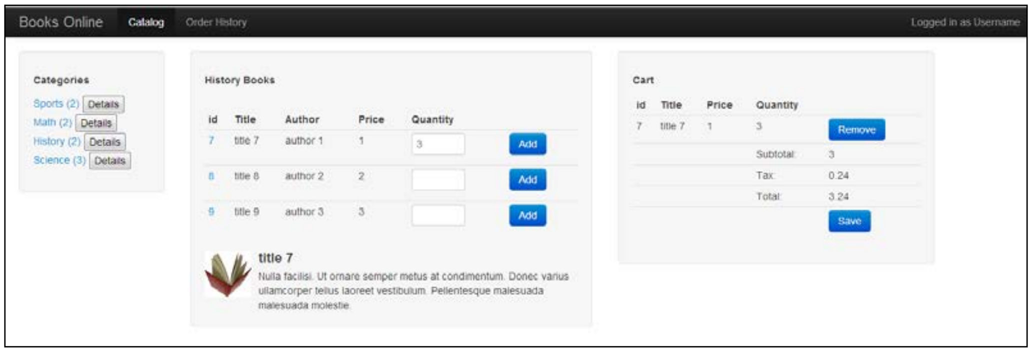
This is the description of the Math 1 book , you should definilty read it!
In this book you will learn about math!

This is the Footer of the Book store

We have a navigation section that provides the categories of the books. Then in the middle, we have two sections. The one on top is the list of books by name, author, and price. This section also allows users to order books.

The second section, in the center of the screen, will show a description of each book as the user selects from the list on top. Finally, to the right of the screen, we have the Order section that will contain the details about our order.

At the end of the book, the application should look like the following screenshot:



id	Title	Author	Price	Quantity
7	title 7	author 1	1	3
8	title 8	author 2	2	
9	title 9	author 3	3	

title 7

Nulla facilisi. Ut ornare semper metus at condimentum. Donec varius ullamcorper tellus laoreet vestibulum. Pellentesque malesuada malesuada molestie.

id	Title	Price	Quantity	
7	title 7	1	3	
			Subtotal:	3
			Tax:	0.24
			Total:	3.24

The goal of this chapter is to build the foundation of the book store website and a part of that foundation is to have the `Backbone.Marionette.Application` object working with enough functionality so that we can call it an application. Our philosophy is to take small steps at a time and then check where we stand. So let's get started!

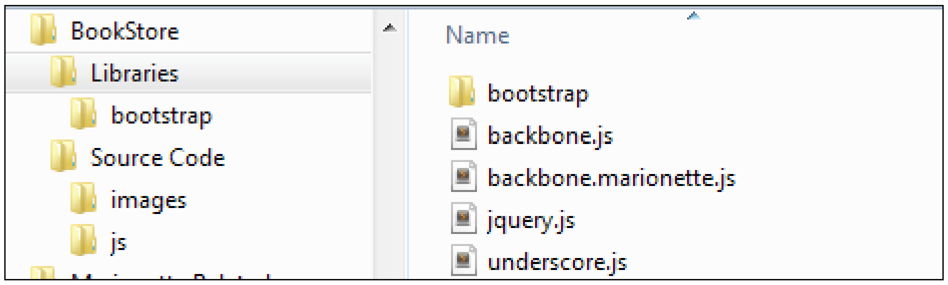
Setting up our development environment

As we will be building an application together, we need to set up our development environment. The following are the steps to do it:

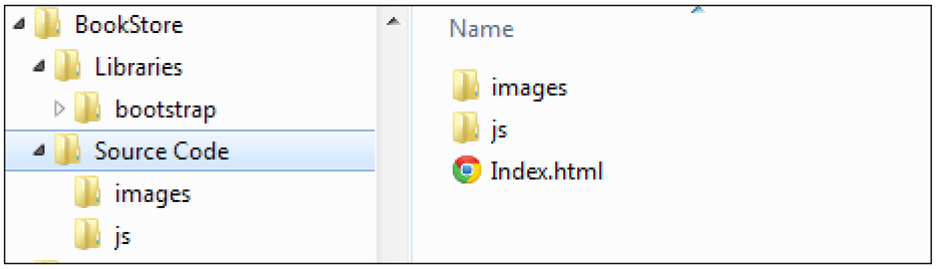
1. Create a folder and name it `Bookstore`.
2. Inside this folder, create two new folders—one named `Source Code` and the other `Libraries`.
3. In the `Libraries` folder, place the following four libraries:
    - `Underscore.js`
    - `jQuery.js`
    - `Backbone.js`
    - `Backbone.Marionette.js`

   For styling purposes, we will use Twitter bootstrap v2. Download the default package, unzip it, and place the entire unzipped bootstrap folder beside the `.js` files inside the `Libraries` folder.
4. In the `Source Code` folder, create a new folder with the name `js` as it will be the location where we will save all our JavaScript files.

5. Under the `Source Code` folder, create an HTML file and name it `Index.html`. It should be placed at the same level as the `js` folder.
6. Make sure that your folder structure looks like the following screenshot and that you have the right library files inside the `Libraries` folder.



Your `Source Code` folder should look like the following screenshot:



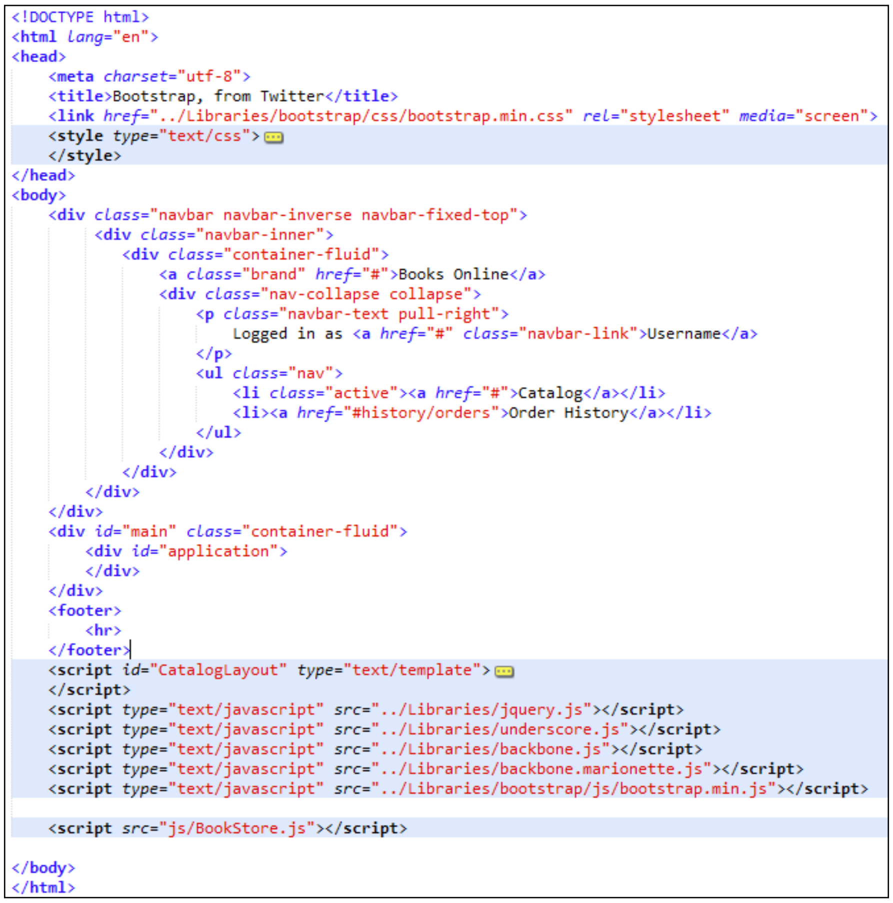
We are building a single-page application and in this section, we are about to build the initial HTML page structure for our application. It is the HTML file that will be rendered by the server the first time a user types the URL of the site.

7. Open the `Index.html` file in your preferred code editor.
8. To avoid the tedious task of writing the HTML file manually for this chapter, we have made it available for you at `http://jsfiddle.net/`. The code is available at `http://jsfiddle.net/rayweb_on/hsrv7/11/`.

`jsfiddle.net`—if you don't know it already, this is an excellent tool to test the small parts of your JavaScript code and share your snippets with ease.

I'm sure that if you are reading a Marionette book, it is because you have enough experience to put the CSS and JS tags in the right place. So feel free to skip the following steps.

9. Copy the **CSS** section and paste it into the `<head>` section of the HTML file.
10. Copy the **HTML** section and paste it into the `<body>` section of the HTML file.
11. At `http://jsfiddle.net/`, the scripts are already included for you. But in our local environment, we have to add them. We will do it just at the bottom of the `<html>` tag, but still inside the `<body>` tag.
12. When you are done with copying the initial structure, your HTML file should look like the following screenshot (the style script and the template script are collapsed in the screenshot). In this chapter, we will be using the console of your browser and we won't be interacting with the HTML file for now, but it's important that your `Index.html` file follows the structure shown in the following screenshot:



```
<!DOCTYPE html>
<html lang="en">
<head>
    <meta charset="utf-8">
    <title>Bootstrap, from Twitter</title>
    <link href="../Libraries/bootstrap/css/bootstrap.min.css" rel="stylesheet" media="screen">
    <style type="text/css">
    </style>
</head>
<body>
    <div class="navbar navbar-inverse navbar-fixed-top">
        <div class="navbar-inner">
            <div class="container-fluid">
                <a class="brand" href="#">Books Online</a>
                <div class="nav-collapse collapse">
                    <p class="navbar-text pull-right">
                        Logged in as <a href="#" class="navbar-link">Username</a>
                    </p>
                    <ul class="nav">
                        <li class="active"><a href="#">Catalog</a></li>
                        <li><a href="#history/orders">Order History</a></li>
                    </ul>
                </div>
            </div>
        </div>
    </div>
    <div id="main" class="container-fluid">
        <div id="application">
        </div>
    </div>
    <footer>
        <hr>
    </footer>
    <script id="CatalogLayout" type="text/template">
    </script>
    <script type="text/javascript" src="../Libraries/jquery.js"></script>
    <script type="text/javascript" src="../Libraries/underscore.js"></script>
    <script type="text/javascript" src="../Libraries/backbone.js"></script>
    <script type="text/javascript" src="../Libraries/backbone.marionette.js"></script>
    <script type="text/javascript" src="../Libraries/bootstrap/js/bootstrap.min.js"></script>

    <script src="js/BookStore.js"></script>

</body>
</html>
```

Bootstrap and styling your page is outside the scope of this book. But it's a pretty convenient library that allows us to set up a decent looking HTML file for this demo application.

But wait a minute…what does the last script `js/BookStore.js` refer to? Well, that's the JavaScript code that we will be creating in the next step.

The Backbone.Marionette.Application object

Create a new file inside the `js` folder and name it `BookStore.js`. To create a new application, we just need to type the following line in `Bookstore.js`:

```
var bookStoreApp = new Backbone.Marionette.Application();
```

We will name the application `BookStoreApp` and will start attaching our Backbone pieces to this application. But, we already mentioned that Marionette brings the concept of an application object and, from the documentation, we also know that it is an object that will help us to coordinate the pieces of our application. You may ask, what pieces; for example, a `Marionette.Router` object and a `Marionette.Controller` object.

Backbone already has a router!

