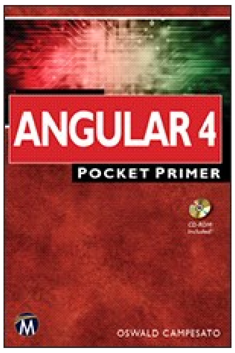


Angular 4 Pocket Primer

by Oswald Campesato

Chapter 4: HTTP Requests and Routing

Overview

This chapter shows you how to make HTTP requests in Angular applications and how to work with Observables in Angular applications. The code samples show you how to obtain data from various sources, and how to create an `Observable` from a `Promise`. If need be, you can access various online tutorials containing introductory material about Observables and Promises.

The first section briefly discusses Dependency Injection (DI) and the `@Injectable` decorator. The second section shows you how to make an HTTP request in an Angular application to read JavaScript Object Notation (JSON)-based data defined in a text file.

The third section shows you how to make an HTTP request in an Angular application to retrieve information about a GitHub user. You will also see how to make multiple concurrent requests via the `forkJoin()` method. The final section in this chapter discusses routing in Angular applications.

Note **DVD** When you copy a project directory from the companion disc, if the node_modules directory is not present, then copy the top-level node_modules directory that has been soft-linked inside that project directory (which is true for most of the sample applications).

Dependency Injection in Angular

Angular provides a simple mechanism for dependency injection: a dependency is injected into the constructor of a class. You can inject multiple dependencies by specifying each dependency as an argument in a constructor of a class.

DI involves specifying the `@Injectable` decorator above a TypeScript class, and a constructor with a type that you want to be injected. The code samples in this chapter use the `Http` service, which is also imported in TypeScript files.

There are two simple steps that you need to perform: First, import `Http` in `app.component.ts` (and possibly other custom classes) and then update the contents of `app.module.ts`.

For example, the following code block (which is Step 1) injects an instance of the `Http` class (shown in bold):

```
import {Injectable} from '@angular/core';
import {Http} from '@angular/http';
...
@Injectable()
export class AppComponent {
  constructor(http:Http) {
     this.http = http;
  }
    }
```

Note The `Http` module uses `rxjs` to return `Observables` in Angular.

As you can see in the preceding code block, the `Injectable` service is in `@angular/core`, whereas the `Http` service is in `@angular/http`.

Note You must also update the contents of `app.module.ts` when you import `Http`.

Step 2 involves updating `app.module.ts`, as shown here:

```
import { NgModule }      from '@angular/core';
import { BrowserModule } from '@angular/platform-browser';
import { HttpModule }    from '@angular/http';

@NgModule({
  imports:      [ BrowserModule, HttpModule ],
  declarations: [ AppComponent ],
  bootstrap:    [ AppComponent ]
})
export class AppModule { }
```

Notice that the preceding code block imports `HttpModule` from `@angular/http` and specifies it as a dependency in the `imports` property, whereas Step 1 imports `Http` from `@angular/http`. Later in this chapter, you will see code samples that require the `providers` property in `app.module.ts`.

Flickr Image Search Using jQuery and Angular

The code sample in this section shows you how to use jQuery in an Angular application, which is relevant for existing Web pages that perform HTTP requests via jQuery.

DVD Copy the directory `SearchFlickr` from the companion disc into a convenient location. Note that the file `index.html` contains the following code snippet, which enables the use of jQuery in this project:

```
<script src="http://code.jquery.com/jquery-latest.js"> </script>
```

Listing 4.1 displays the contents of `app.component.ts` that illustrates how to make an `HTTP GET` request to retrieve images from `Flickr`. This request is based on text string that users enter in a search box.

Listing 4.1: app.component.ts

```
import {Component} from '@angular/core';
declare var $: any;

@Component({
   selector: 'app-root',
   template: '
       Enter a word and search for related images:
       <br />
       <input id="searchterm" />
       <button (click)="httpRequest()">Search</button>
       <div id="images"></div>
  '
})
export class AppComponent {
  url = "http://api.flickr.com/services/feeds/photos_public.
                                            gne?jsoncallback=?";

  constructor() {}

  httpRequest() {
    $.getJSON(this.url,
    {
      tags: $("#searchterm").val(),
      tagmode: "any",
      format: "json"
    },
    function(data) {
      $.each(data.items, function(i,item){
        $("<img/>").attr("src", item.media.m).
                                          prependTo("#images");
      });
    });
  }
}
```

Listing 4.1 contains a standard `import` statement, followed by this code snippet:

```
declare var $: any;
```

The preceding snippet is necessary for TypeScript to "find" jQuery, which is loaded via a `<script>` element in `index.html`. If you remove the preceding code snippet, you will see the following error:

```
app/app.component.ts(20,5): error TS2304: Cannot find name '$'.
```

The next portion of Listing 4.1 is the `@Component` decorator, whose `template` property contains `<input>`, `<button>`, and `<div>` elements to capture the user's search string, perform a search with that string, and display the results of the search, respectively.

The next portion of Listing 4.1 is the exported class `@AppComponent` that defines the `url` variable that is initialized with a hard-coded string value that "points" to the Flickr website.

