



ANGULAR 7

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About the Tutorial

Angular 7 is an **open source JavaScript framework** for building web applications and apps in JavaScript, html, and Typescript which is a superset of JavaScript. Angular provides built-in features for animation, http service, and materials which in turn have features such as auto-complete, navigation, toolbar, menus, etc. The code is written in Typescript, which compiles to JavaScript and displays the same in the browser.

Audience

This tutorial is designed for software programmers who want to learn the basics of Angular 7 and its programming concepts in a simple and easy manner. This tutorial will give you enough understanding on the various functionalities of Angular 7 with suitable examples.

Prerequisites

Before proceeding with this tutorial, you should have a basic understanding of HTML, CSS, JavaScript, Typescript, and Document Object Model (DOM).

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1. Angular 7 – Overview

Angular 7 is owned by Google and the stable release was done on 18th October 2018. This is the latest version of Angular.

Below is the list of Angular versions released so far:

Version	Released Date
Angular JS	October 2010
Angular 2.0	Sept 2016
Angular 4.0	March 2017
Angular 5.0	November 2017
Angular 6.0	May 2018
Angular 7.0	October 2018

The release dates for the next two major upcoming versions of Angular are given below:

Version	Released Date
Angular 8.0	March/April 2019
Angular 9.0	September/ October 2019

Google plans to release the major Angular version every 6 months. The version released so far are backward compatible and can be updated to the newer one very easily.

Let us discuss the new features added to Angular 7.

Angular Update to V7

Angular 7 is a major release wherein the angular core framework, Angular CLI, Angular Materials are updated. In case you are using Angular 5 or 6 and want to update to Angular 7, below is the command which will update your app to the recent version of Angular:

```
ng update @angular/cli @angular/core
```

Angular CLI

While doing project setup using angular CLI, it prompts you about the built-in features available, i.e., routing and stylesheet support as shown below:

```
C:\projectA>ng new angular7-app
? Would you like to add Angular routing? <y/N>
```

```
C:\projectA>ng new angular7-app
? Would you like to add Angular routing? Yes
? Which stylesheet format would you like to use?
> CSS
  Sass  [ http://sass-lang.com      ]
  Less   [ http://lesscss.org      ]
  Stylus [ http://stylus-lang.com ]
```

Application Performance

In Angular 7, there is bundle budget added in angular.json as shown below:

```
  "bundles": [
    {
      "type": "initial",
      "maximumWarning": "2mb",
      "maximumError": "5mb"
    }
  ]
```

Budgets is a feature added to Angular CLI which allows you to set limit inside your configuration to make sure your application size is within the limit set. You can set the size so that the app can be warned when the limit is crossed.

Angular Material and CDK

The version of Angular Material/CDK is updated in Angular 7. Also there are 2 features added to CDK: **virtual scrolling, and drag and drop**.

Virtual Scrolling

Virtual scrolling feature shows up the visible dom elements to the user, as the user scrolls, the next list is displayed. This gives faster experience as the full list is not loaded at one go and only loaded as per the visibility on the screen.

Drag and Drop

You can drag and drop elements from a list and place it wherever required within the list. The new feature is very smooth and fast.

2. Angular 7 — Environment Setup

In this chapter, we will discuss the Environment Setup required for Angular 7. To install Angular 7, we require the following:

- Nodejs
- Npm
- Angular CLI
- IDE for writing your code

Nodejs

To check if nodejs is installed on your system, type **node -v** in the terminal. This will help you see the version of nodejs currently installed on your system.

Nodejs has to be greater than 8.x or 10.x, and npm has to be greater than 5.6 or 6.4.

```
C:\>node -v  
v10.15.1
```

If it does not print anything, install nodejs on your system. To install nodejs, go to the homepage, <https://nodejs.org/en/download/> of nodejs and install the package based on your OS.

The homepage of nodejs is as follows:

The screenshot shows the Node.js download page. At the top, there's a navigation bar with links for HOME, ABOUT, DOWNLOADS, DOCS, GET INVOLVED, SECURITY, NEWS, and FOUNDATION. Below the navigation bar, a banner says "Downloads". It highlights the "Latest LTS Version: 10.15.1 (includes npm 6.4.1)". Under the "LTS" section, there's a "Windows Installer" link with a ".msi" file icon. Under the "Current" section, there's a "macOS Installer" link with a ".pkg" file icon and a "Source Code" link with a ".tar.gz" file icon. A table below lists download links for various platforms and architectures:

	32-bit	64-bit
Windows Installer (.msi)	node-v10.15.1-x86.msi	node-v10.15.1-x64.msi
Windows Binary (.zip)	node-v10.15.1-win32.zip	node-v10.15.1-win64.zip
macOS Installer (.pkg)	node-v10.15.1-macosx.pkg	node-v10.15.1-macosx-x64.pkg
macOS Binary (.tar.gz)	node-v10.15.1-macosx.tar.gz	node-v10.15.1-macosx-x64.tar.gz
Linux Binaries (x64)	node-v10.15.1-linux-x64.tar.gz	node-v10.15.1-linux-x64.tar.gz

Based on your OS, install the required package. Once nodejs is installed, npm will also get installed along with it. To check if npm is installed or not, type `npm -v` in the terminal as given below. It will display the version of the npm.

```
C:\>npm -v
6.4.1
```

Angular 7 installations are very simple with the help of angular CLI. Visit the homepage <https://cli.angular.io/> of angular to get the reference of the command.

Angular CLI

A command line interface for Angular

GET STARTED

ng new

The Angular CLI makes it easy to create an application that already works, right out of the box. It already follows our best practices!

Type **npm install -g @angular/cli** in your command prompt, to install angular cli on your system. It will take a while to install and once done you can check the version using below command:

```
ng version
```

It will display version details of angular - cli as well version of others packages as shown below:

```
C:\projectA7>ng version
Angular CLI: 7.3.2
Node: 10.15.1
OS: win32 x64
Angular:
...
Package          Version
@angular-devkit/architect    0.13.2
@angular-devkit/core         7.3.2
@angular-devkit/schematics   7.3.2
@schematics/angular          7.3.2
@schematics/update           0.13.2
rxjs                          6.3.3
typescript                   3.2.4
```

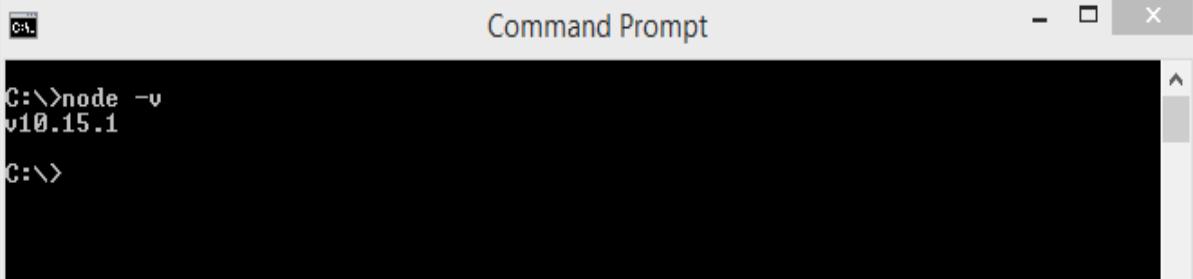
We are done with the installation of Angular 7. You can use any IDE of your choice, i.e., WebStorm, Atom, Visual Studio Code to start working with Angular 7.

The details of the project setup are explained in the next chapter.

3. Angular 7 — Project Setup

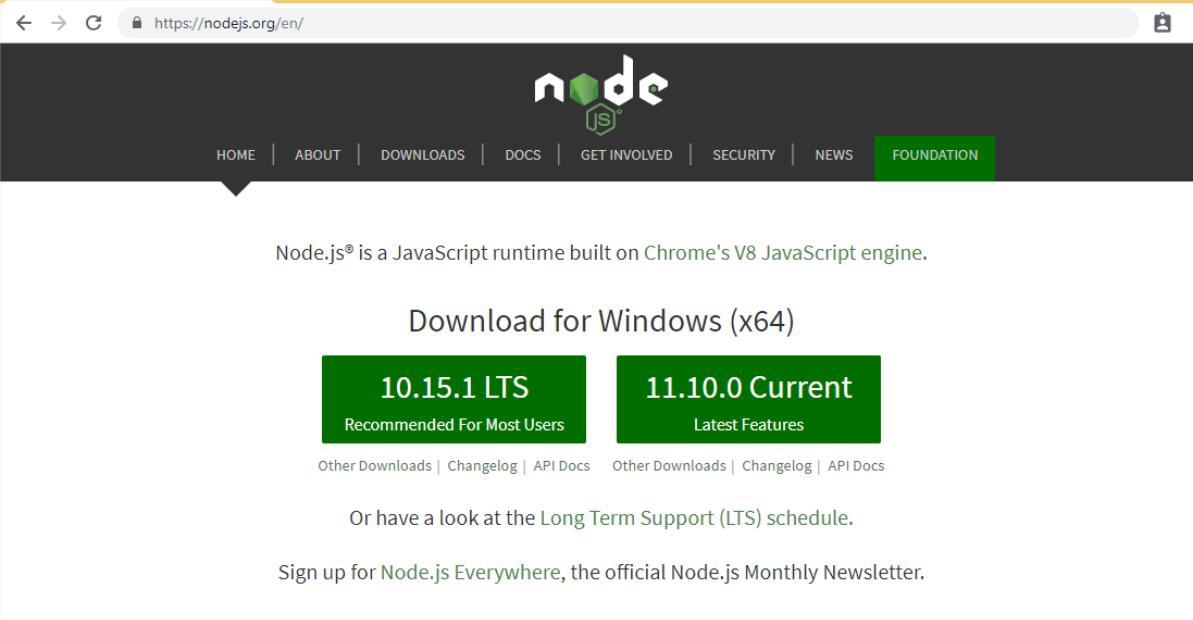
In this chapter, we shall discuss about the Project Setup in Angular 7.