Yes, Backbone already has a router object. Then what does the `Marionette.Router` object do differently? Well, the new router adds the ability of reducing your router to just a small file that will contain only the routes of your application and not the methods that will respond and take action once a route is matched. These methods belong to a controller—another new concept that Marionette adds to Backbone.

Let's build a `Marionette.Router` object and a `Marionette.Controller` object to get a better understanding of them:

```
var BookStoreController = Backbone.Marionette.Controller.extend({
  displayBooks : function (){
    console.log("I will display books...");
  }
});
var BookStoreRouter = Backbone.Marionette.AppRouter.extend({
  controller :  BookStoreController,
  appRoutes: {
    "": "displayBooks"
  }
});
```

In the preceding code snippet, we created the `BookStoreController` object, which is just a JavaScript object containing the functions that will match the name of the methods defined in the router. In this case, the empty router will call the `displayBooks` method or the controller. This separation of concerns will allow us to have a cleaner code base as the router will only know about the routes. We declare which controller will handle the routes by setting the controller property of the router to `BookStoreController`. The rest of the code snippet is just the declaration of the routes.

It is not mandatory to have a router in order to use a controller. The Marionette controllers can be instantiated without the need of a router. You may not handle the interaction of your site by changes in the URL but by events. In this case, the controller still adds value as it can be the container of your views.

It's recommended to have small routers and controllers divided as per the purpose of your application instead of a giant single-router file that will contain all the routes and the functions.

While these two pieces are part of the application's foundation, we still need to make them work within it. But, we also need to do a little more in order to achieve a functional application. Let's take small steps for this. Let's first check out whether we can see a message log in the console of our browser.

To do that, we need to put all the code together and add the missing pieces in order to make it work.

So far, we have only defined the application, controller, and router. But where should we instantiate them? The `Backbone.Marionette.Application` object offers the possibility to add initializer methods that will run when we start our application.

Yes, you read correctly! You can add as many methods as you need in case you want to keep the logic of this initializers separated.

Inside this initializer method, we will instantiate the router and the controller, and just for fun, add another log message to see the order of execution.

Use the following code to do this:

```
BookStoreApp.addInitializer(function () {
  var bookStoreController = new BookStoreController({
    var bookStoreRouter = new
      BookStoreRouter({controller:controller});
  console.log('Message from the addInitializer Method');
..});
})
```

Another useful function of the applications is the events that fire the `initialize:before`, `initialize:after`, and `start` functions. The names of these functions are quite descriptive. As the name suggests, the `initialize:before` function will be executed before the initializers, the `initialize:after` function will be executed after the initializers, and the `start` function is responsible for starting the application and thereafter starting the initializers.

In our application, we will use `initialize:after`. This function will be helpful for us, as the last thing we want to do once we instantiate the router is start `Backbone.history`.

```
BookStoreApp.on('initialize:after', function () {
  if (Backbone.history) {
    Backbone.history.start();
  }
  console.log('Mesagge from initialize:after method');
});
```

The last step to complete the infrastructure or foundation of our application is call the following function:

```
BookStoreApp.start();
```

Now, let's put all the code snippets together as follows:

```
var BookStoreApp = new Backbone.Marionette.Application();
var BookStoreController = Backbone.Marionette.Controller.extend({
  displayBooks : function (){
    console.log("I will display books...");
  }
});
var BookStoreRouter = Backbone.Marionette.AppRouter.extend({
  controller :  BookStoreController,
  appRoutes: {
    "": "displayBooks"
  }
});
BookStoreApp.addInitializer(function () {
  var controller = new BookStoreController();
  var router = new BookStoreRouter({controller:controller});
  console.log("hello from the addInitializer.");
});
BookStoreApp.on('initialize:after', function () {
  if (Backbone.history) {
    Backbone.history.start();}
  console.log("hello from the initialize:after.");
});
BookStoreApp.start();
```

Downloading the example code

You can download the example code files for all Packt books you have purchased from your account at `http://www.packtpub.com`. If you purchased this book elsewhere, you can visit `http://www.packtpub.com/support` and register to have the files e-mailed directly to you.

Now, you can go ahead and open the `Index.html` file in your browser and see the results on the console.

Summary

In this chapter, we learned about the application, controller, and router functionality, and how to get them working together to get a simple application skeleton which will be the base for our book store application.

In the next chapter, we will familiarize ourselves with the different views that Marionette adds to the Backbone development.

3
Marionette View Types and Their Use

In the previous chapter, we learned about components that help us provide a structure to our application; however, none of these components interacted with the DOM. This responsibility belongs to the views in Backbone development; however, the interaction and manipulation of the DOM can quickly become complicated inside our views. With the intention of having cleaner and meaningful objects to manipulate, the DOM Marionette introduces a powerful set of views. The following is a description of each one of those views provided in the official documentation at `https://github.com/marionettejs/backbone.marionette`:

- `Marionette.ItemView`: This is the view that renders a single model
- `Marionette.CollectionView`: This is the view that iterates over a collection and renders the individual `ItemView` instances for each model
- `Marionette.CompositeView`: This is the collection view and item view for rendering leaf-branch/composite model hierarchies
- `Marionette.Layout`: This is the view that renders a layout and creates region managers to manage areas within it
- `Marionette.View`: This is the base view type that other Marionette views extend from (not intended to be used directly)

In this chapter, we will learn the intention behind each one of them and how to start using them.

Marionette.View and Marionette.ItemView

The `Marionette.View` extends the `Backbone.View`, and it's important to remember this, because all the knowledge that we already have on creating a view will be useful while working with these new set of views of Marionette.

Each of them aims to provide a specific out of the box functionality so that you spend less time focusing on the glue code needed to make things work, and more time on things that are related to the needs of your application. This allows you to focus all your attention on the specific logic of your application.

We will start by describing the `Marionette.View` part of Marionette, as all of the other views extend from it; the reason we do this is because this view provides a very useful functionality. But it's important to notice that this view is not intended to be used directly. As it is the base view from which all the other views inherit from, it is an excellent place to contain some of the glue code that we just talked about.

A good example of that functionality is the `close` method, which will be responsible for removing `.el` from DOM. This method will also take care of calling unbind to all your events, thus avoiding the problem called Zombie views. This an issue that you can have if you don't do this carefully in a regular Backbone view, where new instantiations of previously closed fire events are present. These events remain bound to the HTML elements used in the view. These are now present again in the DOM now that the view has been re-rendered, and during the recreation of the view, new event listeners are attached to these HTML elements.

From the documentation of the `Marionette.View`, we exactly know what the `close` method does.

- It calls an `onBeforeClose` event on the view, if one is provided
- It calls an `onClose` event on the view, if one is provided
- It unbinds all custom view events
- It unbinds all DOM events
- It removes `this.el` from the DOM
- It unbinds all `listenTo` events

The link to the official documentation of the `Marionette.View` object is `https://github.com/marionettejs/backbone.marionette/blob/master/docs/marionette.view.md`.

It's important to mention that the third point, *unbind all custom view events*, will unbind events created using the `modelEvents` hash, those created on the events hash, and events created via `this.listenTo`.

As the `close` method is already provided and implemented, you don't need to perform the unbind and remove previously listed tasks. While most of the time this would be enough, at times, one of your views will need you to perform extra work in order to properly close it; in this case, two events will be fired at the same time to close a view.

The event `onBeforeClose`, as the name indicates, will be fired just before the `close` method. It will call a function of the same name, `onBeforeClose`, where we can add the code that needs to be executed at this point.

```
function : onBeforeClose () {
  //  code to be run before closing the view
}
```

The second event will be `onClose`, which will be fired after the `close` method so that the `.el` of the view won't be present anymore and all the unbind tasks will have been performed.

```
 function : onClose () {
  //  code to be run after closing the view
 }
```

One of the core ideas behind Marionette is to reduce the boilerplate code that you have to write when building apps with Backbone. A perfect example of which is the `render` method that you have to implement in every Backbone view, and the code there is pretty much the same in each of your views. Load the template with the underscore `_.template` function and then pass the model converted to JSON to the template.

The following is an example of repetitive code needed to render a view in Backbone:

```
render : function () {
  var template = $( '#mytemplate' ).html();
  var templateFunction = _.template( template );
  var modelToJSON = this.model.toJSON();
  var result = templateFunction(modelToJSON);
  var myElement = $( '#MyElement' );
  myElement.html( result );
}
```

As Marionette defining a `render` function is no longer required, just like the `close` method, the preceding code will be called for you behind the scenes. In order to render a view, we just need to declare it with a template property set.

```
var SampleView = Backbone.Marionette.ItemView.extend({
  template : '#sample-template'
});
```

Next, we just create a Backbone model, and we pass it to the `ItemView` constructor.

```
var SampleModel = Backbone.Model.extend({
  defaults : {
    value1 : "A random Value",
    value2 : "Another Random Value"
  }
})
var sampleModel = new SampleModel();
var sampleView = new SampleView({model:sampleModel);
```

And then the only thing left is to call the `render` function.

```
sampleView.render();
```

> If you want to see it running, please go through this JSFiddle that illustrates the previous code:
>
> `http://jsfiddle.net/rayweb_on/VS9hA/`

One thing to note is that we just needed one line to specify the template, and Marionette did the rest by rendering our view with the specified template. Notice that in this example, we used the `ItemView` constructor; we should not use `Marionette.View` directly, as it does not have many functionalities of its own. It just serves as the base for other views.

So some of the following examples of the functionalities provided by `Marionette.View` will be demonstrated using `ItemView`, as this view inherits all of these functionalities through extension.

As we saw in the previous example, `ItemView` works perfectly for rendering a single model using a template, but what about rendering a collection of models?

If you just need to render, for example, a list of books or categories, you still can use `ItemView`. To accomplish this, the template that you would assign to `ItemView` must know how to handle the creation of the DOM to properly display that list of items.

Let's render a list of books.

The Backbone model will have two properties: the book name and the book ID. We just want to create a list of links using the book name as the value to be displayed; the ID of the book will be used to create a link to see the specific book.

First, let's create the book Backbone model for this example and its collection:

```
var BookModel = Backbone.Model.extend({
  defaults : {
    id : "1",
    name : "First",
  }
});

var BookCollection = Backbone.Collection.extend({
  model : BookModel
});
```

Now let's instantiate the collection and add three models to it:

```
var bookModel = new BookModel();
var bookModel2 = new BookModel({id:"2",name:"second"});
var bookModel3 = new BookModel({id:"3",name:"third"});
var bookCollection = new BookCollection();
bookCollection.add(bookModel);
bookCollection.add(bookModel2);
bookCollection.add(bookModel3);
```

In our HTML, let's create the template to be used in this view; the template should look like the following:

```
<script id="books-template" type="text/html">
  <ul>
    <% _.each(items, function(item){ %>
    <li><a href="book/'+<%= item.id %> +"><%= item.name %> </li>
    <% }); %>
  </ul>
</script>
```

Now we could render the book list using the following code snippet:

```
var BookListView = Marionette.ItemView.extend({
  template: "#books-template"
});

var view = new BookListView ({
  collection: bookCollection
});
view.Render();
```

If you want to see it in action, go to the working code in JSFiddle at `http://jsfiddle.net/rayweb_on/8QAgQ/`.