Next, an empty constructor is defined, followed by the `httpRequest()` method that is invoked when users click the `<button>` element. This method invokes the jQuery `getJSON()` method that performs a Flickr image search based on the text string entered in the `<input>` element because of this code snippet:

```
tags: $("#searchterm").val()
```

When the matching images are retrieved, they are available via `data.items`, and the jQuery `each()` method iterates through the list of images. Each image is dynamically inserted in the `<images>` element via this snippet:

```
$("<img/>").attr("src", item.media.m).prependTo("#images");
```

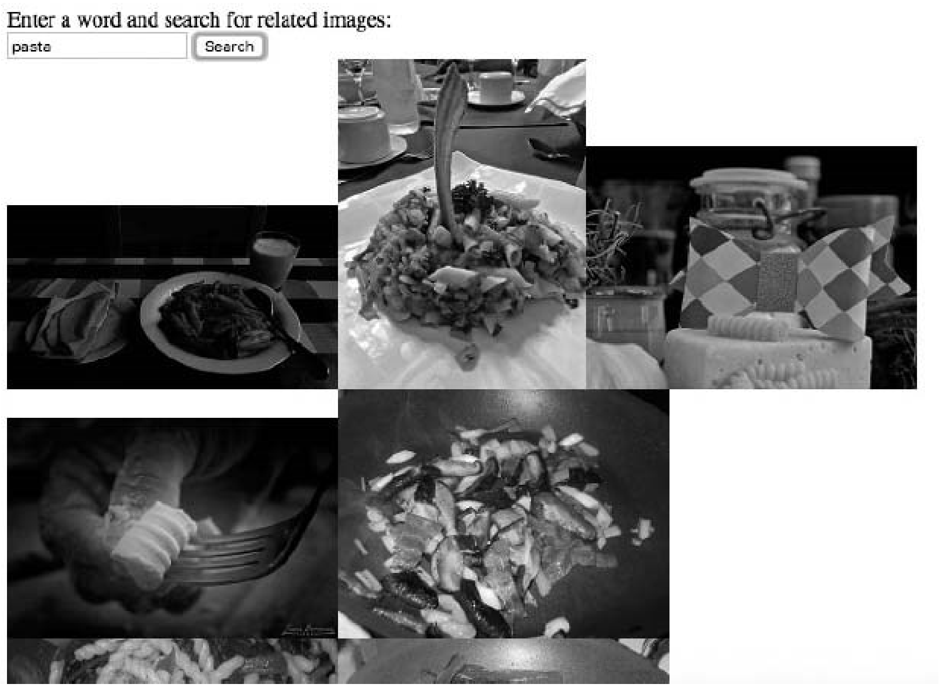


Figure 4.1: A partial list of images showing pasta.

Take a minute or two to absorb the compact manner in which jQuery achieves the desired result.

Figure 4.1 displays the output from launching this Angular application and searching Flickr with the keyword `pasta`.

Combining Promises and Observables in Angular

The code sample in this section shows you how to retrieve `JSON`-based data, convert that data into a `Promise`, and then convert the `Promise` into an `Observable`. In addition, you will see two techniques for handling the data: One code block handles the data as a `Promise`, and another code block handles the data as an `Observable` (so you have a choice of either style). Remember that the `Http` service in Angular returns an `Observable` that supports a `subscribe()` method.

Navigate to the following website to sign up for the free application programming interface (API) key that you will need for the code sample in this section:

http://developer.nytimes.com/signup

Note **DVD** Now copy the directory `SearchNYT` from the companion disc into a convenient location. Listing 4.2 displays the contents of `app.component.ts` that illustrates how to convert a `Promise` (that is returned from a custom service) into an `Observable` and then display the returned data as a list of links.

Listing 4.2: app.component.ts

```
import {Component}      from '@angular/core';
import {Observable}     from 'rxjs/Observable';
import 'rxjs/Rx';
import {NYTService}     from './nyt-service';
declare var $: any;

@Component({
  selector: 'app-root',
  template: '
    <div>
      <h2>New York Times Headlines For Today</h2>
      <ul>
        <li *ngFor="let item of headlines">
          <a href="#">{{item.headline.main}}"</a>
        </li>
      </ul>
    </div>
  '
})
export class AppComponent {
  headlines: any;

  constructor(private nytService:NYTService) {
     var p = new Promise(function(resolve) {
        var value = nytService.getNYTInfo();
        resolve(value);
     });

//----------------------------------------------
// Option #1: process data from an Observable
//----------------------------------------------
     Observable.fromPromise(p)
      .subscribe(
        data => this.headlines = data,
        err => console.log('error reading data: '+err),
        () => this.documentInfo()
      );

/*
//------------------------------------------
// Option #2: process data from a Promise
//------------------------------------------
     p.then(function(data) {
        this.headlines = data.response.docs;
        console.log("found headlines = " +
                    JSON.stringify(this.headlines));
     }
*/
  }
  documentInfo() {
     this.headlines = this.headlines.response.docs;
  }
}
```

Listing 4.2 contains an `@Component` decorator whose `template` property displays an unordered list of headlines from articles that are retrieved from the *New York Times* website.

The `AppComponent` class contains three parts. The first part defines a `Promise` `p` that invokes the `getNYTInfo()` method (defined in the `NYTService` class shown below) to obtain a set of articles. The second part defines an `Observable` from the `Promise` `p`, whose `subscribe()` method initializes the variable `headlines` with the list of headlines from the retrieved articles via this code snippet:

```
data => this.headlines = data.response.docs
```

The `*ngFor` statement in the `template` iterates through the items in `headlines` to display the list of article headlines.

The third part obtains the list of articles from the `Promise` `p`, and initializes the variable `headlines` with the list of headlines from the retrieved articles.

Listing 4.3 displays the contents of `nyt.service.ts` that uses jQuery to make an `HTTP GET` request from a *New York Times* endpoint, which then returns a `Promise` to the parent component. Note that the endpoint will return a `JSON` string, and that the `return` statement (shown in bold in Listing 4.3) converts that `JSON` string into a `Promise`.