To get started with the project setup, make sure you have nodejs installed. **You can check the version of node in the command line using the command, node -v, as shown below:**



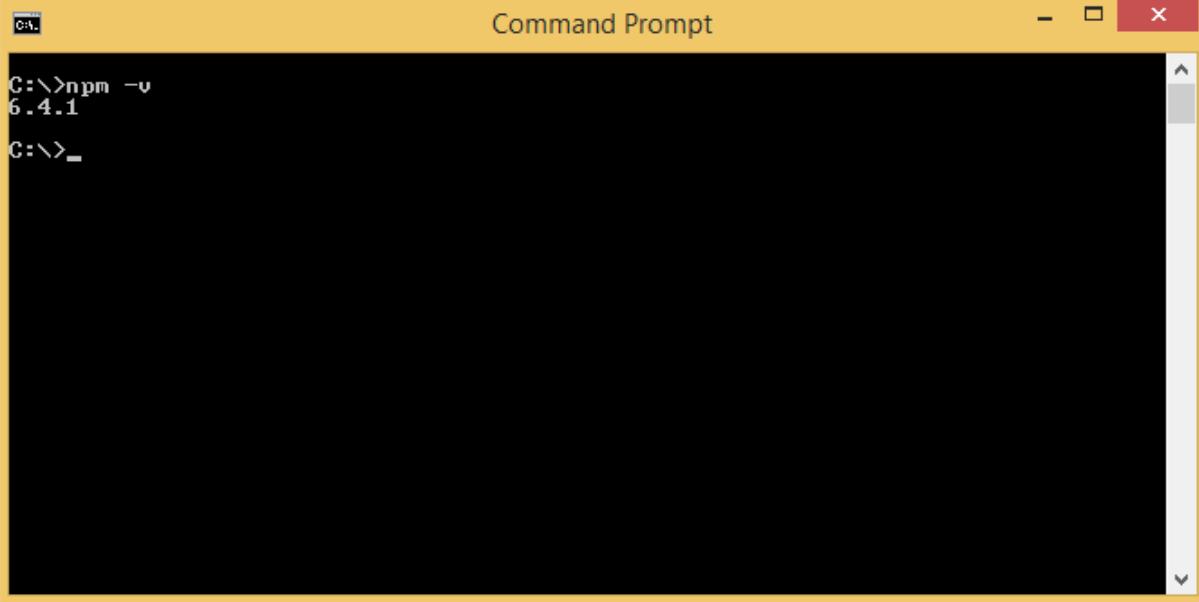
```
C:\>node -v
v10.15.1
C:\>
```

If you do not get the version, install nodejs from their official site: <https://nodejs.org/en/>.



The screenshot shows the Node.js homepage with the URL https://nodejs.org/en/ in the browser address bar. The page features the Node.js logo at the top center. Below the logo is a navigation bar with links: HOME, ABOUT, DOWNLOADS, DOCS, GET INVOLVED, SECURITY, NEWS, and FOUNDATION. The FOUNDATION link is highlighted with a green background. A large text block below the navigation bar states: "Node.js® is a JavaScript runtime built on Chrome's V8 JavaScript engine." Two prominent download buttons are displayed: "10.15.1 LTS" (Recommended For Most Users) and "11.10.0 Current" (Latest Features). Below these buttons are links to "Other Downloads", "Changelog", and "API Docs". A note encourages users to look at the "Long Term Support (LTS) schedule". At the bottom, there is a call to action to "Sign up for Node.js Everywhere, the official Node.js Monthly Newsletter."

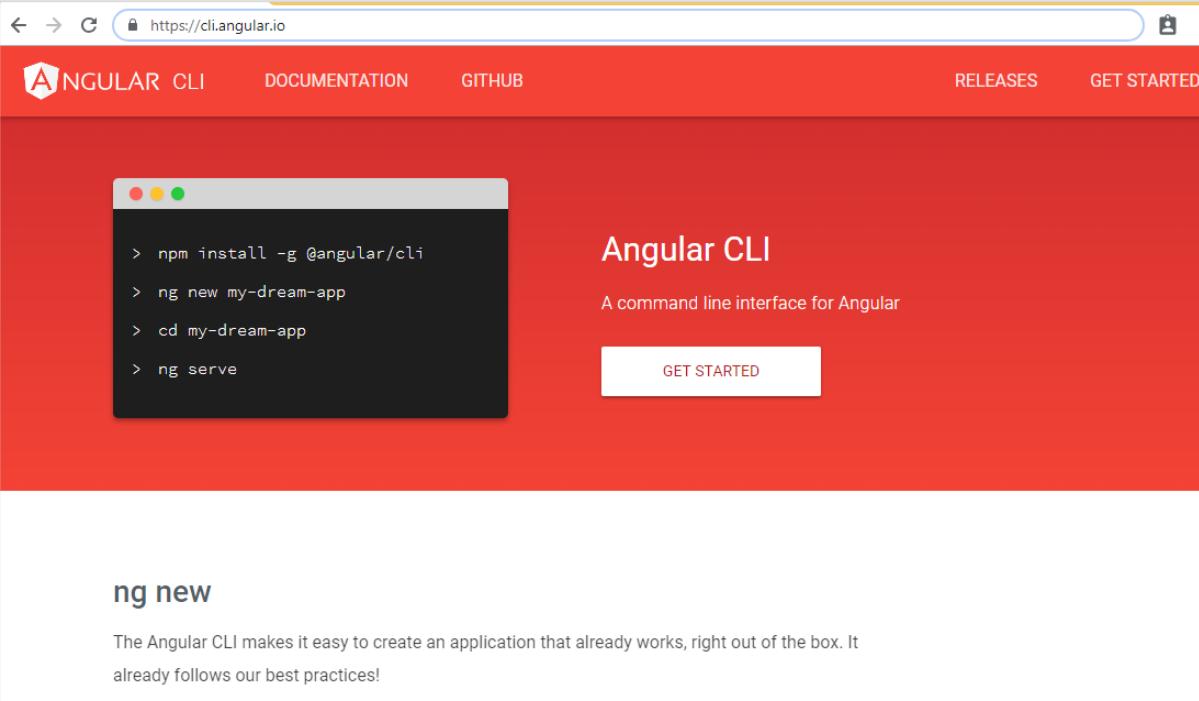
Once you have nodejs installed, npm will also get installed with it. To check npm version, run npm -v in command line as shown below:



```
C:\>npm -v
6.4.1
C:\>_
```

So we have node version 10 and npm version 6.4.1.

To install Angular 7, go to the site, <https://cli.angular.io> to install Angular CLI.



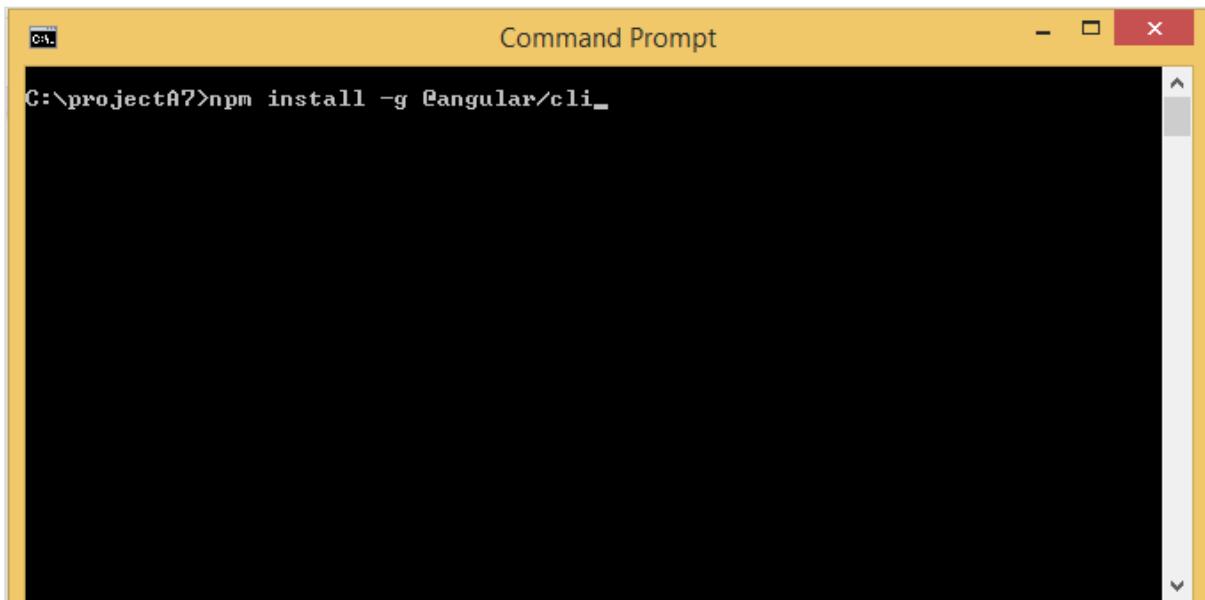
You will see the following commands on the webpage:

```
npm install -g @angular/cli //command to install angular 7
ng new my-dream-app // name of the project
cd my-dream-app

ng serve
```

The above commands help to get the project setup in Angular 7.

We will create a folder called **projectA7** and install **angular/cli** as shown below:



```
C:\>npm install -g @angular/cli
```

Once the installation is done, check the details of the packages installed by using the command `ng version` as shown below:



```
C:\>ng version
```

Angular CLI: 7.3.2
 Node: 10.15.1
 OS: win32 x64
 Angular:
 ...
 Package Version
 @angular-devkit/architect 0.13.2
 @angular-devkit/core 7.3.2
 @angular-devkit/schematics 7.3.2
 @schematics/angular 7.3.2
 @schematics/update 0.13.2
 rxjs 6.3.3
 typescript 3.2.4

It gives the version for Angular CLI, typescript version and other packages available for Angular 7.