The previous code would produce an unordered list of books with links to the specific book. Again, we gained the benefit of writing very little code once again, as we didn't need to specify the `Render` function, which could be misleading, because the `ItemView` is perfectly capable of rendering a model or a collection. Whether to use `CollectionView` or `ItemView` will depend on what we are trying to accomplish. If we need a set of individual views with its own functionality, `CollectionView` is the right choice, as we will see when we get to the point of reviewing it. But if we just need to render the values of a collection, `ItemView` would be the perfect choice.

Handling events in the views

To keep track of model events or collection events, we must write the following code snippet on a regular Backbone view:

```
this.listenTo(this.model, "change:title", this.titleChanged);
this.listenTo(this.collection, "add", this.collectionChanged);
```

To start these events, we use the following handler functions:

```
titleChanged: function(model, value){alert("changed");},
collectionChanged: function(model, value){alert("added");},
```

This still works fine in Marionette, but we can accomplish the same thing by declaring these events using the following configuration hash:

```
modelEvents: {
  "change:title": "titleChanged"
},
collectionEvents: {
  "add": "collectionChanged"
},
```

This will give us exactly the same result, but the configuration hash is very convenient as we can keep adding events to our model or collection, and the code is cleaner and very easy to follow.

The `modelEvents` and `collectionEvents` are not the only configuration hash sets that we have available in each one of the Marionette views; the UI configuration hash is also available. It may be the case that one of the DOM elements on your view will be used many times to read its value, and doing this using jQuery can not be optimal in terms of performance. Also, we would have the jQuery reference in several places, repeating ourselves and making our code less DRY.

Inside a Backbone view, we can define a set of events that will be fired once an action is taken in the DOM; for instance, we pass the function that we want to handle in this event at the click of a button.

```
events : {
  "click #button2" : "updateValue"
},
```

This will invoke the `updateValue` function once we click on `button2`. This works fine, but what about calling a method that is not inside the view?

To accomplish this, Marionette provides the `triggers` functionality that will fire events which can be listened to outside of your view. To declare a `trigger`, we can use the same syntax used in the `events` object as follows:

```
triggers : { "click #button1": "trigger:alert"},
```

And then, we can listen to that event somewhere else using the following code:

```
sampleView.on("trigger:alert", function(args){
  alert(args.model.get("value2"));
});
```

In the previous code, we used the model to alert and display the value of the property, `value2`.

The `args` parameter received by the function will contain objects that you can use:

- The view that fired the trigger
- The Backbone model or collection of that view

UI and templates

While working with a view, you will need a reference to a particular HTML element through jQuery in more than one place in your view. This means you will make a reference to a button during initialization and in few other methods of the view. To avoid having the jQuery selector duplicated on each of these methods, you can map that UI element in a hash so that the selector is preserved. If you need to change it, the change will be done in a single place.

To create this mapping of UI elements, we need to add the following declaration:

```
ui: {
  quantity: "#quantity"
  saveButton : "#Save"
},
```

And to make use of these mapper UI elements, we just need to refer them inside any function by the name given in the configuration.

```
validateQuantity: function() {
  if (this.ui.quantity.val() > 0 {
    this.ui.saveButton.addClass('active');
  }
}
```

There will be times when you need to pass a different template to your view. To do this in Marionette, we remove the template declaration and instead add a function called `getTemplate`.

The following code snippet would illustrate the use of this function:

```
getTemplate: function(){
  if (this.model.get("foo"){
    return "#sample-template";
  }else {
    return "#a-different-template";
  }
},
```

In this case, we check the existence of the property `foo`; if it's not present, we use a different template and that will be it. You don't need to specify the `render` function because it will work the same way as declaring a template variable as seen in one of the previous examples.

If you want to learn more about all the concepts that we have discussed so far, please refer to the JSFiddle link `http://jsfiddle.net/rayweb_on/NaHQS/`.

If you find yourself needing to make calculations involving a complicated process while rendering a value, you can make use of `templeteHelpers` that are functions contained in an object called `templateHelpers`. Let's look at an example that will illustrate its use better.

Suppose we need to show the value of a book but are offering a discount that we need to calculate, use the following code:

```
var PriceView = Backbone.Marionette.ItemView.extend({
  template: "#price-template",
  templateHelpers: {
    calculatePrice: function(){
    // logic to calculate the price goes here
```

```
        return price;
      }
    }
  });
```

As you can see the in the previous code, we declared an object `literal` that will contain functions that can be called from the templates.

```
<script id="my-template" type="text/html">
  Take this book with you for just : <%= calculatePrice () %>
</script>
```

Marionette.CollectionView

Rendering a list of things like books inside one view is possible, but we want to be able to interact with each item. The solution for this will be to create a view one-by-one with the help of a loop. But Marionette solves this in a very elegant way by introducing the concept of `CollectionView` that will render a child view for each of the elements that we have in the collection we want to display.

A good example to put into practice could be to list the books by category and create a Collection view. This is incredible easy.

First, you need to define how each of your items should be displayed; this means how each item will be transformed in a view.

For our categories example, we want each item to be a list `<li>` element and part of our collection; the `<ul>` list will contain each category view.

We first declare `ItemView` as follows:

```
var CategoryView = Backbone.Marionette.ItemView.extend({
        tagName : 'li',
        template: "#categoryTemplate",
});
```

Then we declare `CollectionView`, which specifies the view item to use.

```
var CategoriesView = Backbone.Marionette.CollectionView.extend({
        tagName : 'ul',
        className : 'unstyled',
        itemView: CategoryView
});
```

A good thing to notice is that even when we are using Marionette views, we are still able to use the standard properties that Backbone views offer, such as `tagName` and `ClassName`.

Finally, we create a collection and we instantiate `CollectionView` by passing the collection as a parameter.

```
var categoriesView = new CategoriesView({collection:categories);
categoriesView.render();
```

And that's it. Simple huh?

The advantage of using this view is that it will render a view for each item, and it can have a lot of functionality; we can control all those views in the `CollectionView` that serves as a container.

You can see it in action at `http://jsfiddle.net/rayweb_on/7usdJ/`.

Marionette.CompositeView

The `Marionette.Composite` view offers the possibility of not only rendering a model or collection models, but also the possibility of rendering both a model and a collection. That's why this view fits perfectly in our BookStore website. We will be adding single items to the shopping cart, books in this case, and we will be storing these books in a collection. But we need to calculate the subtotal of the order, show the calculated tax, and an order total; all of these properties will be part of our `totals` model that we will be displaying along with the ordered books.

But there is a problem. What should we display in the order region when there are no items added? Well, in the `CompositeView` and the `CollectionView`, we can set an `emptyView` property, which will be a view to show in case there are no models in the collection. Once we add a model, we can then render the item and the `totals` model.

Perhaps at this point, you may think that you lost control over your render functionality, and there will be cases where you need to do things to modify your HTML. Well, in that scenario, you should use the `onRender()` function, which is a very helpful method that will allow you to manipulate the DOM just after your `render` method was called.

Finally, we would like to set a template with some headers. These headers are not part of an `ItemView`, so how can we display it?

Let's have a look at part of the code snippet that explains how each part solves our needs.

```
var OrderListView = Backbone.Marionette.CompositeView.extend({
        tagName: "table",
        template: "#orderGrid",
        itemView: CartApp.OrderItemView,
        emptyView: CartApp.EmptyOrderView,
        className: "table table-hover table-condensed",

        appendHtml: function (collectionView, itemView) {
            collectionView.$("tbody").append(itemView.el);
        },
```

So far we defined the view and set the template; the `Itemview` and `EmptyView` properties will be used to render our view.

The `onBeforeRender` is a function that will be called, as the name indicates, before the `render` method; this function will allow us to calculate the totals that will be displayed in the `total` model.

```
    onBeforeRender: function () {
        var subtotal = this.collection.getTotal();
        var tax = subtotal * .08;
        var total = subtotal + tax;
        this.model.set({ subtotal: subtotal });
        this.model.set({ tax: tax });
        this.model.set({ total: total });
    },
```

The `onRender` method is used here to check whether there are no models in the collection (that is, the user hasn't added a book to the shopping cart). If not, we should not display the header and footer regions of the view.

```
    onRender: function () {
        if (this.collection.length > 0) {
            this.$('thead').removeClass('hide');
            this.$('tfoot').removeClass('hide');
        }
    },
```

As we can see, Marionette does a great job offering functions that can remove a lot of boilerplate code and also give us full control over what is being rendered.

Building the layout of our application with Marionette.Layout

The final view that we need to review is the `Marionette.Layout` view. This view is the combination of `Itemview` and `Region`; we haven't reviewed the `Marionette.Region` component, but for now, it's enough to say that it's a component that will be in charge of rendering a view on its `el`.

So the layout works as an `ItemView` because it requires a template to render itself. This template can be your initial HTML divided by logical regions, such as the navigation region that will contain a view which will display the navigation section of your site, the footer view that should be displayed at the footer region, and so on. You can start by rendering your layout and then rendering the view properly on each of the regions.

Let's create the `Marionette.Layout` view.

```
varCatalogLayout = Backbone.Marionette.Layout.extend({
        template: "#CatalogLayout",
        regions: {
            categories : '#categories',
            products : '#products',
            order : '#order',
            book: '#book'
        }
    });
```

In the HTML that you copied in *Chapter 2*, *Our First Application*, you will find the corresponding `<div>` tags with the IDs of the regions.

In this view, we specified the script/template that the view will use to render. This specified template was added to the initial HTML, and inside it were `<div>` tags that will serve as regions. Each of the regions is given a name that makes sense with the view that it will be displaying, and we used an object `literal` to define the regions.

The `Layout` view inherits the same functionality as for all the other views, so in case you want to listen to events, you can do it just like in any other view.

To render this initial layout, we just need to instantiate it and render it as any other view.

```
var catalogLayout = new CatalogLayout();
catalogLaout.render();
```

You can still add and remove regions to your layout at runtime by calling the `addRegion` and `removeRegion` methods.

```
layout.addRegion("footer", "#footer");
layout.removeRegion("footer ");
```

To add multiple regions, the `Layout` view provides an `addRegions` method that receives an object `literal` with the regions to be added.

```
layout.addRegions({
  favoriteBooks: "#favoritebooks",
  bestRated: "#best"
});
```

The behavior of the `Close` function on this view will be a little different as it will call `close` on all of the regions. These regions will then call close on the views that they contain, making sure all of the views contained are closed properly.

A good way to start your application is to define a `Body` region; this region will then contain the application `Layout` that will contain all of the logical regions of the application. Maybe you need to display a sublayout in one of these regions, which is perfectly fine. There is no limit of nested layouts; use them as your application requires.

Extending Marionette views

A common need while working with Backbone and Marionette and in pretty much every language is to re-use code as much as possible. If you want all your views to behave in a certain way, you can achieve it by extending your Marionette views. In the following example, we will add a `log` method to all the item views by extending the `Marionette.ItemView`.

```
var HandyView = Backbone.Marionette.ItemView.extend({
  initialize:function(){
  Backbone.Marionette.ItemView.prototype.initialize.apply
    (this,arguments);
  },
  logMessage : function (message){
    console.log(message);
  }
});
```

Now you just need to start using your `HandyView` in order to get the benefit of the `logMessage` function.

```
var BookView = HandyView.extend({
alertMessage : function () {
  alert(message);
}
});

var bookView = new BookView();
bookView.logMessage("Hi");
bookView.alertMessage("Bye");
```

The idea here is to let you know that you can extend Marionette views just like you can extend Backbone views, and take advantage of the benefits of inheritance.