Listing 4.3: nyt.service.ts

```
import {Inject, Injectable} from '@angular/core';
import {Http}               from '@angular/http';
declare var $: any;

@Injectable()
export class NYTService {
  // register for your NYT account and then get an API key:
  apiKey = "c96f0026207946e8ab610f4c7abcxxxxxxxxx";
  nytURL = "http://api.nytimes.com/svc/search/v2/
                                        articlesearch.json";

  constructor(@Inject(Http) public http:Http) { }

  getNYTInfo() {
    return $.get(this.nytURL, {
      "api-key": this.apiKey,
      sort:"oldest",      fq:"headline:(\""+"Fashion"+"\")",
      fl:"headline,snippet,multimedia,pub_date"}, function(res) {
         var responseObj =
               $.parseJSON(JSON.stringify(res.response));
         var docs = JSON.stringify(responseObj["docs"]);
         var docsArray = JSON.parse(docs);
         this.dataFound = true;
         return docsArray;
       }, "JSON")
  }
}
```

Listing 4.3 initializes the variables `apiKey` and `nytURL` with the value of the registered API key and the *New York Times* URL, respectively. The main focus is the `gettNYTInfo()` method, which that populates various attributes (such as `fq` and `fl`) that are required by the *New York Times*, and then invokes the jQuery `get()` method to retrieve articles from the *New York Times*.

Here's the interesting part: Because of the `return` statement (shown in bold), *the JSON-based data is returned as a* `Promise`. The `docsArray` contains an array of articles that is accessed in the code in Listing 4.2.

Listing 4.4 displays the updated contents of `app.module.ts` that imports the `NYTService` class and the Angular `HttpModule`.

Listing 4.4: app.module.ts

```
import { NgModule }      from '@angular/core';
import { BrowserModule } from '@angular/platform-browser';
import { HttpModule }    from '@angular/http';
import { AppComponent }  from './app.component';
import { NYTService }    from './nyt.service';

@NgModule({
  imports:      [ BrowserModule, HttpModule ],
  providers:    [ NYTService ],
  declarations: [ AppComponent ],
  bootstrap:    [ AppComponent ]
})
export class AppModule { }
```

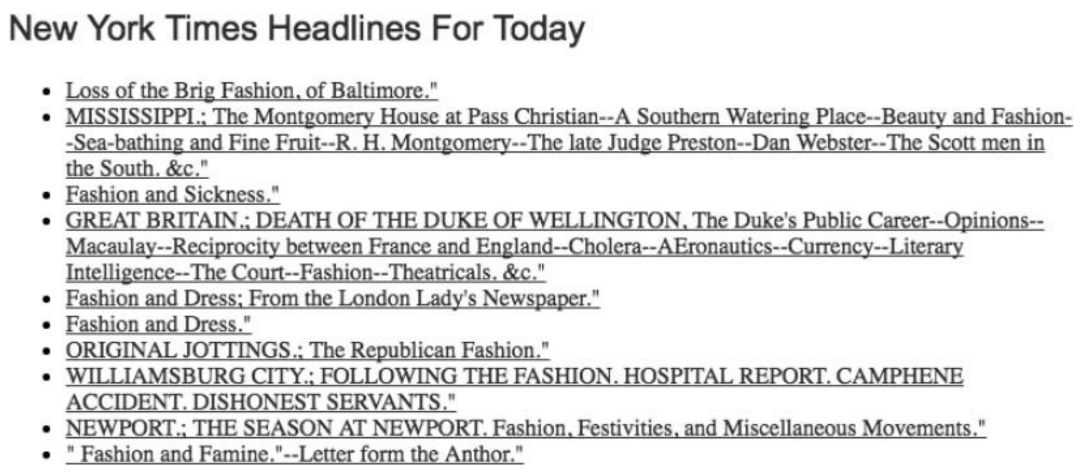
The main thing to notice in Listing 4.4 is that the custom `NYTService` class is listed in the array of `providers`, whereas the Angular `HttpModule` is listed in the array of `imports`, both of which are specified in the `@NgModule` decorator.

Note that the Web service is less than 100% reliable, and you might see an error message similar to this one:

```
ERROR in SearchNYT/src/app/app.component.ts (36,39): Property
                         'response' does not exist on type '{}'.)
webpack: Failed to compile.
```

Wait a short while and reload the Web page and eventually you will see the correct results.

Figure 4.2 displays the output from launching this Angular application and retrieving a set of articles from the *New York Times* (admittedly the user interface [UI] portion can be greatly improved).



New York Times Headlines For Today

- Loss of the Brig Fashion, of Baltimore."
- MISSISSIPPI.; The Montgomery House at Pass Christian--A Southern Watering Place--Beauty and Fashion--Sea-bathing and Fine Fruit--R. H. Montgomery--The late Judge Preston--Dan Webster--The Scott men in the South, &c."
- Fashion and Sickness."
- GREAT BRITAIN.; DEATH OF THE DUKE OF WELLINGTON, The Duke's Public Career--Opinions--Macaulay--Reciprocity between France and England--Cholera--AEronautics--Currency--Literary Intelligence--The Court--Fashion--Theatricals, &c."
- Fashion and Dress; From the London Lady's Newspaper."
- Fashion and Dress."
- ORIGINAL JOTTINGS.; The Republican Fashion."
- WILLIAMSBURG CITY.; FOLLOWING THE FASHION. HOSPITAL REPORT. CAMPHENE ACCIDENT. DISHONEST SERVANTS."
- NEWPORT.; THE SEASON AT NEWPORT. Fashion, Festivities, and Miscellaneous Movements."
- " Fashion and Famine."--Letter form the Anthor."

Figure 4.2: A list of article headings from the New York Times.

Reading JSON Data via an Observable in Angular

DVD This section shows you how to read data from a file that contains JSON-based data. Copy the directory `ReadJSONFile` from the companion disc into a convenient location. Listing 4.5 displays the contents of `app.component.ts` that illustrates how to make an `HTTP` request (which returns an `Observable`) to read a `JSON` -based file with `employee` information.