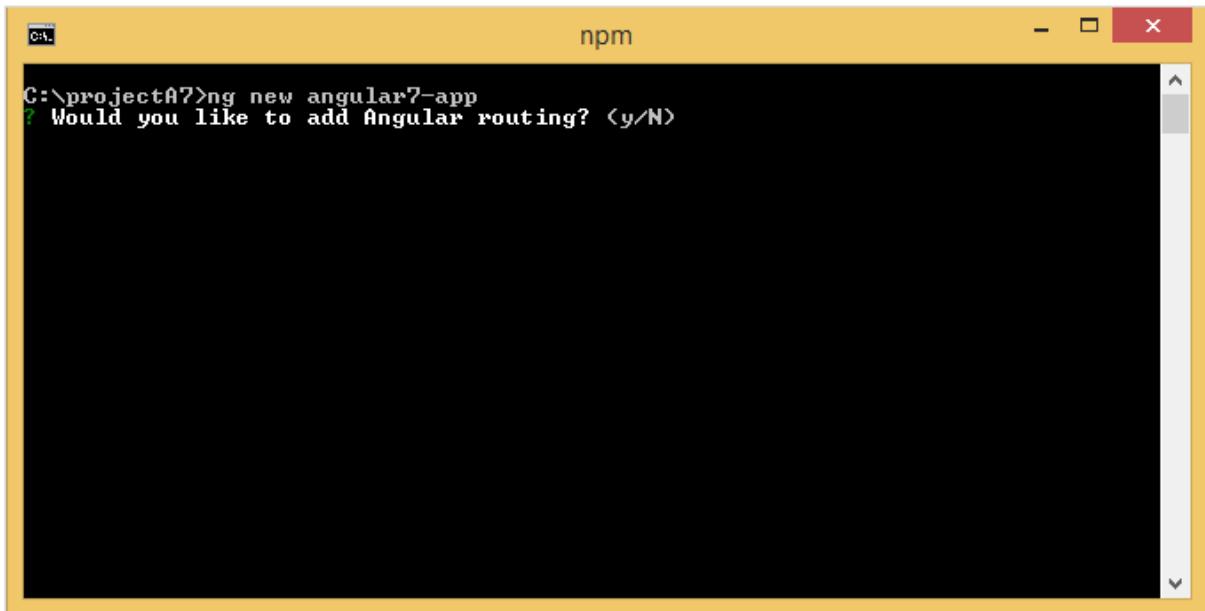
We are done with the installation of Angular 7, now we will start with the project setup.

To create a project in Angular 7, we will use the following command:

```
ng new projectname
```

You can use the *projectname* of your choice. Let us now run the above command in the command line.

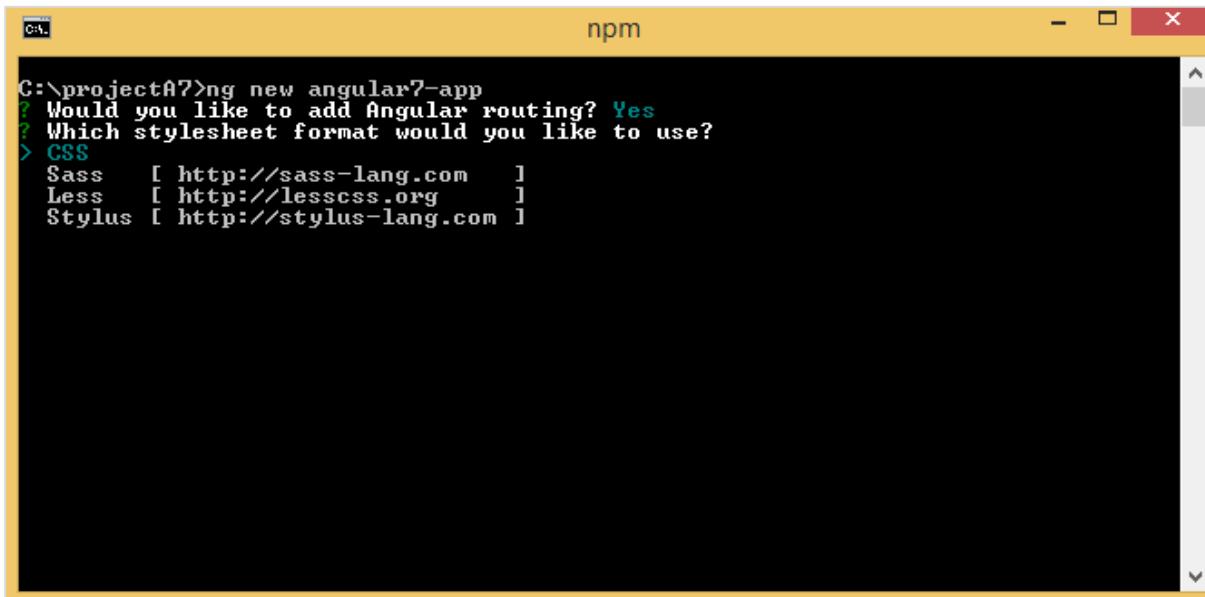
Here, we use the *projectname* as *angular7-app*. Once you run the command it will ask you about routing as shown below:



```
C:\>ng new angular7-app
? Would you like to add Angular routing? <y/N>
```

Type *y* to add routing to your project setup.

The next question is about the stylesheet:



```
C:\>ng new angular7-app
? Would you like to add Angular routing? Yes
? Which stylesheet format would you like to use?
> CSS
  Sass  [ http://sass-lang.com      ]
  Less   [ http://lesscss.org      ]
  Stylus [ http://stylus-lang.com ]
```

The options available are CSS, Sass, Less and Stylus. In the above screenshot, the arrow is on CSS. To change, you can use arrow keys to select the one required for your project setup. At present, we shall discuss CSS for our project-setup.

```

C:\>ng new angular7-app
? Would you like to add Angular routing? Yes
? Which stylesheet format would you like to use? CSS
CREATE angular7-app/angular.json <3861 bytes>
CREATE angular7-app/package.json <1311 bytes>
CREATE angular7-app/README.md <1028 bytes>
CREATE angular7-app/tsconfig.json <435 bytes>
CREATE angular7-app/tslint.json <1621 bytes>
CREATE angular7-app/.editorconfig <246 bytes>
CREATE angular7-app/.gitignore <629 bytes>
CREATE angular7-app/src/favicon.ico <5430 bytes>
CREATE angular7-app/src/index.html <298 bytes>
CREATE angular7-app/src/main.ts <372 bytes>
CREATE angular7-app/src/polyfills.ts <2841 bytes>
CREATE angular7-app/src/styles.css <80 bytes>
CREATE angular7-app/src/test.ts <642 bytes>
CREATE angular7-app/src/browserslist <388 bytes>
CREATE angular7-app/src/karma.conf.js <1025 bytes>
CREATE angular7-app/src/tsconfig.app.json <166 bytes>
CREATE angular7-app/src/tsconfig.spec.json <256 bytes>
CREATE angular7-app/src/tslint.json <314 bytes>
CREATE angular7-app/src/assets/.gitkeep <0 bytes>
CREATE angular7-app/src/environments/environment.prod.ts <51 bytes>
CREATE angular7-app/src/environments/environment.ts <662 bytes>
CREATE angular7-app/src/app/app-routing.module.ts <245 bytes>
CREATE angular7-app/src/app/app.module.ts <393 bytes>
CREATE angular7-app/src/app/app.component.html <1152 bytes>
CREATE angular7-app/src/app/app.component.spec.ts <1113 bytes>
CREATE angular7-app/src/app/app.component.ts <216 bytes>
CREATE angular7-app/src/app/app.component.css <0 bytes>
CREATE angular7-app/e2e/protractor.conf.js <752 bytes>
CREATE angular7-app/e2e/tsconfig.e2e.json <213 bytes>
CREATE angular7-app/e2e/src/app.e2e-spec.ts <641 bytes>
CREATE angular7-app/e2e/src/app.po.ts <251 bytes>
npm WARN deprecated circular-json@0.5.9: CircularJSON is in maintenance only, flattened is its successor.

> node-sass@4.11.0 install C:\projectA7\angular7-app\node_modules\node-sass
> node scripts/install.js

Downloading binary from https://github.com/sass/node-sass/releases/download/v4.1.0/win32-x64-64_binding.node
Download complete [1 - :
Binary saved to C:\projectA7\angular7-app\node_modules\node-sass\vendor\win32-x64-64_binding.node
Caching binary to C:\Users\Kamat\AppData\Roaming\npm-cache\node-sass\4.11.0\win32-x64-64_binding.node

> node-sass@4.11.0 postinstall C:\projectA7\angular7-app\node_modules\node-sass
> node scripts/build.js

Binary found at C:\projectA7\angular7-app\node_modules\node-sass\vendor\win32-x64-64_binding.node
Testing binary
Binary is fine
npm WARN optional SKIPPING OPTIONAL DEPENDENCY: fsevents@1.2.7 (node_modules\fse