Summary

In this chapter, we got to learn about all the kinds of views that Marionette offers, when to use them, how to advantageously make use of its handy methods that will allow us to manage the DOM creation and interaction better, and finally how to extend them.

In the next chapter, we will learn about how to manage a set of views with the help of the `Regions`, `RegionManager`, and `BabySitter` objects of Marionette.

4
Managing Views

As we learned in *Chapter 3, Marionette View Types and Their Use*, `Marionette.js` views provide us with a lot of functionality to render data with the benefit of having to write very little code in exchange. In this chapter, we are going to discover what a `Region` in Marionette is and what `RegionManager` and `BabySitter` objects are. All of them are intended to help us manage views in an easier way.

We will also get to know a handy object while rendering templates in your application: the `Renderer` object. After that, we will have a short summary of what we have learned through the first four chapters.

We will cover the following topics in this chapter:

- `Marionette.Region`
- `Marionette.RegionManager`
- `Marionette.BabySitter`
- `Marionette.Renderer`
- Improving the application's performance with `Marionette.TemplateCache`

All of these are very helpful objects that will help us to manage our Marionette views with ease, keeping in mind performance and reuse.

Understanding the Marionette.Region object

While building an application, we need to separate the screen into small, logical pieces such as header, footer, navigation, and content area. These are common parts that are present in most applications. Usually your navigation options can change depending on the user. The header may also be different based on your user profile, and of course, your content area is going to be busy showing different views—views that need to be rendered to perform an action and closed in order to show a new view with perhaps some results or the next logical steps in your application. That's why we should think of the footer or content parts of your application as regions within your application, where we will be swapping different views.

The following code exemplifies one of the ways to create a `Marionette.Region` object:

```
var FooterRegion = new Backbone.Marionette.Region({
  el: "#footer"
});
```

To define a region, we just need to specify an element in DOM that will serve as a container of the views on your logical section of the application. In this case, the `#footer` is a DIV element, but it can be any HTML element as long as appending a view inside of it generates a valid HTML.

The idea behind a region is to use it as a container of views in your application one at a time. It will be in charge of calling the `render` function of the specified view when we call the method `.show` of the region. It will call the close method of the current view and remove it from the DOM when we call the method `.close` of the region.

The following is the code needed to use a region in order to render a view:

```
// definition of a view to be shown in the region
var footerView = new FooterView();

//the Region will show the footerview in its DOM element
//in this case it will render the footer view inside the #footer
  element in the DOM
FooterRegion.show(footerView);
// the footerView is now rendered

//Finally we can call close on the region and the footer view
  will be removed from the #footer element
FooterRegion.close();
```

As we can see in the preceding code snippet, the `show` method of the region will take the instance of the view to be rendered as a parameter.

Rendering the views and then swapping them for new ones seems trivial at the beginning. We can just call `close` and `render`, right? Then why do we need a region object to do it for us? This is because the region does these things for us and much more, without us having to worry about which view is the current view displayed inside of it. Think of it in this way: you have the content region and you will display a view inside of it. We can replace this view with a new one just by calling the `.show` method and the region will take care of the removal of the first view. So we don't have to call its `close` method, as this is part of the functionality of the `show` method of the region. This means that if there is a view already being displayed in the region, the `close` method of the exiting view will be called by calling `show` and passing a new view, thereby ensuring there is proper removal of its `.el` event bindings.

Let's use a wizard as an example. We have four steps and on each step, we show a view where we will fill some data. On each one of these views, we have links that will guide us to the next step or to the previous step in case we want to modify the data. The links will modify the URL, and it will be the router's responsibility to call the proper step.

For this example, the code that is inside the controller is given as follows:

```
// each view step syncs with the server at the time to
  initialize and close in order to preserve the data
stepOne : function () {
  var stepOneView = new StepOneView();
  content.region.show(stepOneView);
},
stepTwo : function () {
  var stepTwoView = new StepTwoView();
  content.region.show(stepTwoView);
}
stepThree : function () {
  ar stepThreeView = new StepThreeView();
  content.region.show(stepThreeView);
}
finalStep : function () {
  var finalStepView = new FinalStepView();
  content.region.show(finalStepView);
}
```

From the preceding code, we can see the benefits of using a region to render views. If the user clicks on the second step and decides to go back, we don't need to check whether the instance of the `stepTwoView` method is in memory and close it in order to render the `stepOneView` method, as this will be handled by the region.

There will be occasions where it will be impossible to track which view is present in a region, and in most of those cases, we don't care. We just need to render a new view on this area without having to worry about whether the previous view is being removed in a proper way.

Another way to declare a region is by attaching it directly to a Marionette application, as follows:

```
BookStoreApp = new Backbone.Marionette.Application();
BookStoreApp.addRegions({
  contentRegion: "#mainContent",
});
```

In this case, we used the `.addRegions` method of the application object that is expecting an object literal with the names of the regions and the DOM element to be used.

To use these new regions, we just need to call them by the name given in the object literal, which is used for this configuration as follows:

```
BookStoreApp.contentRegion.show(stepOneView);
```

In *Chapter 3, Marionette View Types and Their Use*, we defined a layout. The layout view of Marionette serves as a container of regions or as a container of containers. The layout will render a template with the skeleton of your HTML. Inside this skeleton, we will put the DIV element or elements that will serve as regions, and once this layout is rendered, we can use its region to display views.

So lets review the code as follows:

```
CatalogLayout = Backbone.Marionette.Layout.extend({
  template: "#CatalogLayout",
  regions: {
    categoriesRegion : '#categories',
    productsRegion : '#products',
    orderRegion : '#order',
    bookRegion: '#book'
  }
});
```

In the layout declaration, we defined a template and the regions object literal, giving names to the regions and matching those with the DOM elements.

For this `BookStoreApp`, we will create `mainRegion`. The responsibility of this region is to render the layout view of the application. The layout view will contain the initial HTML file and the logical regions of the application, regions that will show the proper views. The following code exemplifies the creation of the application object, the layout view, and the rendering of views inside the regions of the layout:

```
BookStoreApp = new Backbone.Marionette.Application();
BookStoreApp.addRegions({
  mainRegion: "#mainContent",
});
CatalogLayout = Backbone.Marionette.Layout.extend({
  template: "#CatalogLayout",
  regions: {
    categoriesRegion : '#categories',
    productsRegion : '#products',
    orderRegion : '#order',
    bookRegion: '#book'
  }
});
var catalogLayput  = new CatalogLayout();
BookStoreApp.mainRegion.show(catalogLayput );

catalogLayput.categoriesRegion.show(new CategoriesView());
catalogLayput.productsRegion.show(new ProductsView());
```

With the help of the layout and the regions, we can create a logical segmentation of the screen that will allow us to render views on each region. Using meaningful names for these regions will definitely help, as we just need to pass the right view to the region and stop worrying about the glue code needed for rendering and cleanup.

A region will raise the following two events while rendering a view that will help us to perform an extra manipulation to the DOM:

- `"show"/onShow`: This event is called on the view instance when the view has been rendered and displayed
- `"show"/onShow`: This event is called on the region instance when the view has been rendered and displayed

Finally, while closing a view, the following method will be raised that can be used to perform one of the final tasks such as notifying the user with a friendly message:

- `"close"/onClose`: This method is called when the view has been closed

You can subscribe to these events as usual with the `.on` method declaration as follows:

```
BookStoreApp.mainRegion.on("show", function(view){
  // extra functionality needed to be added once the view is
    rendered
});
```

The following code exemplifies how to subscribe to the `close` method:

```
BookStoreApp.mainRegion.on("close", function(view){
  // code to notify that the view as been removed
});
```

Using the Marionette.RegionManager object

Using regions helps to manage views in a very elegant way. But that may not be enough for some applications, which can have dozens of regions that need to be added and removed during the lifetime of the application. To accomplish this management, we can take advantage of the `RegionManager` object of Marionette, which will serve as a container for regions.

Having your regions in this container can help us to accomplish almost the same actions, which we could accomplish with a `Backbone.Collection` object, with the help of underscore methods such as `each`, `map`, `invoke`, `contains`, and `toArray`.

The following syntax can help us to declare `Marionette.RegionManager`:

```
var regionManager = new Marionette.RegionManager();
```

The following syntax demonstrates how to add a region to `regionManager`. The `addRegion` method takes two parameters. The first one will be the ID or alias of the region, and the second one will be the DOM element to be used.

```
regionManager.addRegion("math", "#math");
```

If we want to add multiple regions, we need to use the `addRegions` method and pass an object literal to this method with names and IDs as parameters.

```
regionManager.addRegions({
  art: "#art",
  music: "#music",
  science: "#science"
});
```

We can make use of the `removeRegion` method to remove the region from `regionManager` and also to close the region, which will call `close` on the contained view, thereby removing this view from the application.

```
regionManager.removeRegion("math");
```

To remove all the regions, we can use the `removeRegions` method as shown in the following code:

```
regionManager.removeRegions();
```

We can continue adding more regions to this container. But let's now create a `RegionManager` object for a category that will contain regions for subcategories; each region will show a `CollectionView` object with books of the same subcategory. So we display a `CollectionView` object inside a region with the same name.

The idea is that the user wants to view books of his favorite category and also wants to add more subcategories to the screen to be rendered. For instance, in the History category, we can have an option to view books from modern history, Rome, universal history, World War II, and many more subcategories.

```
var historyManager = new Marionette.RegionManager();
historyManager.addRegions({
  wwIIRegion: "#wwII",
  romeRegion: "#rome",
  modernRegion: "#modern",
  unitedStatesHistoryRegion : "#us"
});
```

And then just render the proper view on each region as follows:

```
historyManager.modernRegion.show(new BooksView({collection :
  modern}));
historyManager.wwIIRegion.show(new BooksView({collection
  :wwIIBooks}));
```

If at some point, the user switches to another category and no longer wants to see the History category, calling `removeRegions` will cascade to the view level, thereby removing all the views in a safe way for us.

Using the Backbone.BabySitter object

With the value that they provide, two objects made its way out of the Marionette library and can be used individually by including them in your scripts or using the blended version of Marionette. One is the `Backbone.Wreqr.EventAggregator` object and the other is the `Backbone.BabySitter` object, which is the one that we are about to discuss.

This object helps us to keep track of views and to manage them. These views can be contained within another view or another object that needs to keep track of these views.

The `BabySitter` object can be used to contain views instead of regions. The responsibility of `RegionManager` is to contain and perform actions on regions within your application. The `BabySitter` object has the same responsibility, but in this case, it helps us to manage related views.

The following code is an example of an instantiation of a BabySitter object:

```
container = new Backbone.ChildViewContainer();
```

You can start adding and removing views to this container as it is a regular `Backbone.Collection` object; you can do this by using the add and remove functions.

```
container.add(someView);
container.add(anotherView);
container.remove(someView);
```

The container offers a lot of useful methods such as length, which will return the number of views that the container is keeping track of.

```
var numberofViews  =container.length
```

As we have mentioned earlier, the container exposes several functions of the underscore collection functions, such as `each`, `map`, `find`, `select`, `filter`, `all`, `some`, and `toArray`.

To demonstrate that we can call a method of each one of the views inside the container, we just need to write the following code:

```
container.each(function(view){
  view.changeColor();
});
```

The responsibility of the preceding function is to iterate all the views in the container and call a function inside this view,in this case, the `changeColor` function of each view.