Listing 4.5: app.component.ts

```
import { Component }  from '@angular/core';
import { Observable } from 'rxjs/Observable';
import { Inject }     from '@angular/core';
import { Http }       from '@angular/http';
import 'rxjs/Rx';
declare var $: any;

@Component({
  selector: 'app-root',
  template: '
     <button (click)="httpRequest()">Employee Info</button>
     <ul>
       <li *ngFor="let emp of employees">
         {{emp.fname}} {{emp.lname}} lives in {{emp.city}}
       </li>
     </ul>
   '
})
export class AppComponent {
  employees = [];

  constructor(@Inject(Http) public http:Http) {}

  httpRequest() {
    this.http.get('src/app/employees.json')
      .map(res => res.json())
      .subscribe(
        // this function runs on success
        data => this.employees = data,
        // this function runs on error
        err => console.log('error reading data: '+err),
        // this function runs on completion
        () => this.userInfo()
      );
  }

  userInfo() {
 //console.log("employees = "+JSON.stringify(this.employees));
  }
}
```

The template property in Listing 4.5 starts with a `<button>` element for making an `HTTP GET` request to retrieve information about employees.

The `template` property also contains a `<ul>` element for displaying an unordered list of employee-based data.

The `AppComponent` class contains the variable `employees`, followed by a constructor that initializes the `http` variable, which is an instance of the `Http` class. The `httpRequest()` method contains the code for making the `HTTP GET` request that returns an `Observable`. The `subscribe()` method contains the usual code, which in this case also initializes the `employees` array from the contents of the file `employees.json` in the subdirectory `app/src`.

Listing 4.6 displays the contents of `employees.json` that contains employee-related information. This file is located in the `src/app` subdirectory, as shown in bold in Listing 4.5.

Listing 4.6: employees.json

```
[
{"fname":"Jane","lname":"Jones","city":"San Francisco"},
{"fname":"John","lname":"Smith","city":"New York"},
{"fname":"Dave","lname":"Stone","city":"Seattle"},
{"fname":"Sara","lname":"Edson","city":"Chicago"}
]
```

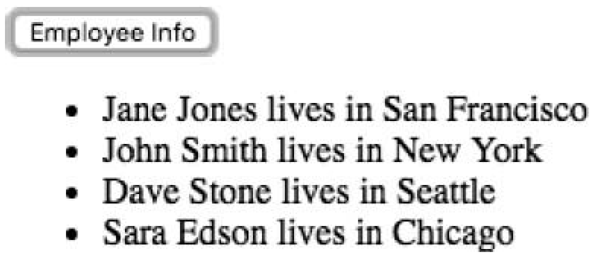
Listing 4.7 displays the contents of `app.module.ts` that imports the Angular `HttpModule`.

Listing 4.7: app.module.ts

```
import { NgModule }      from '@angular/core';
import { BrowserModule } from '@angular/platform-browser';
import { HttpModule }    from '@angular/http';
import { AppComponent }  from './app.component';

@NgModule({
  imports:      [ BrowserModule, HttpModule ],
  declarations: [ AppComponent ],
  bootstrap:    [ AppComponent ]
})
export class AppModule { }
```

Listing 4.7 contains the standard set of import statements, along with `HttpModule`, which is listed in the array of `imports` in the `@NgModule` decorator.



- Jane Jones lives in San Francisco
- John Smith lives in New York
- Dave Stone lives in Seattle
- Sara Edson lives in Chicago

Figure 4.3: A list of employees from a JSON file.

Figure 4.3 displays the output from launching this Angular application and retrieving JSON-based employee data from a file.

The next section contains an example of using `forkjoin()`, and the code is similar to the contents of Listing 4.5.

Multiple Concurrent Requests with forkJoin() in Angular

The code sample in the previous section reads the contents of a single file. However, in some cases you might need to load data from multiple sources, and delay the post-loading logic until all the data has loaded. `Observables` provide a method called `forkJoin()` to "wrap" multiple `Observables`, and make multiple concurrent `http.get()` requests. Note that the operation fails if any individual request fails. The `subscribe()` method sets the handlers on the entire set of `Observables`.

DVD Copy the directory `ForkJoin` from the companion disc into a convenient location. Listing 4.8 displays the contents of `app.component.ts` that illustrates how to reference the custom component `FileService`, which reads the contents of `employees.json` and `customers.json`.

Listing 4.8: app.component.ts

```
import {Component}      from '@angular/core';
import {FileService}    from './file.service';

@Component({
   selector: 'app-root',
   template:'
  <h2>Angular2 HTTP and Observables</h2>
  <h3>Some of our Employees</h3>
  <ul>
    <li *ngFor="let emp of employees">
      {{emp.fname}} {{emp.lname}} lives in {{emp.city}}
    </li>
  </ul>

  <h3>Some of our Customers</h3>
  <ul>
    <li *ngFor="let cust of customers">
      {{cust.fname}} {{cust.lname}} lives in {{cust.city}}
    </li>
   </ul>
  '

  })
  export class AppComponent {
  public employees;
  public customers;

  constructor(private _fileService: FileService) { }

  ngOnInit() {
    this.getBothFiles();
  }

  getBothFiles() {
    this._fileService.getBothFiles().subscribe(
      data => {
        this.customers = data[0]
        this.employees = data[1]
      }
      // error/completion callbacks are optional, and console
      // messages appear if the Observable is in an error state
    );
  }
}
```

The `template` property in Listing 4.8 contains an unordered list of employees and an unordered list of customers, both of which are retrieved via the method `getBothFiles()` in the custom `AppComponent` component. Notice that the retrieved data is an array of two elements, where the first element contains customer-related data and the second element contains employee-related data.