```

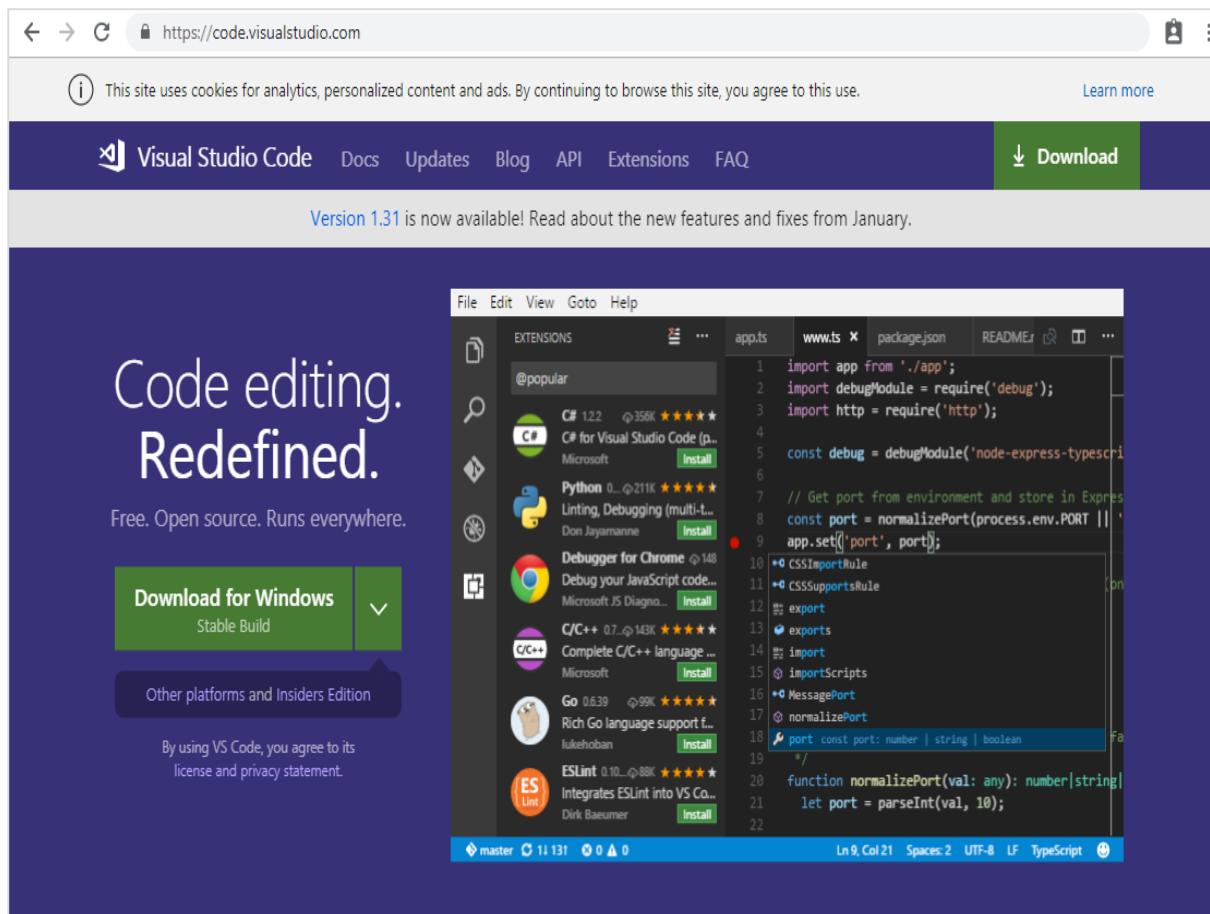
The project **angular7-app** is created successfully. It installs all the required packages necessary for our project to run in Angular7. Let us now switch to the project created, which is in the directory **angular7-app**.

Change the directory in the command line using the given line of code:

```
cd angular7-app
```

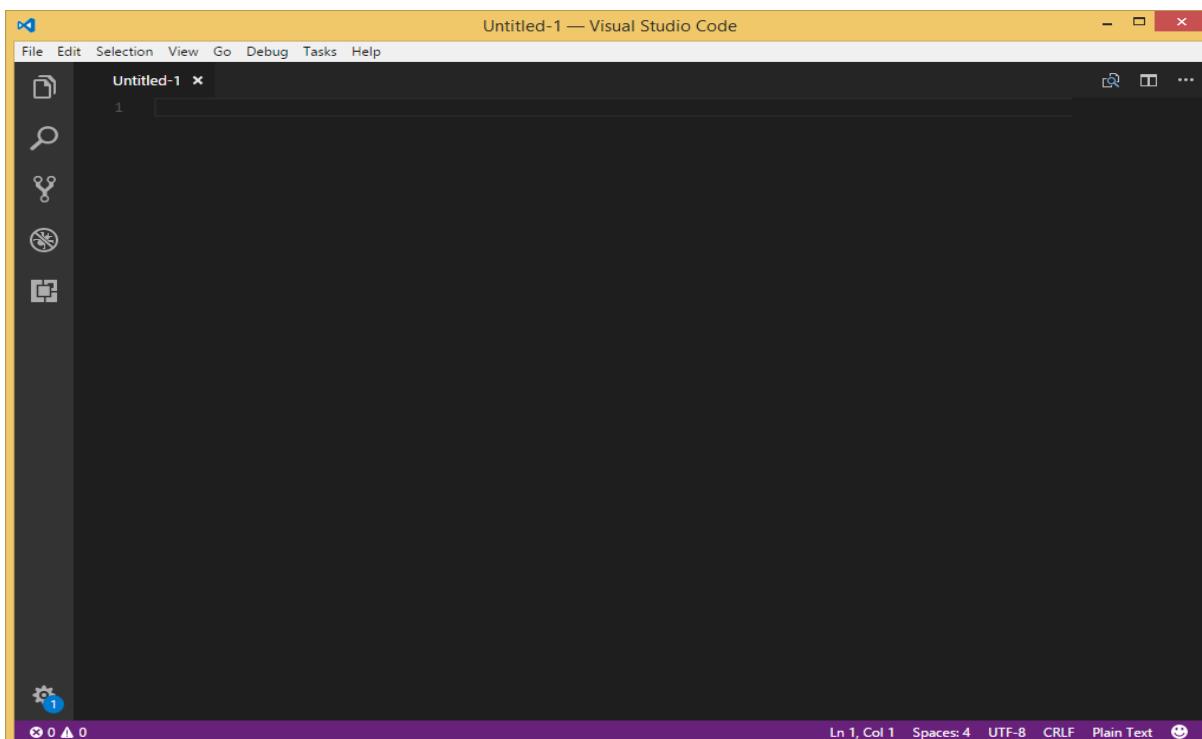
We will use Visual Studio Code IDE for working with Angular 7, you can use any IDE, i.e., Atom, WebStorm, etc.

To download Visual Studio Code, go to <https://code.visualstudio.com/> and click Download for Windows.

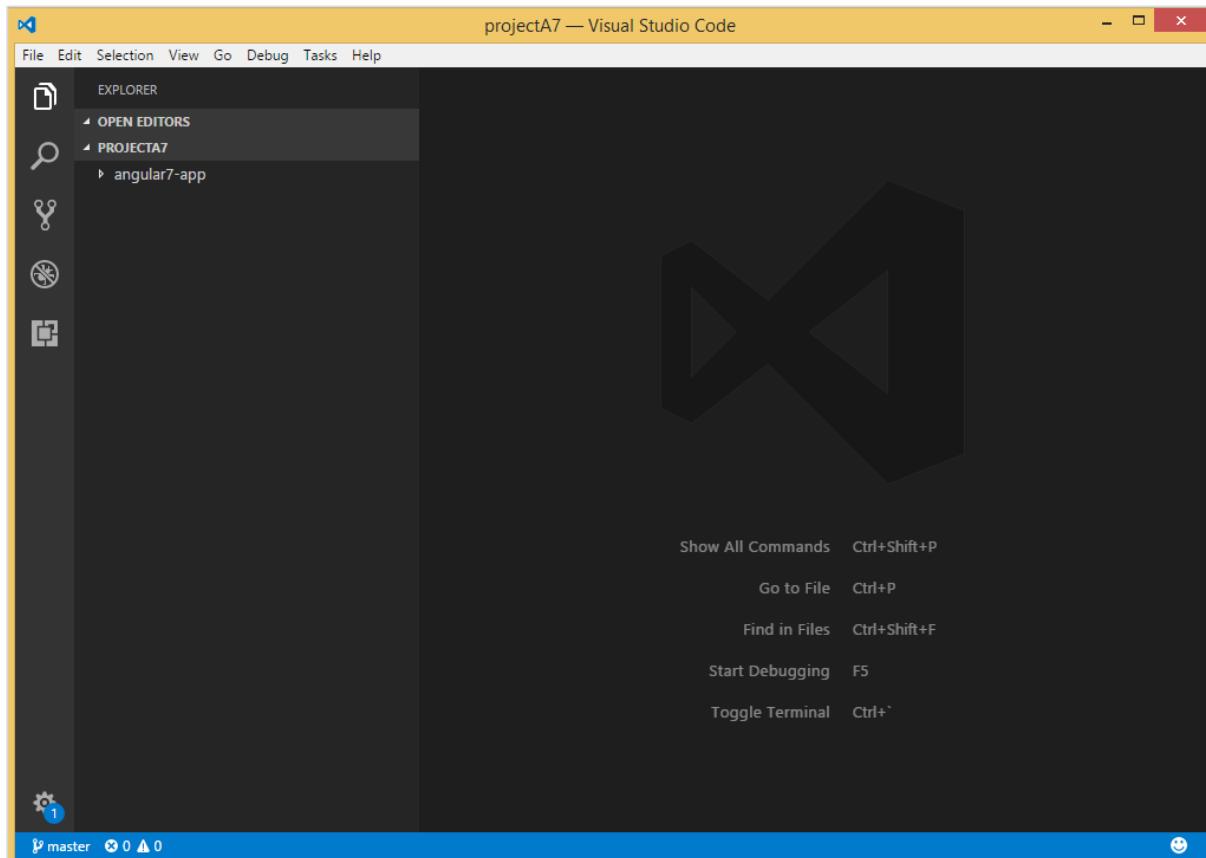


Click Download for Windows for installing the IDE and run the setup to start using IDE.