We have created a JSFiddle that demonstrates the use of the `BabySitter` object. You can find it at `http://jsfiddle.net/rayweb_on/fxzAs/`.

`jsfiddle.net` is a very useful website for sharing small snippets of code, facilitating collaboration between developers.

Taking advantage of the Marionette. Renderer object

As we saw in *Chapter 3, Marionette View Types and Their Use*, Marionette does the great job of removing the repetitive code needed in order to render views. But behind the scenes, what Marionette does is it delegates this task to the `Renderer` object. Its responsibility is to load and compile the template into the `.template` function and to pass the data to be used in order to properly render the model of the view. This means that every view object in Marionette uses the `Renderer` object. This object can also help to render HTML into DOM by just passing a template with the data to be used for this purpose.

Let's say that for some reason we need to append HTML into our view, but we don't want to call the render of the view that we are working with. In such a case, we can use the `Marionette.Renderer` object.

```
callRenderer : function () {
  var template = "#sample-template2";
  var data = {foo: "I was appended with Marionette Renderer"};
  var html = Backbone.Marionette.Renderer.render(template, data);
  this.$el.append(html);
}
```

In the preceding function, we declared a template that is in DOM, then we created an object literal with dummy data, and then we passed these two to the `Renderer` object, which returned an HTML, that we finally appended to the `$el` of our view.

To see this example working, you can go to the `http://jsfiddle.net/rayweb_on/BeMfz/` JSFiddle link.

But perhaps a better use could be to render DOM elements that will serve as containers for the regions.

If we need to render the subcategories, we need the DIVs (`<div id="rome"><div>`) to be available in order to attach the regions and then call `show` to render the views inside these containers (DIV elements).

Improving the performance of the application with TemplateCache

In every application, performance matters. That's why having our templates available in the cache will definitely improve the speed of the rendering process in future calls.

Marionette has an object called `TemplateCache` that is used by the `Renderer` object. This means that all of our templates are stored in this `TemplateCache` object and to start making use of it, we just need to call the `get` method. Internally, this method will confirm whether it already has the template and then return it; alternatively, it will load the template from DOM and will return the template so that we can use it, but it will also keep a reference of it. Hence in the subsequent call, we will get the cached version of our template by using the following code:

```
var template = Backbone.Marionette.TemplateCache.get("#my-
  template");
```

To remove one or more templates from our cache, we need to call the `clear` function as follows:

```
Backbone.Marionette.TemplateCache.clear("#my-template")
```

If we need to delete more than one template, we can pass a list of templates to be deleted or simply call the `clear()` function without parameters to delete all the cached templates as follows:

```
Backbone.Marionette.TemplateCache.clear("#my-template", "#this0-
  template")
```

Alternatively, we can use the following code to do this:

```
Backbone.Marionette.TemplateCache.clear()
```

By default, the Marionette `TemplateCache` works with underscore templates, but to override this, we need to provide our own definition of the `compileTemplate` function.

To be consistent, we will override this function to return handlebars templates.

```
Backbone.Marionette.TemplateCache.prototype.compileTemplate =
  function(rawTemplate) {
  return Handlebars.compile(rawTemplate);
}
```

Handlebars is a very popular template engine and is commonly used as an alternative to underscore templates. You can find out more about it on its website, `http://handlebarsjs.com/`.

As we saw, making use of `TemplateCache` is very easy and the benefits that it provides are definitely its biggest selling point.

Summary

In this chapter, we learned about different objects that Marionette provides to manage views, such as the `Region` and `BabySitter` objects. This management is definitely needed, but it takes a lot of glue code to achieve it. So having it out of the way at the time of building an application is a very good reason to start using these objects.

In the next chapter, we will learn how to modularize our applications into small modules of subapplications in order to keep different functionalities of our website separated from each other, but still working together.

5
Divide and Conquer – Modularizing Everything

After explaining in detail in *Chapter 4*, *Managing Views*, how to implement regions in `Marionette.js` to manage your views, it is time to understand how to deal with complex JavaScript projects and learn how to create a framework that would be extensible in subapplications and should require minimal effort to scale.

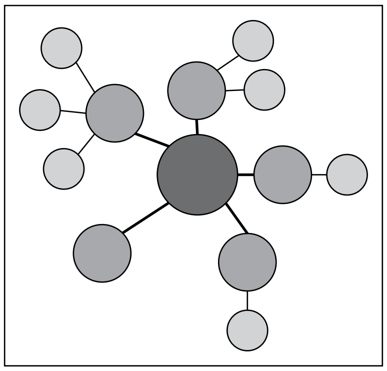
The following list contains the main topics that we will cover in this chapter and that we should consider while building modular and scalable single-page apps using `Marionette.js`:

- Divide and conquer
- Modules
- Subapplications
- Memory management

Applying the divide and conquer principle

Complexity is the enemy of software, and building complex JavaScript applications can easily get out of hand. There are multiple ways to deal with complexity, but the most effective method is by using the principle of divide and conquer.

Directly through its module definition, `Marionette.js` allows us to split our code into smaller and more single responsibility blocks. If we do not break our code into smaller pieces, we will slow down development and make our application difficult to maintain. The easiest starting point to structure the code is the `Marionette.Application`. The application's primary responsibility is to start and stop subapplications and, if necessary, mediate cross subapplication communication. The following image shows how we can start from the application object to modularize our solution in subapplications and modules:



For the **Single-page application** (**SPA**) example that we are building, we probably will not need a lot of subapplications right from the beginning. But it is really important to know how to use this powerful feature that helps to break up an app into smaller and single responsibility units. The subapplication modules are independent parts of our app and they can consist of routers, controllers, models, layouts, and views.

All modules can be loaded on demand, so they do not need to be created from the beginning. For example, we can start them when the subapplication route matches specific patterns.

Modularizing single-page applications

Designing a base architecture for single-page apps is not trivial. SPAs are opposite to traditional web apps that often have full-page reloads. They are dynamic page applications running in one page and usually, require spending some time on designing foundations. They are designed more like desktop apps since we store the application state in the client, but managing it quickly becomes a problem. As we have learned from the divide and conquer principle, a problem can be divided in several parts, so that each part can be handled independently. Having said that, let's explore how we can implement an application that will load single responsibility subapplications on demand, each of them has the ability to stop and start modules.

Getting started with modules

"Beauty of style and harmony and grace and good rhythm depends on simplicity."
– Plato

By understanding the concept of divide and conquer, we should agree that the modularization of code is tremendously important. Modules are small, simple, and well-encapsulated packages that have a singular focus with well-defined functions; they can be used in conjunction with other modules to create an entire system. In `Marionette.js`, a module provides a high-level piece of functionality and manages objects that really provide implementation details.

Let's define a module with no functionality to continue with the examples from the book store, where we will create the module that will contain the cart and order history subapplications:

```
var MyApp = new Backbone.Marionette.Application();
var myModule = MyApp.module("MyModule");
```

The modules of `Marionette.js` are loaded and defined after the `app.start()` call and they are fully instantiated objects. As you can see, Marionette's modules hang from our application. Let's now define a real-world module definition:

```
Books.module('HistoryApp', {
  startWithParent: false,
  define:
  function (HistoryApp, App, Backbone, Marionette,$, _) {

  }
});
```

The following is an explanation of the previous code snippet:

- `Books`: This is the main application object.
- `HistoryApp`: This is the name module.
- `startWithParent`: This should be false if we wish to manually start a module instead of having the application start it. We have to tell the module definition not to start with the parent, and that is exactly our scenario since we do not want to start all the subapplications from the beginning. This concept will be explained in detail when we get into the *Working with subapplications* section of this chapter.

An explanation of the function arguments is as follows:

- `App`: This is the application central object that manage the module life cycle
- `Backbone`: This is the reference to the `Backbone` library
- `Marionette`: This is the reference to the `Backbone.Marionette` library
- `$`: This is the reference to the DOM library, jQuery in this case
- `_`: This is a reference to underscore

In addition to the arguments explained, you can pass custom arguments to this function definition. Now we have a very simple module ready to encapsulate some of the functionality required.

Splitting modules into multiple files

Sometimes a module is so long for a single file that we want to split the definition across multiple files. But it is pretty common for the subapplication modules to contain controllers, routers, and views, among others, so we do not want to put them all together in a file. This is made really simple by `Marionette.js` modules, so let's take a look.

The following is an example code from a controller file:

```
Books.module('HistoryApp', function (HistoryApp, App) {
    HistoryApp.Controller = Marionette.Controller.extend({

    });
});
```

An example code from a router file is as follows:

```
Books.module('HistoryApp', {
    startWithParent: false,
    define:
  function (HistoryApp, App, Backbone, Marionette, $, _) {
    var Router = Backbone.Router.extend({

    });
  }
});
```

We have created two files, one for the controller and other for the router, both of them are contained in the same module HistoryApp but located in separated files.

Implementing initializers and finalizers

Modules have initializers and finalizers similar to application objects. Initializers are run when the module is started and finalizers are run when a module is stopped.

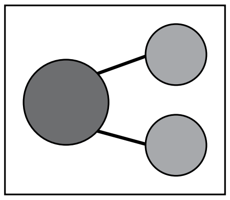
Let's add an initializer and a finalizer to our existing module:

```
Books.module('HistoryApp', function (HistoryApp, App) {
    'use strict';

    HistoryApp.Controller = Marionette.Controller.extend({

});

    HistoryApp.addInitializer(function (args) {
        HistoryApp.controller = new HistoryApp.Controller();
    });

    HistoryApp.addFinalizer(function () {
        if (HistoryApp.controller) {
            HistoryApp.controller.close();
            delete HistoryApp.controller;
        }
    });

});
```

This example shows how we can create definitions inside a module. We added a controller in this case, without actually creating any objects—just the definition—and then we let the initializer start creating the objects and set them up when the module is loaded.

Working with subapplications

Our book's sample app is a single application that can contains several smaller applications, for example, shopping cart and order history. Each of them are independent but managed by the same application and are able to interact with other modules if necessary. The next diagram describes the concept of two subapplications being managed by a central application.



Each subapplication is usually related with a screen from the SPA. They are responsible for doing what is required for screen changes using a controller that starts and stops modules and deals with their communication. They also manage the layout manipulating regions to display or hide views. Take a look at the code related to the diagram.

Let's now explore how to define two subapplications, each of them is also located in different file as we just learned in the previous section.

The following is our first application:

```
Books.module('HistoryApp', function (HistoryApp, App) {
    'use strict';

    HistoryApp.Controller = Marionette.Controller.extend({

    });
});
```

Our second application is as follows:

```
Books.module('CartApp', function (CartApp, App) {
    'use strict';

    CartApp.Controller = Marionette.Controller.extend({

    });
});
```

These applications are managed by the central application (`App`) that is passed as a parameter. Both the modules contain a controller definition as an example.

The next code snippet demonstrates how the main application is capable of starting and stopping subapplications:

```
Books = (function (Backbone, Marionette) {
    'use strict';

    var App = new Marionette.Application();

    App.on('initialize:after', function () {
        if (Backbone.history) {
            Backbone.history.start();
        }
    });

    App.startSubApp = function (appName, args) {
        var currentApp = App.module(appName);
        if (App.currentApp === currentApp) { return; }

        if (App.currentApp) {
            App.currentApp.stop();
        }

        App.currentApp = currentApp;
        currentApp.start(args);
    };

    return App;

})(Backbone, Backbone.Marionette);
```

As we can see, the main application is defined in a self-invoking function. It runs automatically/immediately when we create it, and note that calling the function returns the main `App` object.