The `getBothFiles()` method is invoked in the `ngOnInit()` lifecycle method, and the actual `HTTP GET` request is performed in a method (also called `getBothFiles()`) that is defined in the `FileService` custom component.

Listing 4.9 displays the contents of `file.service.ts` that defines the class `FileService`. This class contains a method `getBothFiles()` that uses `forkJoin()`to read data from two `JSON`-based files.

Listing 4.9: file.service.ts

```
import {Injectable}     from '@angular/core';
import {Http, Response} from '@angular/http';
import {Observable}     from 'rxjs/Rx';

@Injectable()
export class FileService {
  constructor(private http:Http) { }

  // http.get() loads one JSON file
  getEmployees() {
    return this.http.get('/src/app/employees.json')
                .map((res:Response) => res.json());
  }

  getBothFiles() {
    return Observable.forkJoin(
      this.http.get('/src/app/customers.json')
          .map((res:Response) => res.json()),
      this.http.get('/src/app/employees.json')
          .map((res:Response) => res.json())
    );
  }
}
```

Listing 4.9 contains the `getBothFiles()` method, which invokes the `forkJoin()` method of the `Observable` class to retrieve the `JSON` data in the file `src/app/customers.json` and the file `src/app/employees.json`.

The following code snippet appears three times in Listing 4.9, and in every case it returns `JSON`-formatted data inside an `Observable`:

```
.map((res:Response) => res.json())
```

The employee-related data is displayed in Listing 4.6, and Listing 4.10 displays the contents of `customers.json` that contains customer-related information.

Listing 4.10: customers.json

```
[
{"fname":"Paolo","lname":"Friulano","city":"Maniago"},
{"fname":"Luigi","lname":"Napoli","city":"Vicenza"},
{"fname":"Miko","lname":"Tanaka","city":"Yokohama"},
{"fname":"Yumi","lname":"Fujimoto","city":"Tokyo"}
]
```

Launch the Angular application via the `ng serve` command. You will see the following output in a browser session at the address `localhost:4200`:

Angular2 HTTP and Observables

Some of our Employees

- Paolo Friulano lives in Maniago
- Luigi Napoli lives in Vicenza
- Miko Tanaka lives in Yokohama
- Yumi Fujimoto lives in Tokyo

Some of our Customers

- Jane Jones lives in San Francisco
- John Smith lives in New York
- Dave Stone lives in Seattle
- Sara Edson lives in Chicago

Now that you have a basic grasp of how to work with `Observables` in Angular applications, let's see how to represent `JSON` data in a TypeScript interface.

TypeScript Interfaces in Angular

The `JSON` file `customers.json` contains record-like information about customers, each of which can be modeled via something called an interface, which exists in many programming languages. Interfaces are somewhat analogous to a `struct` in languages such as Apple Swift, Google Go, or the C programming language.

In general, a TypeScript interface specifies a list of variables and their type, along with one or more methods. A TypeScript interface is a useful construct whenever you want to associate logically related data items (i.e., pieces of information). Many examples of entities with multiple data items are available, such as customers, employees, students, purchase orders, and so forth. You can model all of them (and many others) with a TypeScript interface, an example of which is discussed in the next section.

A Simple TypeScript Interface

Listing 4.11 displays the contents of `employee.ts` that contains an interface for a hypothetical employee. A real-life example would contain many other pieces of information (and methods) in such an interface, whereas this highly simplified example is intended to illustrate how to use TypeScript interfaces in Angular.

Listing 4.11: employee.ts

```
export interface Employee {
  fname: string,
  lname: string,
  city: string
}
```

Notice that the structure of the interface `Employee` in Listing 4.11 matches the contents of the rows in `Employees.json`.

JSON Data and TypeScript Interfaces

Listing 4.12 displays the contents of `employees.ts` that contains an array of `Employee` instances. The file `employees.ts` illustrates how to populate an array with hard-coded data values that conform to a TypeScript interface. Note that Listing 4.10 is not used in the current code sample. Its purpose is to merely demonstrate that it's possible to load "seed data" (which can be useful for testing purposes) from a static file.

Listing 4.12: employees.ts

```
import {Employee} from './employee';

export const EMPLOYEES : Employee[] = [
  {"fname":"Jane","lname":"Jones","city":"San Francisco"},
  {"fname":"John","lname":"Smith","city":"New York"},
  {"fname":"Dave","lname":"Stone","city":"Seattle"},
  {"fname":"Sara","lname":"Edson","city":"Chicago"}
];
```

An Angular Application with a TypeScript Interface

This section discusses how to create an Angular application that uses a TypeScript interface.

Create an Angular application called `ReadJSONFileTS` by cloning the Angular application `ReadJSONFile` and then make two small changes to the contents of `app.component.ts` in `ReadJSONFileTS`.

The first change is to include the following `import` statement:

```
import {Employee} from './employee';
```

The second change is to replace the code snippet in bold in Listing 4.10 with the following code snippet, which declares the employees variable to be an array of objects that conform to the `Employee` interface:

```
employees : Employee[];
```

Launch the application and you will see the same results. Keep in mind that the only significant difference in this project involves a TypeScript interface. Although the use of a TypeScript interface in this example does not provide a significant advantage, consider the case of Angular applications that contain multiple TypeScript interfaces, some of which might contain dozens of elements. In such scenarios, TypeScript interfaces simplify the task of keeping track of related data, which is useful when you need to perform create, read, update, and delete (CRUD) operations.

There are some useful facts to keep in mind about TypeScript interfaces. First, they can contain method definitions that are implemented in a class. Second, a TypeScript interface can extend an existing interface (so it's possible to create a hierarchical structure). Third, a TypeScript interface can extend a TypeScript class. Although this chapter does not contain examples that illustrate any of these additional features, you can perform an online search to find relevant code samples and tutorials.