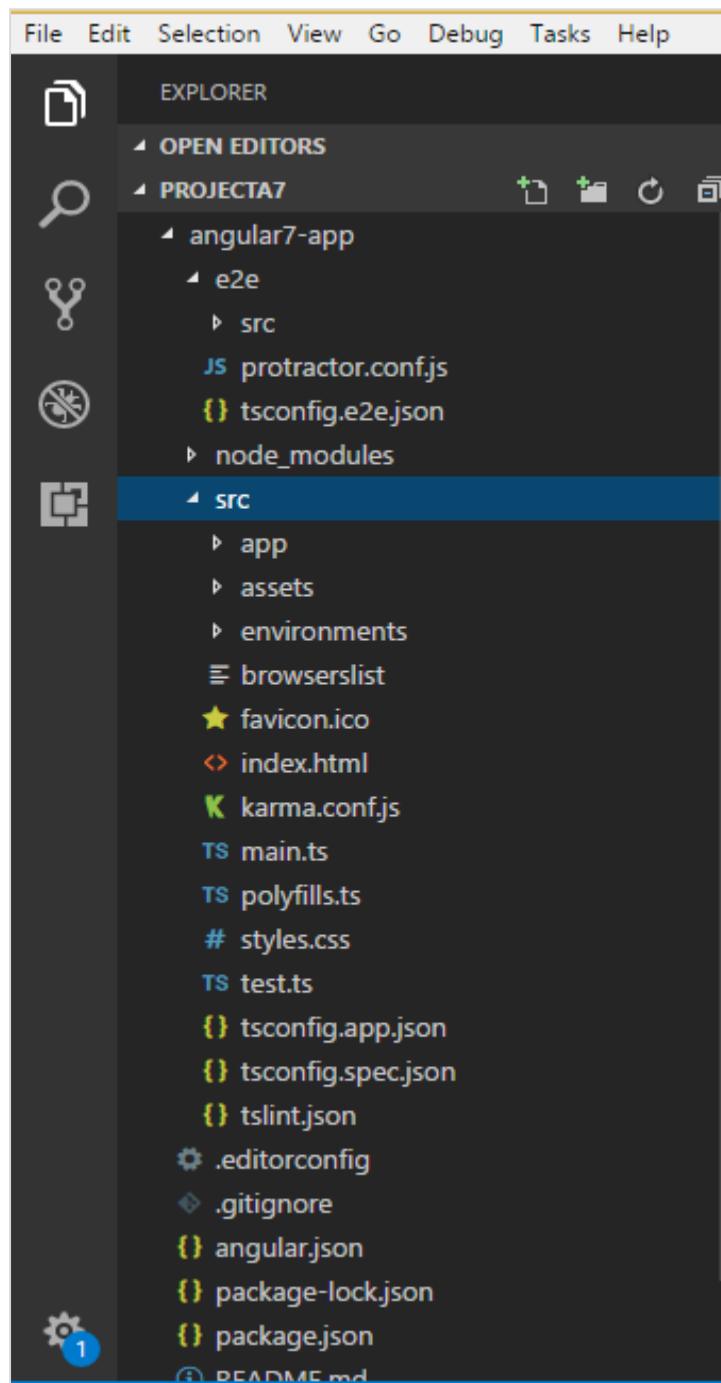
Following is the Editor:



We have not started any project in it. Let us now take the project we have created using angular-cli.



We will consider the **angular7-app** project. Let us open the **angular7-app** and see how the folder structure looks like.



Now that we have the file structure for our project, let us compile our project with the following command:

```
ng serve
```

The ng serve command builds the application and starts the web server.

```
C:\projectA7\angular7-app>ng serve
```

You will see the below when the command starts executing:

```
ng serve
** Angular Live Development Server is listening on localhost:4200, open your browser on http://localhost:4200/ **
25% building 99/100 modules 1 active ...les\core-js\modules\es6.string.fixed.js
25% building 100/101 modules 1 active ...core-js\modules\es6.string.fontcolor.js
25% building 101/102 modules 1 active ...core-js\modules\es6.string.fontSize.js
25% building 102/103 modules 1 active ...s\modules\es6.string.fromCodePoint.js
25% building 103/104 modules 1 active ...es\core-js\modules\es6.string.repeat.js
25% building 104/105 modules 1 active ...s\core-js\modules\es6.string.italics.js
25% building 105/106 modules 1 active ...ules\core-js\modules\es6.string.link.js
25% building 106/107 modules 1 active ...les\core-js\modules\es6.string.small.js
25% building 107/108 modules 1 active ...dules\core-js\modules\es6.string.sub.js
25% building 108/109 modules 1 active ...es\core-js\modules\es6.string.strike.js
25% building 109/110 modules 1 active ...dules\core-js\modules\es6.string.sup.js
25% building 110/111 modules 1 active ...les\core-js\modules\es6.regexp.match.js
25% building 111/112 modules 1 active ...es\core-js\modules\es6.regexp.search.js
25% building 112/113 modules 1 active ...les\core-js\modules\es6.regexp.split.js
25% building 113/114 modules 1 active ...es\core-js\modules\es6.string.anchor.js
25% building 114/115 modules 1 active ...dules\core-js\modules\es6.string.big.js
25% building 115/116 modules 1 active ...dules\core-js\modules\es6.math.acosh.js
25% building 116/117 modules 1 active ...core-js\modules\es6.string.iterator.js
25% building 117/118 modules 1 active ...s\core-js\modules\es6.regexp.replace.js
25% building 118/119 modules 1 active ...dules\core-js\modules\es6.math.asinh.js
25% building 119/120 modules 1 active ...dules\core-js\modules\es6.math.atanh.js
```

The web server starts on port 4200. Type the url, <http://localhost:4200/> in the browser and see the output. Once the project is compiled, you will receive the following output:

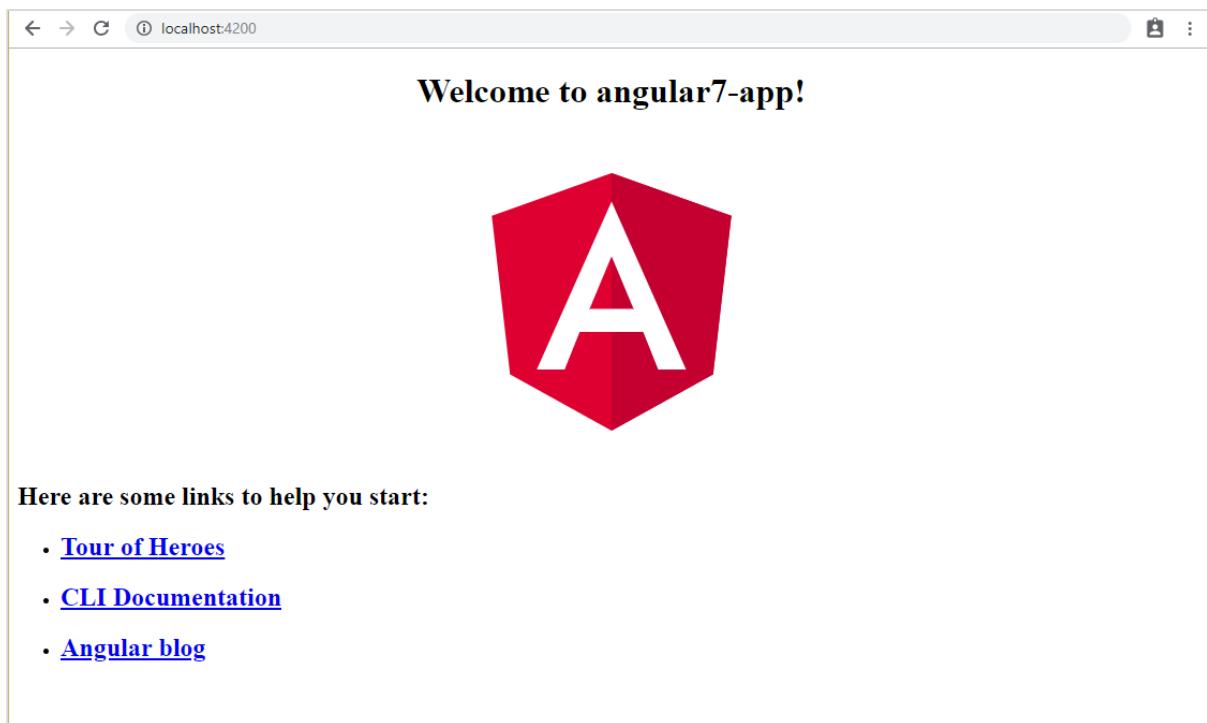
```

93% after chunk asset optimization SourceMapDevToolPlugin main.js generate Sour
93% after chunk asset optimization SourceMapDevToolPlugin polyfills.js generate S
93% after chunk asset optimization SourceMapDevToolPlugin runtime.js generate S
93% after chunk asset optimization SourceMapDevToolPlugin styles.js generate So
93% after chunk asset optimization SourceMapDevToolPlugin vendor.js generate So
93% after chunk asset optimization SourceMapDevToolPlugin es2015-polyfills.js ge
93% after chunk asset optimization SourceMapDevToolPlugin main.js attach Source
93% after chunk asset optimization SourceMapDevToolPlugin polyfills.js attach S
93% after chunk asset optimization SourceMapDevToolPlugin runtime.js attach Sou
93% after chunk asset optimization SourceMapDevToolPlugin styles.js attach Sour
93% after chunk asset optimization SourceMapDevToolPlugin vendor.js attach Sour

Date: 2019-02-22T05:07:45.726Z
Hash: e6f74e8b478aaf201fbcd
Time: 111483ms
chunk {es2015-polyfills} es2015-polyfills.js, es2015-polyfills.js.map <es2015-po
lyfills> 284 kB [initial] [rendered]
chunk {main} main.js, main.js.map <main> 11.5 kB [initial] [rendered]
chunk {polyfills} polyfills.js, polyfills.js.map <polyfills> 236 kB [initial] [r
endered]
chunk {runtime} runtime.js, runtime.js.map <runtime> 6.08 kB [entry] [rendered]
chunk {styles} styles.js, styles.js.map <styles> 16.3 kB [initial] [rendered]
chunk {vendor} vendor.js, vendor.js.map <vendor> 3.76 MB [initial] [rendered]
i ?wdm?: Compiled successfully.

```

Once you run url, <http://localhost:4200/> in the browser, you will be directed to the following screen:



Let us now make some changes to display the following content:

"Welcome to Angular 7!"



We have made changes in the files — **app.component.html** and **app.component.ts**. We will discuss more about this in our subsequent chapters.

Let us complete the project setup. If you see we have used port 4200, which is the default port that angular-cli makes use of while compiling. You can change the port if you wish using the following command –

```
ng serve --host 0.0.0.0 -port 4205
```

The angular7-app/ folder has the following **folder structure**:

- **e2e/**: end to end test folder. Mainly e2e is used for integration testing and helps ensure the application works fine.
- **node_modules/**: The npm package installed is node_modules. You can open the folder and see the packages available.
- **src/**: This folder is where we will work on the project using Angular 7. Inside src/ you will app/ folder created during the project setup and holds all the required files required for the project.

The angular7-app/ folder has the following **file structure**:

- **angular.json**: It basically holds the project name, version of cli, etc.
- **.editorconfig**: This is the config file for the editor.
- **.gitignore**: A .gitignore file should be committed into the repository, in order to share the ignore rules with any other users that clone the repository.
- **package.json**: The package.json file tells which libraries will be installed into node_modules when you run npm install.