The function `startSubApp` is what provides the ability to start and stop a module. This function will be called probably when the user clicks on the button to open the history or when a user navigates directly to this specific route. The next step is to understand how to call this function.

Using the route filter

We have understood how to divide the application into subapplications; however, we still need to decide when and how we will tell the main application that we need to start a specific subapplication. To accomplish that, each module should be associated with a specific router that needs to be active from the beginning. This is different from modules that can be lazy loaded when a route matches. The creator of `Marionette.js` solves this scenario perfectly with his `BBCloneMail` example app that we mentioned before. For that purpose, he included a library called `routefilter.js`. As with any other library, this library is installed by adding the path reference in our project.

Route filter can be found at `https://github.com/boazsender/backbone.routefilter`.

Usually, when we use SPA composed by subapplications, just one subapp is active at the same time, and our example application is not the exception. It is important to mention this in order to understand the next code.

The following code is for the `cart` router:

```
Books.module('CartApp', {
    startWithParent: false,

    define: function (CartApp, App, Backbone, Marionette, $, _) {
        'use strict';

        var Router = Backbone.Router.extend({
            routes: {
                   "(:category)(/:id)": "init"
            },

            before: function () {
                App.startSubApp('CartApp');
            },

            init: function (category,id) {
                //call cart app controller function
            }
        });

        App.addInitializer(function () {
            var router = new Router();
        });
    }
});
```

As we mentioned before, each subapplication generally has a router associated with it. This router will be the point of entrance for that application and will be responsible to lazy load it.

Let's explain what the pieces of the code means. Here, `before` is a function that is defined with the magic of `routefilter.js`. This function is executed before any function that maps the particular route. What it means is that the router will know when we are trying to access the specific subapplication and will start it by calling the function that we visited before, which is located at the main application (`App.startSubApp('CartApp')`). Other pieces that we are already familiar with are the module initializer and the route definition.

So, what if we want to start the history application now? Easy, just create a router associated with that subapplication, define that router, and we are done.

The following code puts this concept into practice:

```
Books.module('HistoryApp', {
    startWithParent: false,
    define:
      function (HistoryApp, App, Backbone, Marionette, $, _) {
        'use strict';

        var Router = Backbone.Router.extend({
            routes: {
                "history/orders": "showHistory",
            },
            before: function () {
                App.startSubApp('HistoryApp');
            },

            showHistory: function () {
                // call history app controller
            }
        });

        App.addInitializer(function () {
            var router = new Router();
        });
    }
});
```

Memory considerations

One of the major challenges in single-page applications is to eliminate the memory leaks. The main problem is that we never do full-page reloads to flush the memory. So, applications need to handle closing subapplications when a new one is put in place to simulate a page load, thus unbinding all the events and objects associated with it.

But, we can still mess up the memory with zombies if we do not clean up references correctly. So like the main application, all subapplications should close old views and this is where Marionette's Region comes in to play. This especially ensures the unbinding of all the events when an object is disposed or when we switch views in a region.

In the case of subapplications, there are multiple ways to clean up the memory. To illustrate this, let's revisit some lines of code from the *Working with subapplications* section. This function is designed to stop and start subapplications as needed. We are using this technique to have just one subapplication running at the same time; once a subapplication is stopped, all its objects and events are disposed.

```
App.startSubApp = function (appName, args) {
    var currentApp = App.module(appName);
```

```
            if (App.currentApp === currentApp) { return; }

            if (App.currentApp) {
                App.currentApp.stop();
            }
            App.currentApp = currentApp;
            currentApp.start(args);
        };
```

In our example, if the application was stopped, the router provides the functionality to call this function to start the subapplication again, if required. The next code is from the *Using the route filter* section of this chapter.

```
        before: function () {
          App.startSubApp('HistoryApp')
        },
```

As an important note, we need to develop discipline to remember that every time we create objects, we should be writing the proper code to remove them, always taking advantage of the `Marionette.js` capabilities.

Summary

By far, the main problem that we have in creating a software is complexity. An easy starting point for a model view structure is provided by `Backbone.js`, but it offers mainly low-level patterns. In the case of a more complex application, we can take advantage of some other frameworks to provide the missing parts on top of `Backbone.js`. For each part of your system, find a way to solve it and combine the solutions of the parts to obtain the solution of the original problem. Always strive for readability and maintainability when you implement your modules, and try to encapsulate behavior and not just state code with no reason.

Modules address the larger scale needs for encapsulation, while controllers, views, routers, and regions address the more detailed aspects of the matter.

Divide and conquer is a principle that has been used for years and is one of the most useful concepts when dealing with large and complex system structures. Keep up with all the best practices that we have learned and try to make them an integral part of your applications. The next step is to learn about messaging with `Marionette.js`.

6
Messaging

The previous chapter suggested an architecture that allows your entire application to be divided into subapplications and modules. Subapplications are just separate parts of your application with functionality that is entirely separate from each other.

The goal when designing your modules and subapplications is to produce an entire system that is integrated but also loosely coupled, and this is where a very well-known technique enters the scene: messaging. The concept of messaging, like the divide and conquer method, has been around for a long time and developers use these types of tools and patterns every day. This pattern tries to provide a way for the components to talk to each other through messages, thus allowing modules to subscribe and publish events on a common message bus.

The topics that will be covered in this chapter are as follows:

- Understanding the event aggregator
- Using the event aggregator of `Marionette.js`
- Making applications more extensive with the event aggregator
- Getting started with `Commands`
- Setting up the `RequestResponse` object

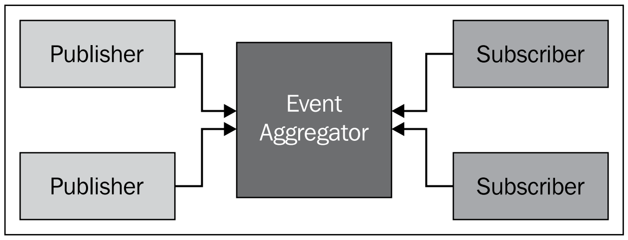
Understanding the event aggregator

According to *Martin Fowler*, an Event Aggregator does the following:

> "*Channels events from multiple objects into a single object to simplify registration for clients.*"

One of the most useful patterns of modular, scalable, and complex JavaScript applications is the event aggregation. The event aggregator functionality is in a container for events that allow publishers and subscribers of these events to have a channel of communication; however, at the same time, it allows them to work independently without the need for code references between them, so they can be updated or removed without affecting the others. Having said that, note how this decoupling is useful in your modularized applications because new subapps and modules can be added to just make use of your current architecture. In our composite application design, the event aggregator is a powerful way to implement communication among `Marionette.js` objects and we will see how we can integrate that in our current code.

The following is a graphical explanation of the event aggregator:



Using the event aggregator of Marionette.js

The Marionette implementation of the event aggregator pattern made its way out of the Marionette core build as it can be found now in a separate distributable file called `backbone.wreqr.js`. This implementation extends from the `backbone.events` object. The following is an example of how to instantiate an event aggregator:

```
var vent = new Backbone.Wreqr.EventAggregator();
```

You can start adding listeners that will react to the events triggered:

```
vent.on("do something", function(){
  console.log("im logging a message");
});
```

Now, you have a listener that will be expecting an event to be triggered.

Let's trigger the `do something` method:

```
vent.trigger("do something");
```

And that's all you need to log the message. Ok, but how can we do this at the application level, the `Marionette. An application` object comes with an instance of the `Backbone.Wreqr.EventAggregator`. So by instantiating a Marionette application object, you can start registering listeners to events without the need of instantiating the `EventAggregator` object.

```
var myApp = new Backbone.Marionette.Application();
```

The following is an example of how to register a listener to an event at the application level:

```
myApp.vent.on("helloWorld", function(){
  alert("Hello World");
});
```

The event publisher can now raise the event anywhere inside the application with the following code:

```
myApp.vent.trigger("helloWorld");
```

As you can see, we don't have to ask the application to do some work. In this case, to show an alert, we should tell the application object that we need to be notified when work will execute `MyApp.vent.trigger("helloWorld ")`, which will display the message.

Making applications more extensive with an event aggregator

To make this pattern easy to understand, we can use the metaphor of the shopping cart app. The user selects an item to be purchased from the book view. The order view needs to be notified when a new product is added in order to display it and calculate the total.

For example, we have multiple ways to complete this functionality and the obvious one is to have the order view reference in the book view, so we can either call methods or raise events. But then, we will have, for example, a much coupled design where you cannot delete the order view without affecting the book view. So now, it is time to bring the event aggregator to our application and solve this problem.

We need a central object that manages the events and the subscribers for those events. For this example, we will use a controller. With this controller and the event aggregator in place, the views will be decoupled from each other. This means that the book view will not contain a reference to the order's view and can be changed without design problems.

The following is the code for adding the controller:

```
var cartApp.Controller = App.Controller.extend({
        initialize: function (options) {
            var self = this;
            App.vent.on("itemAdded", function (model) {
                self.addProduct(model);
            });
        },
        addProduct: function (model) {
        //call orders view
        }
});
```

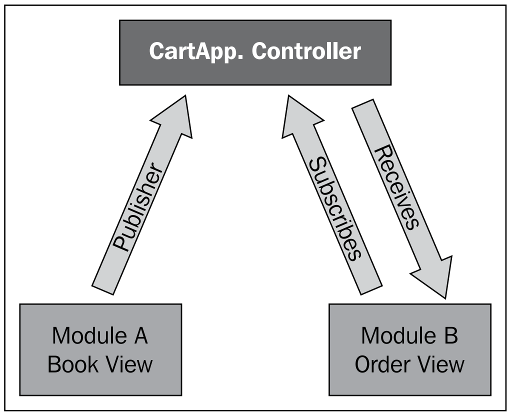
When the controller is initialized, we register the listener for the item added. It's expecting to receive parameters from the publisher event and then call the local function. The next step is to create the view that is raising the event.

The following is the code for adding the view:

```
CartApp.BookItemView = Backbone.Marionette.ItemView.extend({
        template: "#catalogRow",
        tagName: "tr",
        events: {
            'click .btn-primary': 'addItem',
        },

        addItem: function () {
            if (this.$('input').val() > 0) {
               this.model.set({ qty: this.$('input').).).val() });
            App.vent.trigger("itemAdded", this.model);
          }
        },
    });
```

This contains a view with a declared event ; this event is to be called from a button located in the view when the `addItem` function is executed. It also raised the `App.vent.trigger("itemAdded", this.model)` event; this event is going to be handled by the central object, that is, the controller, and call the order view. Pretty easy right? In this way, we do not have the order view reference here that allows both the views to evolve independently.

The following is a graphical explanation of the code that we just explained. As you can see, we have the central object, that is, the controller; it contains listeners that will raise the event to refresh the order view after the button is clicked in the book view. You can also update multiple modules according to your business flow.



This design also allows the controller to have multiple views or modules that listens to the event and responds accordingly. The event aggregator is a powerful pattern with the ability to send messages between modules, allowing applications to be much more decoupled from each other.

Getting started with Commands

While building an application using the plain Backbone, you will just have four components: the model, collection, view, and router. By now, we have reviewed some of the objects that Marionette adds, such as the controller and the application, and of course the different kinds of views. Each of these objects aim to reduce the boilerplate and facilitate the process of structuring your application to accomplish the concerned separation in the code, as not everything belongs to the views or the router. We now know that the controller is a perfect place to orchestrate our views, but what about the code snippets that does not belong to a view? It definitely does not make sense to put that code in the router or in the model as it is meant to be used across all applications; for those scenarios, Marionette has the `Commands` component.