Getting GitHub User Data in Angular

DVD Copy the directory `GithubUsers` from the companion disc into a convenient location. Listing 4.13 displays the contents of `app.component.ts` that illustrates how to make an `HTTP GET` request to retrieve information about GitHub users.

Listing 4.13: app.component.ts

```
import { Component }    from '@angular/core';
import {Inject}         from '@angular/core';
import {Http}           from '@angular/http';
import {HTTP_BINDINGS}  from '@angular/http';
import 'rxjs/add/operator/map';

@Component({
   selector: 'app-root',
   template: '<button (click)="httpRequest()">User Info
                                                     </button>'
})
export class AppComponent {
  githubData : any;

   constructor(@Inject(Http) public http:Http) {}

  httpRequest() {
       this.http.get('https://api.github.com/users/
                                            ocampesato')
      .map(res => res.json())
      .subscribe(
        data => this.githubData = data,
        err => console.log('error'),
        () => this.userInfo()
      );
    }

  userInfo() {
     console.log("followers  = "+this.githubData.followers);
     console.log("following  = "+this.githubData.following);
     console.log("created_at = "+this.githubData.created_at);
  }
}
```

Listing 4.13 contains code that is similar to the code in Listing 4.5. The difference is in the `httpRequest()` method, which makes an `HTTP GET` request from a live endpoint instead of reading data from a file. Another difference is that the only data that is displayed is shown in the console tab of the browser.

Launch the code in this section; in the console tab, you will see something similar to the following output:

```
followers  = 16
following  = 2
created_at = 2011-07-14T23:06:31Z
```

The code in this section gives you a starting point for displaying additional details regarding a user, and displays the information in a more pleasing manner.

HTTP GET Requests with a Simple Server

This section shows you how to work with the command line utility `json-server`, which can serve JSON-based data. This program performs the function of a very simple server: clients can make `GET` requests to retrieve `JSON` data from a server. Moreover, a simple command in the console where `json-server` was launched enables you to save the in-memory data to a file.

Although `json-server` does not perform the functions of a node-based application that contains Express and MongoDB, `json-server` is a convenient program that helps you learn how an Angular application can interact with a file server.

You need to perform the following steps:

- Step 1: Install `json-server`.
- Step 2: Launch `json-server`.
- Step 3: Launch the Angular application.

Install `json-server` via the following command:

```
[sudo] npm install –g json-server
```

Navigate to the directory that contains the `JSON` file `posts.json` and invoke this command:

```
json-server posts.json
```

The preceding command launches a file server at port `3000` and reads the contents of `posts.json` into memory, making that data available to `HTTP GET` requests.

DVD Copy the directory `JSONServerGET` from the companion disc into a convenient location. Listing 4.14 displays the contents of `app.component.ts` that illustrates how to make an `HTTP GET` request to retrieve data from a file server.

Listing 4.14: app.component.ts

```
import {Component}     from '@angular/core';
import {Inject}        from '@angular/core';
import {Http}          from '@angular/http';
import {HTTP_BINDINGS} from '@angular/http';
import 'rxjs/add/operator/map';

@Component({
   selector: 'app-root',
   template: '
     <button (click)="httpRequest()">Get Information</button>
     <div>
       <li *ngFor="let post of postData">
         {{post.author}}
         {{post.title}}
       </li>
     </div>
   '
})
export class AppComponent {
  postData = "";

  constructor(@Inject(Http) public http:Http) {
   }

  httpRequest() {
      this.http.get('http://localhost:3000/posts')
      .map(res => res.json())
      .subscribe(
        data => this.postData = JSON.stringify(data),
        err => console.log('error'),
        () => this.postInfo()
      );
  }

  postInfo() {
     //-----------------------------------------------
     // the 'eval' statement is required in order to
     // convert the data retrieved from json-server
     // to an array of JSON objects (else an error)
     //-----------------------------------------------
     var myObject = eval('(' + this.postData + ')');
     console.log("myObject = "+JSON.stringify(myObject));
     this.postData = myObject;
  }
}
```

Listing 4.14 contains code that is similar to earlier code samples. The first difference involves the details of the unordered list that is displayed in the template property.

The second difference involves the local endpoint http://local-host:3000/users in the `HTTP GET` request. This endpoint provides `JSON` data via the `json-server` that is listening on port `3000`.

Listing 4.15 displays the contents of `posts.json` that is retrieved during the `HTTP GET` request in Listing 4.14.

Listing 4.15: posts.json

```
{
  "posts": [
    {"id": 100,"title": "json-server","author": "smartguy"},
    {"id": 200,"title": "pizza-maker","author": "chicago"},
    {"id": 300,"title": "good-beer",  "author": "escondido"}
  ]
}
```

The next section shows you how to make an `HTTP POST` request to a local file server in an Angular application.

HTTP POST Requests with a Simple Server

This section shows you how to make an `HTTP POST` request with the utility `json-server,` which can serve `JSON`-based data. Keep in mind that the server in this code sample only handles basic data requests; "universal" JavaScript (sometimes called "isomorphic" JavaScript) is not covered in this chapter.

Navigate to the `src/app` subdirectory, which contains the `JSON` file `authors.json` and launch this command:

```
json-server authors.json
```

The preceding command launches a file server at port `3000` and reads the contents of `authors.json` into memory, making that data available to `HTTP GET` requests.

DVD Now copy the directory `JSONServerPOST` from the companion disc into a convenient location. Listing 4.16 displays the contents of `app.component.ts` that illustrates how to make an `HTTP POST` request to a local file server.