At present, if you open the file package.json in the editor, you will get the following modules added in it:

```
"@angular/animations": "~7.2.0",
"@angular/common": "~7.2.0",
"@angular/compiler": "~7.2.0",
"@angular/core": "~7.2.0",
"@angular/forms": "~7.2.0",
"@angular/platform-browser": "~7.2.0",
"@angular/platform-browser-dynamic": "~7.2.0",
"@angular/router": "~7.2.0",
"core-js": "^2.5.4",
"rxjs": "~6.3.3",
"tslib": "^1.9.0",
"zone.js": "~0.8.26"
```

In case you need to add more libraries, you can add those over here and run the npm install command.

- **tsconfig.json**: This basically contains the compiler options required during compilation.
- **tslint.json**: This is the config file with rules to be considered while compiling.

The **src/** folder is the main folder, which internally has a different file structure.

app

It contains the files described below. These files are installed by angular-cli by default.

app.module.ts

If you open the file, you will see that the code has reference to different libraries, which are imported. Angular-cli has used these default libraries for the import: angular/core, platform-browser.

The names itself explain the usage of the libraries. They are imported and saved into variables such as declarations, imports, providers, and bootstrap.

We can see **app-routing.module** is also added. This is because we had selected routing at the start of the installation. The module is added by @angular/cli.

Following is the structure of the file:

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

```

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

```

@NgModule is imported from @angular/core and it has object with following properties:

declarations: In declarations, the reference to the components is stored. The AppComponent is the default component that is created whenever a new project is initiated. We will learn about creating new components in a different section.

imports: This will have the modules imported as shown above. At present, BrowserModule is part of the imports which is imported from @angular/platform-browser. There is also routing module added AppRoutingModule.

providers: This will have reference to the services created. The service will be discussed in a subsequent chapter.

bootstrap: This has reference to the default component created, i.e., AppComponent.

app.component.css: You can write your css over here. Right now, we have added the background color to the div as shown below.

The structure of the file is as follows:

```

.divdetails{
  background-color: #ccc;
}

```

app.component.html

The html code will be available in this file.

The structure of the file is as follows:

```

<!--The content below is only a placeholder and can be replaced.-->
<div style="text-align:center">
  <h1>

```

```

    Welcome to {{ title }}!

</h1>



</div>

<h2>Here are some links to help you start: </h2>

<ul>
  <li>
    <h2><a target="_blank" rel="noopener"
    href="https://angular.io/tutorial">Tour of Heroes</a></h2>
  </li>
  <li>
    <h2><a target="_blank" rel="noopener" href="https://angular.io/cli">CLI
    Documentation</a></h2>
  </li>
  <li>
    <h2><a target="_blank" rel="noopener"
    href="https://blog.angular.io/">Angular blog</a></h2>
  </li>
</ul>
<router-outlet></router-outlet>

```

This is the default html code currently available with the project creation.

app.component.spec.ts

These are automatically generated files which contain **unit tests** for source component.

app.component.ts

The class for the component is defined over here. You can do the processing of the html structure in the .ts file. The processing will include activities such as connecting to the database, interacting with other components, routing, services, etc.

The structure of the file is as follows:

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

```
@Component({
```

```

    selector: 'app-root',
    templateUrl: './app.component.html',
    styleUrls: ['./app.component.css']
  })
export class AppComponent {
  title = 'Angular 7';
}

```

app-routing.module.ts

This file will deal with the routing required for your project. It is connected with the main module, i.e., app.module.ts.

The structure of the file is as follows:

```

import { NgModule } from '@angular/core';
import { Routes, RouterModule } from '@angular/router';

const routes: Routes = [];

@NgModule({
  imports: [RouterModule.forRoot(routes)],
  exports: [RouterModule]
})
export class AppRoutingModule { }

```

Assets

You can save your images, js files in this folder.

Environment

This folder has details for the production or the dev environment. The folder contains two files.

- environment.prod.ts
- environment.ts

Both the files have details of whether the final file should be compiled in the production environment or the dev environment.

The additional file structure of *angular7-app/* folder includes the following:

favicon.ico

This is a file that is usually found in the root directory of a website.

index.html

This is the file which is displayed in the browser.

```
<!doctype html>
<html lang="en">
<head>
  <meta charset="utf-8">
  <title>Angular7App</title>
  <base href="/">

  <meta name="viewport" content="width=device-width, initial-scale=1">
  <link rel="icon" type="image/x-icon" href="favicon.ico">
</head>
<body>
  <app-root></app-root>
</body>
</html>
```

The body has **<app-root></app-root>**. This is the selector which is used in **app.component.ts** file and will display the details from **app.component.html** file.

main.ts

main.ts is the file from where we start our project development. It starts with importing the basic module which we need. Right now if you see angular/core, angular/platform-browser-dynamic, app.module and environment is imported by default during angular-cli installation and project setup.

```
import { enableProdMode } from '@angular/core';
import { platformBrowserDynamic } from '@angular/platform-browser-dynamic';

import { AppModule } from './app/app.module';
import { environment } from './environments/environment';

if (environment.production) {
  enableProdMode();
}

platformBrowserDynamic().bootstrapModule(AppModule)
  .catch(err => console.error(err));
```

The `platformBrowserDynamic().bootstrapModule(AppModule)` has the parent module reference `AppModule`. Hence, when it executes in the browser, the file is called `index.html`. `Index.html` internally refers to `main.ts` which calls the parent module, i.e., `AppModule` when the following code executes:

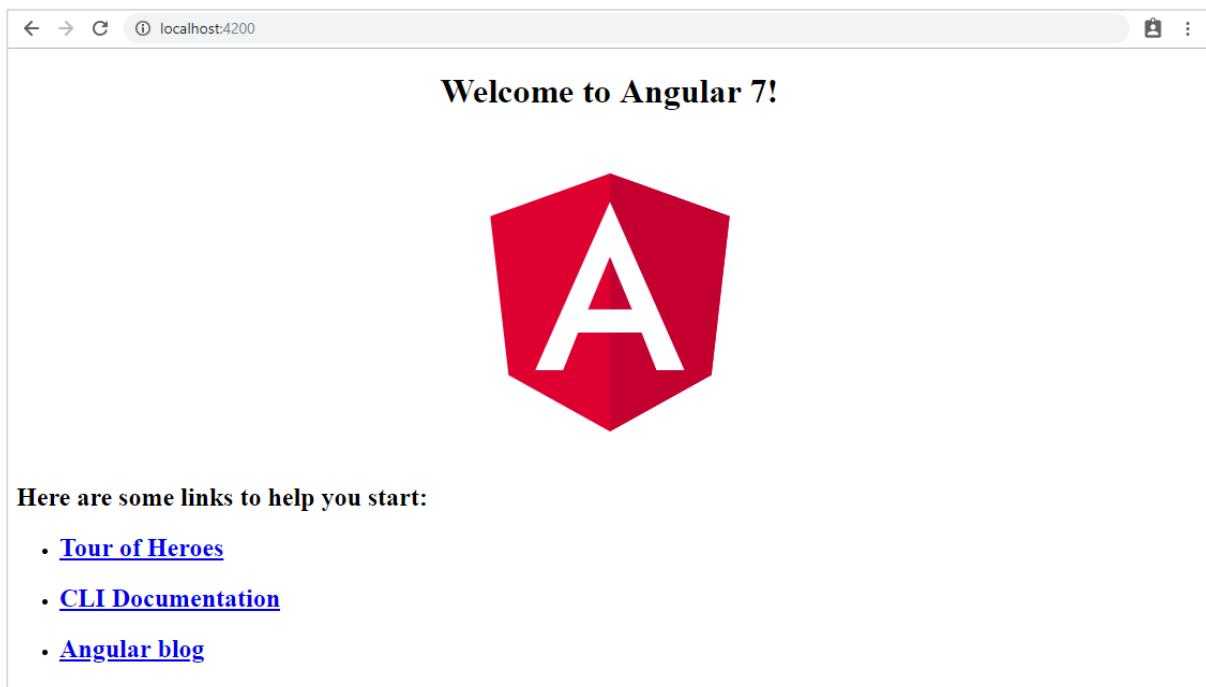
```
platformBrowserDynamic().bootstrapModule(AppModule) .catch(err =>
  console.error(err));
```

When `AppModule` is called, it calls `app.module.ts` which further calls the `AppComponent` based on the bootstrap as follows:

```
bootstrap: [AppComponent]
```

In `app.component.ts`, there is a selector: `app-root` which is used in the `index.html` file. This will display the contents present in `app.component.html`.

The following will be displayed in the browser:



polyfill.ts

This is mainly used for backward compatibility.

styles.css

This is the style file required for the project.

test.ts

Here, the unit test cases for testing the project will be handled.

tsconfig.app.json

This is used during compilation, it has the config details that need to be used to run the application.

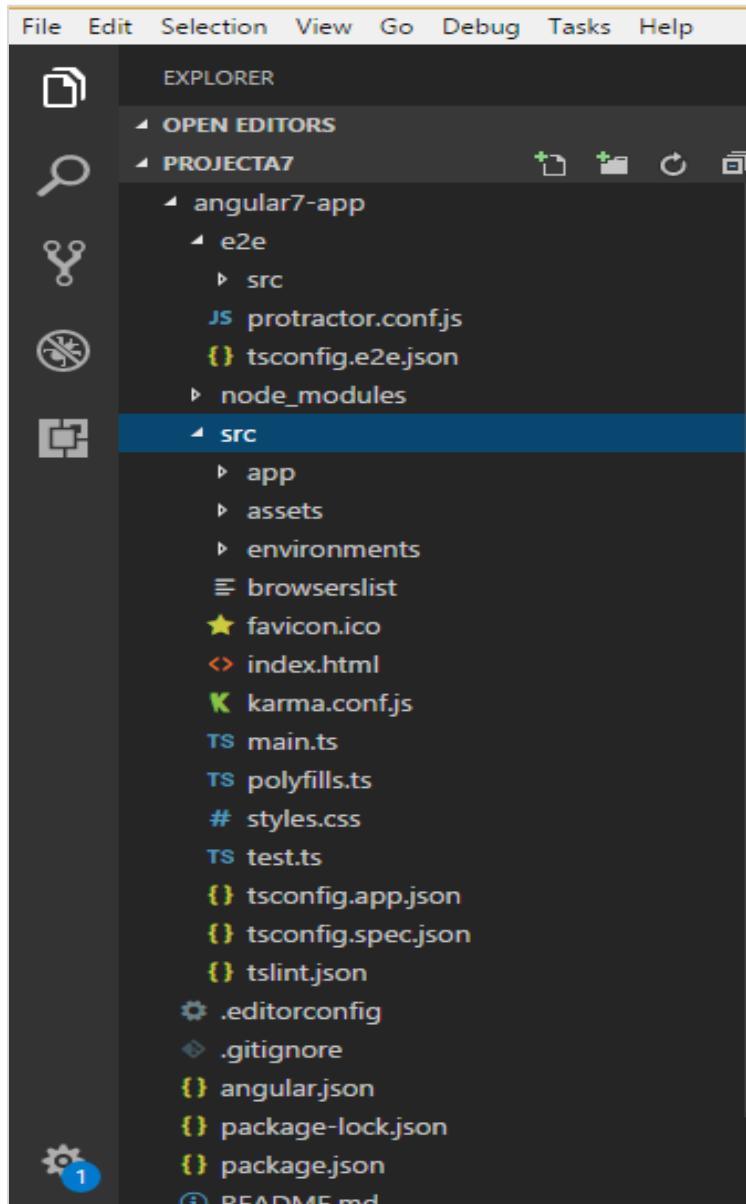
tsconfig.spec.json

This helps maintain the details for testing.

typings.d.ts

It is used to manage the Typescript definition.