In order to instantiate it, we just need the following line:

```
var commands = new Backbone.Wreqr.Commands();
```

As you can see, it is also part of the `Wreqr` object, so you can use it by itself. Now, we need to set handlers that will perform the actions once you call them through the execute keyword.

```
commands.setHandler("logMessage", function(){
  console.log("Im logging an important message");
});
```

The `setHandler` function takes the name of the command and the function that it will execute.

The following line of code exemplifies the execution of a command using the name of the command as the parameter for the `execute` function:

```
commands.execute("logMessage");
```

And that's all you need to do in order to set a command and execute it. It's good to know that you can pass parameters to these commands in the same way as in the event aggregator.

In the following example, we will pass the message to be logged:

```
var commands = new Backbone.Wreqr.Commands();
commands.setHandler("logMessage", function(message){
  console.log(message);
});
commands.execute("logMessage","I am the message to be logged ");
```

As you can see, the functions receive the message passed on the execute call. This parameter, of course, can be whatever object you need to pass to the handler.

Let's now use a command in the BookStore application that we are building, but we are not going to instantiate the `Wrerq` component because the Marionette application object already has an instance of it. So, you can set the handlers of the commands to the application object.

The following code demonstrates how to set a handler to the application object:

```
var App = new Marionette.Application();

App.commands.setHandler("deleteLocalStorage", function(){
  // code todelete the local storage of the application
});
App.execute("deleteLocalStorage");
```

Note that you can call `App.command.execute` or just `App.execute` plus the name of the command and the result will be the same.

The handler created in the previous code is to delete the stored values in the local storage of the browser to remove old entries from previous visits to the site. This code does not belong to any view or controller because the responsibility of those objects differs from what this code is doing. We consider cleaning the local storage of the browser to prevent old and invalid entries in the code that belong to the application level, and having a command for that is very handy.

We can execute it from any part of the application, but the code is well placed in order to keep your concerns separate. We are sure you will find scenarios in which it makes sense to use commands while using Backbone and Marionette.

Finally, if you want to remove a handler, you can do it using the following code line:

```
App.commands.removeHandler("deleteLocalStorage");
```

For removing all the registered handlers at once, use the instruction `App.commands.removeAllHandlers()`.

Setting up the RequestResponse object

Finally, the last part of the `Wreqr` object is the `RequestResponse`, which in our opinion is definitely a nice addition to the Backbone development. We just saw how we can make different components work together with the help of events in order to communicate each other. We also learned that not all the code belongs to a view or router of the controller, and for those cases, the Marionette commands are definitely a good option in order to keep our concerns separate. Similar to `Commands`, the `RequestResponse` object can help us split more responsibilities of the code in an application.

The `RequestResponse` object conceptually works in the same way as events and `Commands`, where an object fires a call and the other object responds to it. The difference with `Commands` is that, in this case, a response is returned to the caller.

To set up a `RequestResponse` object, we need the following line of code:

```
var reqres = new Backbone.Wreqr.RequestResponse();
```

The setup of a handler is also similar to the commands handler as we can see in the following code snippet:

```
reqres.setHandler("getUserName", function(userId){
  //code to get the user name goes here
  return Username;  ///this will be the response
});
```

In order to get that response value, we need to put in a request as follows:

```
var username = reqres.request("getUserName", userId);
```

In the previous example, we requested a username and the handler, with the name `getUserName`, is just a function that will return that value for us. Also, note that you can pass parameters to this request.

We consider the `RequestResponse` object very useful to separate concerns, get the value from the server, filter those values, and perform a data manipulation task again; these are not responsibilities of the other components of Backbone or of Marionette reviewed so far. Think of `RequestRepsonse` as a service layer that will call the server and return a collection or models in a single place. Instead of doing this at the view level, your views should display the data passed to them. But they will be doing too much by also being in charge of retrieving this data from the server, and what if your API changes? You would need to change that server call in all the views or controllers where you made the calls.

Using the `RequestResponse` object will give you the ability to perform this synchronization with the server in one place and call it from different places, always getting the same return. But above everything, it allows you to decouple your application and keep the responsibility and duties of the other components short and meaningful.

Let's see an example of this, but again, we will use the default instance of `Wreqr`, which is in the application object of Marionette:

```
App.reqres.setHandler("GetBooksByCategory", function(category){
 //code to fetch the books by category goes here.
 return collection;
});
```

Inside the method of a controller, we can call the handler by performing a request and passing the collection to the view, as demonstrated in the following code snippet:

```
var BooksController = Marionette.Controller.extend({

  initialize: function(options){
      this.region = options.region;
  },

  showBooksinCategory: function(category){
   var books = App.request("GetBooksByCategory ", category);
   this.region.show(new CategoryView({collection:books}));
  }
});
```

The benefit of this is that the controller acted as a mediator between the view and the `RequestResponse` object, while the view is responsible for getting the data removed because the controller passes the collection to it.

Summary

In this chapter, we learned how to decouple our application with the help of the `Wreqr` object while splitting the responsibilities between the different subcomponents such as the `event aggregator`, `Commands`, and `RequestRespone`.

In the next chapter, we will learn how to make these components work in single files and keep our file structure organized with the help of `Require.js`.

7 Changing and Growing

In the previous chapter, we explored various functions that could be combined to produce a system that is fully integrated, but loosely coupled. In this chapter, we will cover some external pieces of Marionette that are very valuable, and as we progress, you will discover how to change some default features of the framework and combine `Marionette.js` with external libraries to make your application perform better. Here is a list of the topics that we will cover:

- Using **Asynchronous Module Definitions** (**AMD**)
- Using the `Require.js` library
- Configuring `Require.js`
- Using the text plugin to load the templates

Using AMD

Using the AMD, API will help us to load scripts on demand, specify the module dependencies, and reduce the script definition order problem. In *Chapter 5*, *Divide and Conquer – Modularizing Everything*, we discussed why building large applications can easily get out of hand. There are multiple aspects to consider, but managing the script modules is a common scenario. We need to make sure that all the scripts are loaded in the right order, combine them, and reduce the number of requests to the servers. This seems to be simple but as the application grows, it is really complex to keep track.

To illustrate the scenario, we will use a part of the script section from the `Index.html` file before we implement an AMD solution as follows:

```
<script src="../libs/jquery.js"></script>
<script src="../libs/underscore.js"></script>
<script src="../libs/backbone.js"></script>
<script src="../libs/backbone.marionette.js"></script>
```

```
<script src="../libs/backbone.routefilter.js"></script>
<script src="../libs/backbone.localStorage.js"></script>
<script src="../libs/bootstrap/js/bootstrap.min.js"></script>
<script src="app/Books.js"></script>
<script src="app/BaseController.js"></script>
<!-- Cart -->
<script src="app/modules/cart/CartApp.js"></script>
<script src="app/modules/cart/CartRouter.js"></script>
<script src="app/modules/cart/views/Catalog.js"></script>
<script src="app/models/BookModels.js"></script>
<script src="app/Books.Data.js"></script>
<script src="app/main.js"></script>
```

This list contains files for just a small proof of the concept and we have already started to accumulate a lot of scripts. As we add more modules, services, models, views, and so on, it will start to get less comprehensive and really hard to maintain. For example, at some point, we may lose track of the files that are not being used anymore. In the preceding code, all the scripts are downloaded when the page is loaded, even if the current view is not using them. Our code is modular, but still it is not easy to write encapsulated code that can be loaded on the fly, injected as dependency, and shared with other modules. Let's review how we can fix this.

Using the Require.js library

James Burke introduced the `Require.js` library and it has a great community. The author is an expert in script loading and a contributor to the AMD specification. This book assumes that you know the basics of AMD and so before jumping to the implementation of our application, it will provide you with some basics of the configuration and boilerplate required while using `Require.js`. To get the latest build of `Require.js`, please go to the project website, `http://requirejs.org/docs/download.html`.

Configuring Require.js

To get started with `Require.js`, we will create a file named `main.js`. Of course, you can give this file a more appropriate name that follows your naming conventions and business domain. We will write the following code inside the `main.js` file:

```
require.config({
   baseUrl: 'src',
  paths: {
    jquery:     'libs/jquery',
    underscore: 'libs/underscore',
    backbone:   'libs/backbone',
    marionette: 'libs/backbone.marionette',
  },
  shim: {
    underscore: {
      exports: '_'
    },
    backbone: {
      deps: ['underscore', 'jquery'],
      exports: 'Backbone'
    },
    marionette : {
      deps : ['jquery', 'underscore', 'backbone'],
      exports : 'Marionette'
    }
  }
});
require(['jquery','underscore','backbone','marionette'],
  function($,_,Backbone,Marionette) {
  console.log('Hello world from the main file! ');
});
```

Let's replace all the script references from our `Index.html` file for the next script reference as follows:

```
<script data-main="main" src="libs/require.js"></script>
```

In this script reference, we pass the name of the file (in our example, the `main.js` file) that has all the required configuration to the `data-main` attribute. Please note that it's just the name of the file (`main`) and not its extension (`.js`) that is passed, because `Require.js` assumes that it will be working only with JavaScript files; therefore, the extension is not needed. The source (`src`) should point to the path where the `Require.js` file is located.

Now, we are ready to complete a small test to see if we are on the right path. Open the browser and in the console, you should see the log message when you load the `Index.html` file.

Now, let's review each section of the content of the `main.js` file to get a better understanding of what's going on.

In the preceding code snippet, we put all the libraries that we will use under the `paths` section of the `require.config` function. On the left-hand side, we assigned the alias of the library and on the right-hand side, we indicated the path of the file—the path that will be relative to the `baseUrl` value assigned, in this case, the `src` folder.

The second property of this function is called **shim**. The primary use of `shim` is for libraries that do not support AMD, but you still need to manage their dependencies. A perfect example for this is `Underscore.js`. In this case, `Underscore.js` is exported as _ and it does not depend on another library to be loaded. We have a different scenario with `Backbone.js` that requires Underscore to work correctly. We have to specify `Underscore.js` as a dependency because it is possible that `Backbone.js` would try to do something with it before it is loaded.

The `require` function is placed at the end of the file as follows:

```
require(['jquery','underscore','backbone','marionette'],
  function($,_,Backbone,Marionette) {
  console.log('Hello world from the main file!);
});
```

The preceding code will be the starting point of our application. It is a function definition that gets the exported values as parameters. At this point, we are just logging a message, but now let's do something more useful.

Defining our application module

Now that the core dependencies are configured using `Require.js`, and once those are loaded and ready, we can define our Marionette application and set up the region initializers, commands, and request/response handlers. This is because we need the inside of a single file that we will name `app.js` with the idea of keeping all the login details related to the Marionette application object inside of this file. In the following code, our application is defined and ready to work as an AMD module. The following is the content of our `app.js` file:

```
define(['marionette'], function(Marionette){
  var Books = new Marionette.Application();
  Books.addRegions({
    main: '#main',
    modal: ModalRegion
  });
  Books.on('initialize:after', function () {
    if (Backbone.history) {
      Backbone.history.start();
    }
  });
  Books.startSubApp = function (appName, args) {
    var currentApp = App.module(appName);
    if (App.currentApp === currentApp) { return; }
    if (App.currentApp) {
      App.currentApp.stop();
    }
    App.currentApp = currentApp;
    currentApp.start(args);
  };
  return Books;
});
```

The book's application that we just defined will be used in the `main.js` file when we start the application.