Listing 4.16: app.component.ts

```
import { Component }    from '@angular/core';
import {Inject}         from '@angular/core';
import {Http}           from '@angular/http';
import 'rxjs/add/operator/map';
declare var $: any;

@Component({
   selector: 'app-root',
   template: '
     <button (click)="getEmpData()">Author Info</button>
     <div>
       <table>
         <thead *ngIf="foundData">
           <th>AUTHORID</th>
           <th>Title</th>
           <th>Author</th>
         </thead>
         <tbody>
           <tr *ngFor="let author of authorData">
             <td>{{author.id}}</td>
             <td>{{author.title}}</td>
             <td>{{author.author}}</td>
           </tr>
         </tbody>
       </table>
       <button (click)="postAuthorData()">Add Author</button>
     </div>
    '
  })
export class AppComponent {
  foundData   = false;
  authorData  = [];
  currData    = {};
  idIncr      = 100;
  newAuthorId = 0;
  newTitle    = "";
  newAuthor   = "";
  largestId   = 0;

  constructor(@Inject(Http) public http:Http) {}

  postAuthorData() {
    this.newAuthorId = 0+this.largestId+this.idIncr;
    this.newTitle    = "The Book of "+this.newAuthorId;
    this.newAuthor   = "My New Title"+this.newAuthorId;

    var postNewAuthor = {id:this.newAuthorId,
                         title:this.newTitle,
                         author:this.newAuthor};

//console.log("postNewAuthor: "+JSON.stringify(postNewAuthor));

    $.post("http://localhost:3000/authors",
       postNewAuthor,
       function(result, textStatus, jqXHR) {
  //console.log("2returned result: "+JSON.stringify(result));
           this.authorData.push(postNewAuthor);
       }.bind(this),"json")
        .fail(function(jqXHR, textStatus, errorThrown) {
  console.log("error: "+errorThrown+" textStatus:
                                                 "+textStatus);
       });
  }

  getAuthorData() {
    this.http.get('http://localhost:3000/authors')
      .map(res => res.json())
      .subscribe(
        data => this.authorData = data,
        err => console.log('error'),
        () => this.authorInfo()
      );
  }

  authorInfo() {
     this.largestId =
          parseInt(this.authorData[this.authorData.length-1].
                                                       id,10);

   //console.log("largestId   = "+ this.largestId);
   //console.log("authorData1 = "+ JSON.stringify(this.
                                                 authorData));
     this.foundData = true;
  }
}
```

Listing 4.16 contains the same `import` statements as Listing 4.14, followed by a `template` property that displays a table of author-based data. When users click the `<button>` element, the `postAuthorData()` adds a hard-coded new author to the list of authors. This method performs a standard jQuery `POST` request instead of using an `Observable`. Note that this method increments the value of the `id` property of each author so that they are treated as distinct authors (even though the names of the new users are almost the same).

On the other hand, the `getAuthorData()` method does involve an `Observable` for retrieving author-related data (shown in Listing 4.17) from the file server that is running on port `3000`.

Note The current functionality only supports the insertion of one new author. As an exercise, modify the code to support the insertion of multiple new authors.

One other minor point: The browser is reloaded after each invocation of the `postAuthorData()` method, so you need to click the "Author Info" button to see the newly added author.

Listing 4.17 displays a portion of the contents of `authors.json`, whose contents are displayed in this Angular application.

Listing 4.17: authors.json

```
{
  "authors": [
    {
      "id": 100,
      "title": "json-server",
      "author": "typicode"
    },
    {
      "id": 200,
      "title": "pizza-maker",
      "author": "chicago"
    },
// sections omitted for brevity
    {
      "id": "900",
      "title": "The Book of 900",
      "author": "My New Title900"
    }
  ]
}
```

As you can see, Listing 4.17 is a very simple collection of JSON-based data items, where each item contains the elements `id`, `title`, and `author`.

This concludes the portion of the chapter involving code samples that use `json-server` as a local file server. The next section of this chapter discusses how routing is supported in Angular.

Routing in Angular

Web applications can have different sections that correspond to different URLs, and supporting those sections programmatically is called *routing*. When you see a Web page that contains tabs or a set of horizontal links that display different sections of an application, it's quite likely that the Web page is using some form of routing.

For instance, a Web page might provide an "about" section, a "login" section, and an "orders" section. Suppose that you want to allow access to the orders section only after users have logged into the application. Routes can restrict access to the orders section, and maintain state in order to simplify the code that makes the transitions between sections.

Routing in Angular applications involves adding a "mapping" between routes and actions in `app.module.ts`, an example of which is shown in the variable `appRoutes` below:

```
const appRoutes: Routes = [
  {path: 'about',   component: AboutComponent},
  {path: 'login',   component: LoginComponent},
  {path: 'contact', component: ContactComponent}
]

@NgModule({
   imports:      [ BrowserModule,
                   FormsModule,
                   RouterModule.forRoot(appRoutes),
                ],
   declarations: [ AppComponent ],
   bootstrap:    [ AppComponent ]
})
```

The preceding code block defines the variable `appRoutes,` which specifies three routes— `about`, `login`, and `contact`—which are mapped to the components `AboutComponent`, `LoginComponent`, and `ContactComponent`, respectively.

Regardless of the link that users click, the relevant component is displayed in the `<router-outlet>` element (specified in the template definition in `app.component.ts`). When users click a link, all existing content in `<router-outlet>` is removed and replaced with the component that is associated with the currently clicked link.

To use a tab-based analogy, when users click a tab, the current screen contents are replaced by the contents of the most recently clicked tab.