When we add a new file we need to know where it is located and also its alias name. We specify this by going to the `paths` section of the `main.js` file definition. After this change your `paths` section should look like the following:

```
paths: {
  jquery:     'libs/jquery',
  underscore: 'libs/underscore',
  backbone:   'libs/backbone',
  marionette: 'libs/backbone.marionette',
  app:        'app'
},
```

Now, we are ready to use this file to start our Marionette application in the `require` function of the `main.js` file as follows:

```
require(['app'], function(Books) {
  Books.start();
});
```

Note how we injected the book's dependency to start the Marionette application and used the `start()` method of the Marionette application object to fire the initializers.

Writing the subapplications using Require.js

The module that we defined is our root app that takes care of starting up the subapplications. The next example shows how we can define the subapplications using `Require.js`. As you can see, we can easily adapt our preceding code to use the `require` function by sending our script definitions to a configuration file and injecting the necessary object into our module definition. The following code is from the `CartApp` subapplication:

```
define(['app'], function(Books){
  Books.module('CartApp', function (CartApp, Books, Backbone,
  Marionette, $, _) {
  CartApp.Controller = Marionette.Controller.extend({
    initialize: function (options) { },
    addProduct: function (model) { },
    removeProduct: function(model){ },
  });
  CartApp.addInitializer(function (args) {
    CartApp.controller = new CartApp.Controller({
      mainRegion: args.mainRegion,
    });
  CartApp.controller.show();
  });
  CartApp.addFinalizer(function () {
    if (CartApp.controller) {
      CartApp.controller.close();
      delete CartApp.controller;
    }
  });
  return Books.CartApp;
});
});
```

Modularizing all your components

In the following example, we will show how to write a module for a view to be loaded with `Require.js`, but the same concept applies for all the objects/components.

In the following code, we define a view called `CategoryView.js` and gave it the alias name of `categoryView` in the `main.js` file so that other files can use it.

```
    define(['app'], function(Books){
      Books.module('CartApp.CategoryView', function(View, Books,
        Backbone, Marionette, $, _){
        View.CategoryView = Backbone.Marionette.ItemView.extend({
          tagName : 'li',
          template: '#categoryTemplate',
          events : {
            'mouseenter .info' : 'showDetails',
            'mouseleave .info' : 'hideDetails'
          },
          showDetails : function() {
            this.$( '.info').popover({
              title:this.model.get('name'),
              content:this.model.get('booksOnCategory')
            });
            this.$( '.info').popover('show');
          },
          hideDetails : function() {
            this.$( '.info').popover('hide');
          },
        });
      return Books.CartApp.CategoryView;
      });
    });
```

The preceding example defined a well-scoped object. When a module does not have any dependencies and it is just a collection, we pass an object literal to `define()`. In our scenario, our module has dependencies, so the first argument should be an array of dependency names—in this case, `app` is the alias of our application—and the second argument should be a definition function.

Adding the text plugin

So far, we have defined the template property of our views using the ID of the template. This template is inside a script tag and has always been present in the DOM. But putting all the templates in the HTML file of a SPA won't scale and will give us the same maintenance problem that we had with all the script references in the `Index.html` file. A solution to this problem is to use the text plugin.

You can download the text plugin from the `Require.js` page. The following is the link for the download:

`http://requirejs.org/docs/download.html#text`.

As with any other script file, we need to give it an alias in the `main.js` file and its path in order to start using it.

The responsibility of the text plugin is to get the template from the server and pass it to our view so that we don't need it in the HTML file.

In the following code, we passed the relative path to the template using the `!text/path` syntax and the function that creates the view receives the exported name of the template as a parameter; in this case, `CategoryTemplate`.

```
  define(['app', '!text/templates/CategoryTemplate.html'],
    function(Books, CategoryTemplate){
    Books.module('CartApp.CategoryView', function(View, Books,
      Backbone, Marionette, $, _){
      View.CategoryView = Backbone.Marionette.ItemView.extend({
        tagName : 'li',
        template: CategoryTemplate,
        events : {'
          'mouseenter .info' : 'showDetails',
          'mouseleave .info' : 'hideDetails'
        },
        showDetails : function() {
          this.$( '.info').popover({
            title:this.model.get('name'),
            content:this.model.get('booksOnCategory')
          });
         this.$( '.info').popover('show');
        },
        hideDetails : function() {
          this.$( '.info').popover('hide');
        },
      });
      return Books.CartApp.CategoryView;
    });
  });
```

This approach is more maintainable when building a large-scale application, but perhaps you want to keep the initial templates in your HTML file for performance benefits and the rest of your templates inside the right file structure.

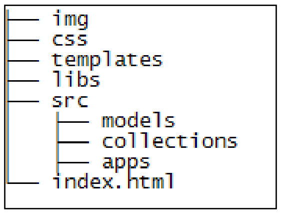
Structuring your files

There are many different options to define the layout of your files and probably this will be defined depending on the size and type of your project. At the end of the day, the goal should be to create a folder structure that is easy to understand, implement, and maintain.

In the following example, we categorize the source into common folders, such as models and collections, and specific folders for the application pieces (views and controllers).

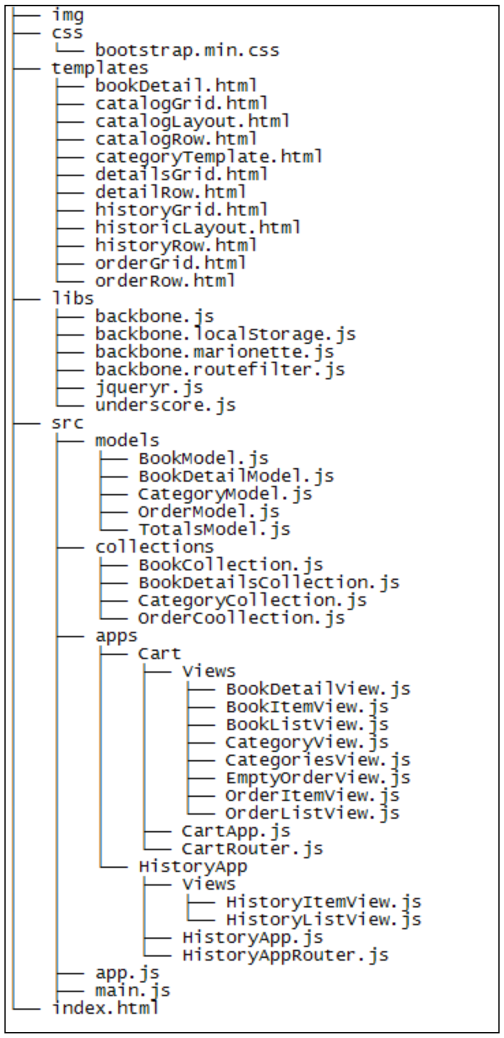
The static dependencies such as CSS, images, and JavaScript libraries required by our code should go under a different directory. It could prevent unintentional modifications to the library code and give us a better understanding of the real business domain.

The following image shows the base structure where we will fit our files:



```
├── img
├── css
├── templates
├── libs
├── src
│   ├── models
│   ├── collections
│   ├── apps
└── index.html
```

Having said that, let's dive into some of the details of our application. The following image shows how you might layout your application structure:



```
├── img
├── css
│   └── bootstrap.min.css
├── templates
│   ├── bookDetail.html
│   ├── catalogGrid.html
│   ├── catalogLayout.html
│   ├── catalogRow.html
│   ├── categoryTemplate.html
│   ├── detailsGrid.html
│   ├── detailRow.html
│   ├── historyGrid.html
│   ├── historicLayout.html
│   ├── historyRow.html
│   ├── orderGrid.html
│   └── orderRow.html
├── libs
│   ├── backbone.js
│   ├── backbone.localStorage.js
│   ├── backbone.marionette.js
│   ├── backbone.routefilter.js
│   ├── jqueryr.js
│   └── underscore.js
├── src
│   ├── models
│   │   ├── BookModel.js
│   │   ├── BookDetailModel.js
│   │   ├── CategoryModel.js
│   │   ├── OrderModel.js
│   │   └── TotalsModel.js
│   ├── collections
│   │   ├── BookCollection.js
│   │   ├── BookDetailsCollection.js
│   │   ├── CategoryCollection.js
│   │   └── OrderCoollection.js
│   ├── apps
│   │   ├── Cart
│   │   │   ├── Views
│   │   │   │   ├── BookDetailView.js
│   │   │   │   ├── BookItemView.js
│   │   │   │   ├── BookListView.js
│   │   │   │   ├── CategoryView.js
│   │   │   │   ├── CategoriesView.js
│   │   │   │   ├── EmptyOrderView.js
│   │   │   │   ├── OrderItemView.js
│   │   │   │   └── OrderListView.js
│   │   │   ├── CartApp.js
│   │   │   └── CartRouter.js
│   │   └── HistoryApp
│   │       ├── Views
│   │       │   ├── HistoryItemView.js
│   │       │   └── HistoryListView.js
│   │       ├── HistoryApp.js
│   │       └── HistoryAppRouter.js
│   ├── app.js
│   ├── main.js
└── index.html
```

In the preceding image, we showed the structure of our book store application. This structure makes sense in this particular case. But the good thing is that we created small meaningful files that can interact with each other in an easier and elegant way, instead of having big files with the logic of different components contained.

Using handlebars as a template engine in Marionette

One of the selling points of Backbone is that it plays well with the other libraries and this also holds true for Marionette . If we want to use a different template engine, we can do it with ease.

For this specific example, we will use handlebars, which we can be downloaded from `http://handlebarsjs.com/`.

Once we have downloaded the `Handlebars.js` file, we can add it to our `Index.html` file by using the following line:

```
<script type="text/javascript" src="libs/handlebars.js">
```

Or, we can do so by specifying an alias and path for it in the `main.js` file.

The syntax difference from the underscore templates is that a handlebars expression is {{, followed by some content, and then by }} instead of `<%= expression %>` of the `require` function. So, a template in handlebars looks like the following:

```
<script type="text/html" id="sample-template">
<p>This is an ItemView template using handlebars<p>
{{ value1 }} </br>
{{ value2 }} </br>
</script>
```

In order to use this template in a Marionette view, we must call the following syntax:

```
template : Handlebars.compile($('#sample-template').html());
```

The preceding line will grab the template from the DOM and compile it into a function that will later be used by Marionette to render the view . The following will be the full code for `ItemView`:

```
var SampleView = Backbone.Marionette.ItemView.extend({
  template : Handlebars.compile($('#sample-template').html())
});
```

To see this working please go to the JSFiddle example at `http://jsfiddle.net/rayweb_on/gXemX/`.

And that's it! There is no global change needed to start using a different template engine. We can also use both the engines if we want because the definition of the template is at the view level.

Summary

In this chapter, we learned that in order to manage the increasing complexity of our application, we must break it down into separate files. This increasing number of files leads to another problem that `Require.js` solves in an elegant way. The `Backbone.js` development clearly benefits from the use of `Marionette.js`, along with other libraries, such as `Require.js` and `Handlebars.js`, among others. This will definitely make our development environment more solid and at the same time, flexible to changes.

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