A more generalized scenario of configuring a set of routes supports rerouting and specifying parameters, as shown here:

```
[
  { path: 'home',          component: HomeComponent },
  { path: 'courses',       component: CourseListComponent },
  { path: 'course/:id',    component: CourseDetailsComponent },
  { path: '', redirectTo: 'home', pathMatch: 'full' },
  { path: '**',            component: UnknownPageComponent }
]
```

More detailed information about Angular routes is located here:

https://angular.io/docs/ts/latest/guide/router.html

Keep in mind that routing-related code has changed from earlier versions of Angular, and might also change in the future, so it's better to check more recent posts on the Stack Overflow site as well as the online documentation.

The next section contains a simple yet complete code sample that uses Angular routes.

A Routing Example in Angular

DVD The code sample in this section shows you how to set up basic routing in Angular applications. Copy the directory `BasicRouting` from the companion disc to a convenient location. Notice the following code snippet above the `<body>` element in `index.html`:

```
<base href="/">
```

The preceding code snippet is required for any Angular application that involves routing-related functionality; in fact, Angular relies on this tag to determine how to construct its routing information.

Listing 4.18 displays the contents of `app.component.ts` that illustrates a simple example of routing in Angular.

Listing 4.18: app.component.ts

```
import {Component}            from '@angular/core';
import {ROUTER_PROVIDERS}     from '@angular/router';
import {ROUTER_DIRECTIVES}    from '@angular/router';
import {RouteConfig}         from '@angular/router';

import {About} from './about';
import {Login} from './login';
import {Users} from './users';

@Component({
  selector: 'app-root',
  template: '
     <h1 class="title">Angular Router</h1>
    <nav>
      <a [routerLink]="['About']">About</a>
      <a [routerLink]="['Login']">Login</a>
      <a [routerLink]="['Users']">Users</a>
    </nav>
    <router-outlet></router-outlet>
  '
})
@RouteConfig([
  {path: '/about', name: 'About', component: About},
  {path: '/login', name: 'Login', component: Login,
                                            useAsDefault:true},
  {path: '/users', name: 'Users', component: Users}
])
export class AppComponent { }
```

Listing 4.18 contains three `import` statements for route-related functionality, followed by `import` statements to access the custom components `About`, `Login`, and `Users`.

The `template` property in Listing 4.18 contains a `<nav>` element that comprises three anchor elements to set up the links to the three custom components. The template property also contains the `<router-outlet>` element, which is where the output for each custom component will be rendered.

The last portion of Listing 4.17 contains the `RouteConfig` mapping that makes the association between the custom components and the path elements.

Listing 4.19 displays the contents of `about.ts` that is a component for allowing users to log into the application.

Listing 4.19: about.ts

```
import {Component} from '@angular/core';

@Component({
   selector: 'app-root',
   template: '
     <div>
       <p>This 'About' page is part of the Routing example.
       </p>
      </div>
```

```
    '
})
export class About { }
```

Listing 4.19 is straightforward: The `template` property contains a `<p>` element with a text string that is displayed in the `<router-outlet>` element of the root component.

Listing 4.20 displays the contents of `login.ts` that is a component for allowing users to log in to the application.

Listing 4.20: login.ts

```
import {Component} from '@angular/core';
import {User}      from './user';

@Component({
    selector: 'app-root',
   template: '
     <div>
       <br />
       <label for="uname">Username:</label>
       <input #uname> <br />
       <label for="passwd">Password:</label>
       <input #passwd> <br />
       <button (click)="clickMe(uname.value,passwd.value)">
         Login
       </button>
      </div>
    '
})
export class Login {
   clickMe(name,pwd) {
      // insert your code to validate the username/password
       console.log("Perform validation logic: "+name+" "+pwd);
   }
}
```

Listing 4.21 contains a `template` property that simulates the login process for a user. Input fields for the user name and password are supplied, and when users click the `<button>` element, the `clickMe()` method is invoked but no actual validation is performed in that method.

Listing 4.21: users.ts

```
import {Component} from '@angular/core';
import {User}      from './user';

@Component({
   selector: 'app-root',
   template: '
     <div>
       <ul>
          <li *ngFor="let user of users"
                                 (click)="onSelect(user)">
           {{user.fname}}
          </li>
       </ul>
     </div>
   '
  })
  export class Users {
  users = [
           new User("Jane"),
           new User("Dave"),
           new User("Tom")
          ];

   onSelect(user) {
      console.log("Selected user: "+JSON.stringify(user));
      var index = this.users.indexOf(user);
      this.users.splice(index,1);
   }
}
```

Listing 4.21 contains a `template` property that displays the list of names of the users in the `users` array, which is initialized in the `Users` class. Each user is created as an instance of the `User` class, which currently contains only the first name of a user; a realistic example would obviously contain many more user-related properties.

Listing 4.22 displays the contents of `user.ts` that is a component for allowing users to register themselves in the application.

Listing 4.22: user.ts

```
import {Component} from '@angular/core';

@Component({
   selector: 'user',
   template: '',
})
export class User {
   fname:string;

   constructor(fname:string) {
      this.fname = fname;
   }
}
```

Listing 4.22 defines the `User` class, which contains a constructor for initializing the first name of a user.

Angular Routing with Webpack

If you use Webpack in conjunction with Angular applications, you can perform Angular routing with Webpack using the following router loader:

https://www.npmjs.com/package/angular2-router-loader

The GitHub repository is located here:

https://github.com/brandonroberts/angular2-router-loader

An article that describes how to use the preceding router loader is located here:

https://medium.com/@daviddentoom/angular-2-lazy-loading- with-webpack-d25fe71c29c1#.8srgkl44h

Summary

This chapter started by showing you how to make an `HTTP GET` request to read the contents of a `JSON`-based file. Next you learned how to make an `HTTP GET` request to retrieve information about a `Github` user, and how to make `HTTP POST` requests. You also learned how to retrieve `JSON` data from a website, convert that data to a `Promise`, and then convert the `Promise` into an `Observable`. Finally, you learned how to set up routing in an Angular application.