The final file structure will be as follows:



4. Angular 7 — Components

Major part of the development with Angular 7 is done in the components. Components are basically classes that interact with the .html file of the component, which gets displayed on the browser. We have seen the file structure in one of our previous chapters.

The file structure has the app component and it consists of the following files:

- `app.component.css`
- `app.component.html`
- `app.component.spec.ts`
- `app.component.ts`
- `app.module.ts`

And if you have selected angular routing during your project setup, files related to routing will also get added and the files are as follows:

- `app-routing.module.ts`

The above files are created by default when we created new project using the angular-cli command.

If you open up the **app.module.ts** file, it has some libraries which are imported and also a declarative which is assigned the appcomponent as follows:

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

import { AppRoutingModule } from './app-routing.module';
import { AppComponent } from './app.component';

@NgModule({
  declarations: [
    AppComponent
  ],
  imports: [
    BrowserModule,
    AppRoutingModule
  ],
  providers: [],
  bootstrap: [AppComponent]
})
```

```
export class AppModule { }
```

The declarations include the AppComponent variable, which we have already imported. This becomes the parent component.

Now, angular-cli has a command to create your own component. However, the app component which is created by default will always remain the parent and the next components created will form the child components.

Let us now run the command to create the component with the below line of code:

```
ng g component new-cmp
```

When you run the above command in the command line, you will receive the following output:

```
C:\projectA7\angular7-app>ng g component new-cmp
CREATE src/app/new-cmp/new-cmp.component.html (26 bytes)
CREATE src/app/new-cmp/new-cmp.component.spec.ts (629 bytes)
CREATE src/app/new-cmp/new-cmp.component.ts (272 bytes)
CREATE src/app/new-cmp/new-cmp.component.css (0 bytes)
UPDATE src/app/app.module.ts (477 bytes)
```

Now, if we go and check the file structure, we will get the new-cmp new folder created under the **src/app** folder.

The following files are created in the new-cmp folder:

- new-cmp.component.css – css file for the new component is created.
- new-cmp.component.html – html file is created.
- new-cmp.component.spec.ts – this can be used for unit testing.
- new-cmp.component.ts – here, we can define the module, properties, etc.

Changes are added to the **app.module.ts** file as follows:

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

import { AppRoutingModule } from './app-routing.module';
import { AppComponent } from './app.component';
import { NewCmpComponent } from './new-cmp/new-cmp.component';

// includes the new-cmp component we created

@NgModule({
  declarations: [
```

```

    AppComponent,
    NewCmpComponent // here it is added in declarations and will behave as a
child component
],
imports: [
  BrowserModule,
  AppRoutingModule
],
providers: [],
bootstrap: [AppComponent] //for bootstrap the AppComponent the main app
component is given.
})
export class AppModule { }

```

The **new-cmp.component.ts** file is generated as follows:

```

import { Component, OnInit } from '@angular/core'; // here angular/core is
imported .

@Component({
  // this is a declarator which starts with @ sign. The component word marked in
bold needs to be the same.
  selector: 'app-new-cmp', // selector to be used inside .html file.
  templateUrl: './new-cmp.component.html', // reference to the html file
created in the new component.
  styleUrls: ['./new-cmp.component.css'] // reference to the style file.
})
export class NewCmpComponent implements OnInit {
  constructor() { }
  ngOnInit() { }
}

```

If you see the above new-cmp.component.ts file, it creates a new class called **NewCmpComponent**, which implements **OnInit** in which there is a constructor and a method called `ngOnInit()`. **ngOnInit is called by default when the class is executed.**

Let us check how the flow works. Now, the app component, which is created by default becomes the parent component. Any component added later becomes the child component.

When we hit the url in the <http://localhost:4200/> browser, it first executes the index.html file which is shown below:

```
<!doctype html>
<html lang="en">
<head>
  <meta charset="utf-8">
  <title>Angular7App</title>
  <base href="/">
  <meta name="viewport" content="width=device-width, initial-scale=1">
  <link rel="icon" type="image/x-icon" href="favicon.ico">
</head>
<body>
  <app-root></app-root>
</body>
</html>
```

The above is the normal html file and we do not see anything that is printed in the browser. We shall take a look at the tag in the body section.

```
<app-root></app-root>
```

This is the root tag created by the Angular by default. This tag has the reference in the **main.ts** file.

```
import { enableProdMode } from '@angular/core';
import { platformBrowserDynamic } from '@angular/platform-browser-dynamic';

import { AppModule } from './app/app.module';
import { environment } from './environments/environment';

if (environment.production) {
  enableProdMode();
}

platformBrowserDynamic().bootstrapModule(AppModule)
  .catch(err => console.error(err));
```

AppModule is imported from the app of the main parent module, and the same is given to the bootstrap Module, which makes the appmodule load.

Let us now see the **app.module.ts** file:

```

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

import { AppRoutingModule } from './app-routing.module';
import { AppComponent } from './app.component';
import { NewCmpComponent } from './new-cmp/new-cmp.component';

@NgModule({
  declarations: [
    AppComponent,
    NewCmpComponent
  ],
  imports: [
    BrowserModule,
    AppRoutingModule
  ],
  providers: [],
  bootstrap: [AppComponent]
})
export class AppModule { }

```

Here, the **AppComponent** is the name given, i.e., the variable to store the reference of the **app.component.ts** and the same is given to the bootstrap. Let us now see the **app.component.ts** file.

```

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

@Component({
  selector: 'app-root',
  templateUrl: './app.component.html',
  styleUrls: ['./app.component.css']
})
export class AppComponent {
  title = 'Angular 7';
}

```

Angular core is imported and referred as the Component and the same is used in the Declarator as:

```
@Component({
  selector: 'app-root',
  templateUrl: './app.component.html',
  styleUrls: ['./app.component.css']
})
```

In the declarator reference to the selector, templateUrl and styleUrls are given. The selector here is nothing but the tag which is placed in the index.html file that we saw above.

The class AppComponent has a variable called title, which is displayed in the browser. The @Component uses the templateUrl called app.component.html which is as follows:

```
<!--The content below is only a placeholder and can be replaced.-->
<div style="text-align:center">
  <h1>
    Welcome to {{ title }}!
  </h1>
</div>
```

It has just the html code and the variable title in curly brackets. It gets replaced with the value, which is present in the **app.component.ts** file. This is called binding. We will discuss the concept of binding in the subsequent chapter.

Now that we have created a new component called new-cmp. The same gets included in the **app.module.ts** file, when the command is run for creating a new component.

app.module.ts has a reference to the new component created.

Let us now check the new files created in new-cmp.

new-cmp.component.ts

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

@Component({
  selector: 'app-new-cmp',
  templateUrl: './new-cmp.component.html',
  styleUrls: ['./new-cmp.component.css']
})
export class NewCmpComponent implements OnInit {
  constructor() { }
  ngOnInit() { }
}
```

Here, we have to import the core too. The reference of the component is used in the declarator.

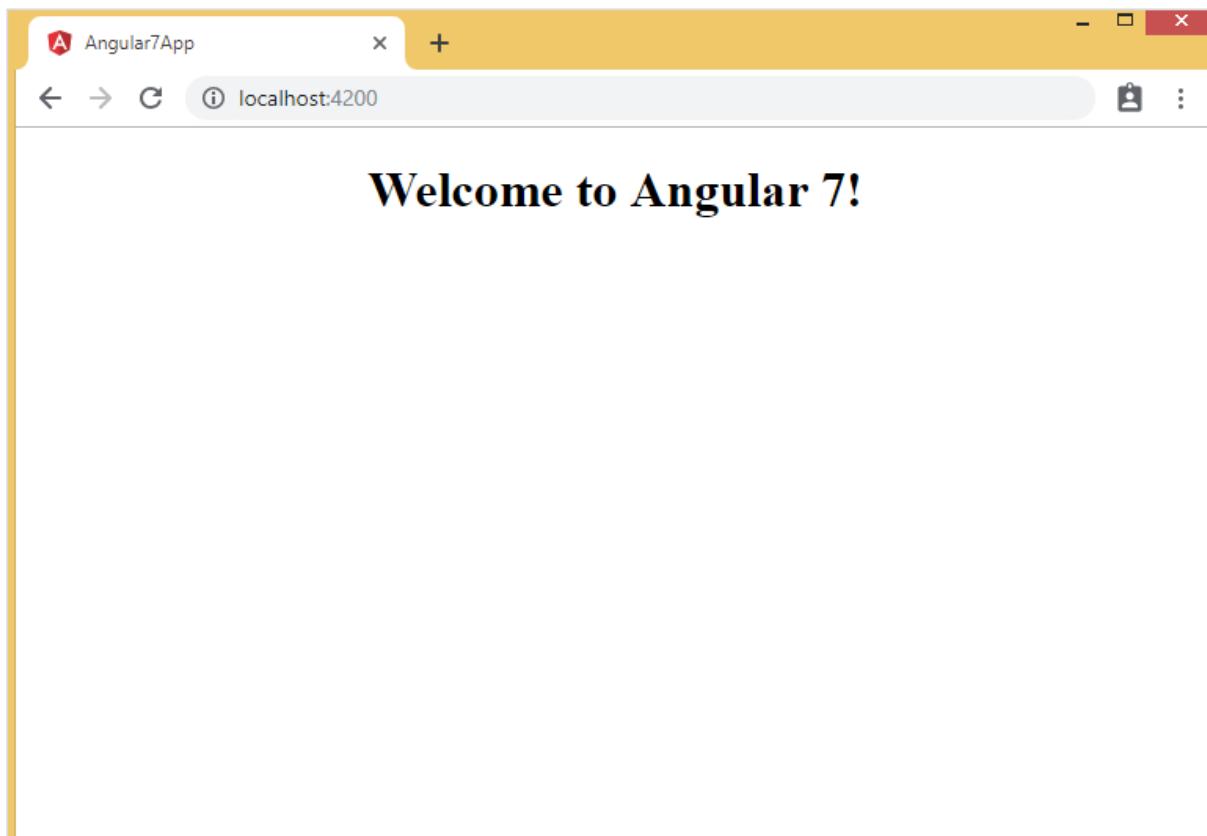
The declarator has the selector called app-new-cmp and the templateUrl and styleUrls.

The .html called new-cmp.component.html is as follows:

```
<p>
  new-cmp works!
</p>
```

As seen above, we have the html code, i.e., the p tag. The style file is empty as we do not need any styling at present. But when we run the project, we do not see anything related to the new component getting displayed in the browser.

The browser displays the following screen:



We do not see anything related to the new component being displayed. The new component created has a .html file with following details:

```
<p>
  new-cmp works!
</p>
```

But we are not getting the same in the browser. Let us now see the changes required to get the new components contents to get displayed in the browser.

The selector '**'app-new-cmp'**' is created for new component from **new-cmp.component.ts** as shown below:

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

@Component({
  selector: 'app-new-cmp',
  templateUrl: './new-cmp.component.html',
  styleUrls: ['./new-cmp.component.css']
})
export class NewCmpComponent implements OnInit {
  constructor() { }
  ngOnInit() { }
}
```

The selector, i.e., **app-new-cmp** needs to be added in the app.component.html, i.e., the main parent created by default as follows:

```
<!--The content below is only a placeholder and can be replaced.-->
<div style="text-align:center">
  <h1>
    Welcome to {{ title }}!
  </h1>
</div>
<app-new-cmp></app-new-cmp>
```

When the **<app-new-cmp></app-new-cmp>** tag is added, all that is present in the .html file, i.e., new-cmp.component.html of the new component created will get displayed on the browser along with the parent component data.



Let us add some more details to the new component created and see the display in the browser.

new-cmp.component.ts

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

@Component({
  selector: 'app-new-cmp',
  templateUrl: './new-cmp.component.html',
  styleUrls: ['./new-cmp.component.css']
})
export class NewCmpComponent implements OnInit {
  newcomponent = "Entered in new component created";
  constructor() { }
  ngOnInit() { }
}
```

In the class, we have added one variable called **newcomponent** and the value is “Entered in new component created”.

The above variable is added in the **new-cmp.component.html** file as follows:

```
<p>
  {{newcomponent}}
</p>

<p>
  new-cmp works!
</p>
```

Now since we have included the **<app-new-cmp></app-new-cmp>** selector in the **app.component.html** which is the .html of the parent component, the content present in the **new-cmp.component.html** file gets displayed on the browser. We will also add some css for the new component in the new-cmp.component.css file as follows:

```
p {
  color: blue;
  font-size: 25px;
}
```

So we have added blue color and font-size as 25px for the p tags.

Following screen will be displayed in the browser:



Similarly, we can create components and link the same using selector in the **app.component.html** file as per our requirements.

5. Angular 7 — Modules

Module in Angular refers to a place where you can **group the components, directives, pipes, and services**, which are related to the application.

In case you are developing a website, the header, footer, left, center and the right section become part of a module.

To define module, we can use the `NgModule`. When you create a new project using the `Angular -cli` command, the `ngmodule` is created in the **app.module.ts** file by default and it looks as follows:

```
import { BrowserModule } from '@angular/platform-browser';
import { NgModule } from '@angular/core';
import { AppRoutingModule } from './app-routing.module';
import { AppComponent } from './app.component';
import { NewCmpComponent } from './new-cmp/new-cmp.component';

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

The `NgModule` needs to be imported as follows:

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

The structure for the `ngmodule` is as shown below:

```
@NgModule({
  declarations: [
```

```

    AppComponent,
    NewCmpComponent

  ],
  imports: [
    BrowserModule,
    AppRoutingModule
  ],
  providers: [],
  bootstrap: [AppComponent]
)

```

It starts with **@NgModule** and contains an object which has declarations, imports, providers and bootstrap.

Declaration

It is an array of components created. If any new component gets created, it will be imported first and the reference will be included in declarations as shown below:

```

declarations: [
  AppComponent,
  NewCmpComponent
]

```

Import

It is an array of modules required to be used in the application. It can also be used by the components in the Declaration array. For example, right now in the @NgModule, we see the Browser Module imported. In case your application needs forms, you can include the module with the below code:

```
import { FormsModule } from '@angular/forms';
```

The import in the **@NgModule** will be like the following:

```

imports: [
  BrowserModule,
  FormsModule
]

```

Providers

This will include the services created.

Bootstrap

This includes the main app component for starting the execution.

6. Angular 7 — Data Binding

Data Binding is available right from AngularJS, and all the versions of Angular released later on. We use curly braces for data binding - `{{}}`; this process is called **Interpolation**. We have already seen in our previous examples how we declared the value to the variable `title` and the same is printed in the browser.

The variable in the `app.component.html` file is referred as `{{title}}` and the value of `title` is initialized in the `app.component.ts` file and in `app.component.html`, the value is displayed.

Let us now create a dropdown of months in the browser. To do that, we have created an array of months in `app.component.ts` as follows:

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

@Component({
  selector: 'app-root',
  templateUrl: './app.component.html',
  styleUrls: ['./app.component.css']
})
export class AppComponent {
  title = 'Angular 7';
  // declared array of months.
  months = ["January", "February", "March", "April", "May",
  "June", "July", "August", "September",
  "October", "November", "December"];
}
```

The month's array that is shown above is to be displayed in a dropdown in the browser.

We have created the normal select tag with option. In option, we have used the **for loop**. The **for loop** is used to iterate over the months' array, which in turn will create the option tag with the value present in the months.

The syntax for in Angular is as follows:

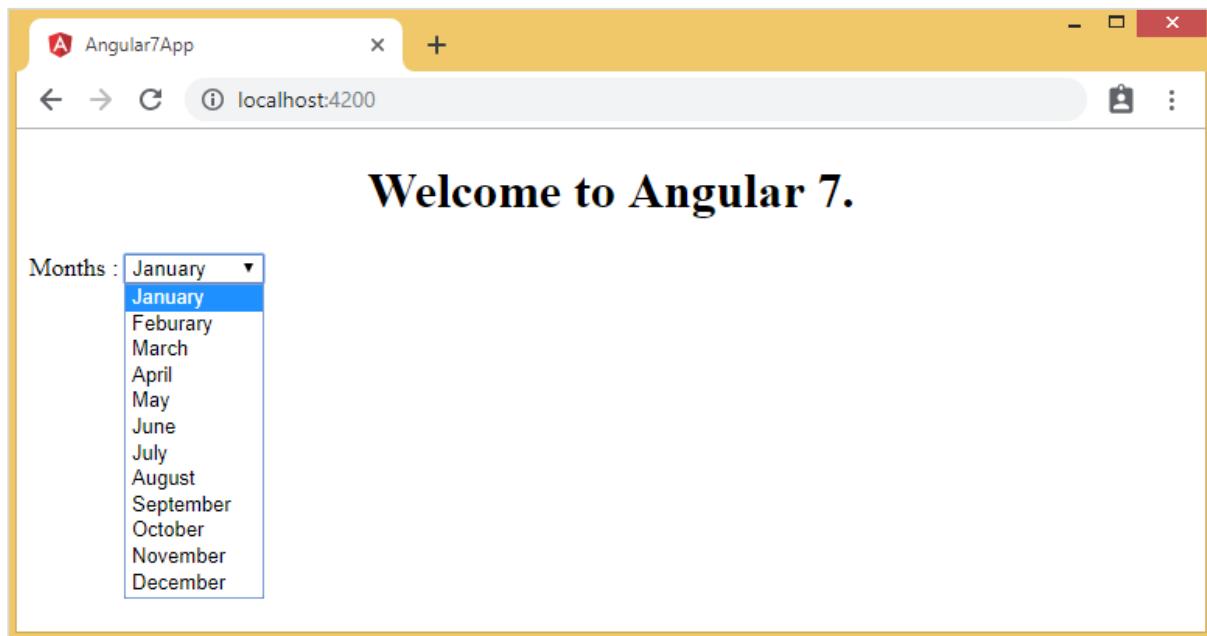
```
*ngFor = "let I of months"
```

and to get the value of months we are displaying it in:

```
{i}}
```

The two curly brackets help with data binding. You declare the variables in your app.component.ts file and the same will be replaced using the curly brackets.

Following is the output of the above month's array in the browser:



The variable that is set in the **app.component.ts** can be binded inside the **app.component.html** using the curly brackets. For example: `{}{}`.

Let us now display the data in the browser based on condition. Here, we have added a variable and assigned the value as **true**. Using the if statement, we can hide/show the content to be displayed.

Example

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

@Component({
  selector: 'app-root',
  templateUrl: './app.component.html',
  styleUrls: ['./app.component.css']
})
export class AppComponent {
  title = 'Angular 7';
  // declared array of months.
  months = ["January", "February", "March", "April", "May",
  "June", "July", "August", "September",
  "October", "November", "December"];
  isavailable = true; //variable is set to true
}
```

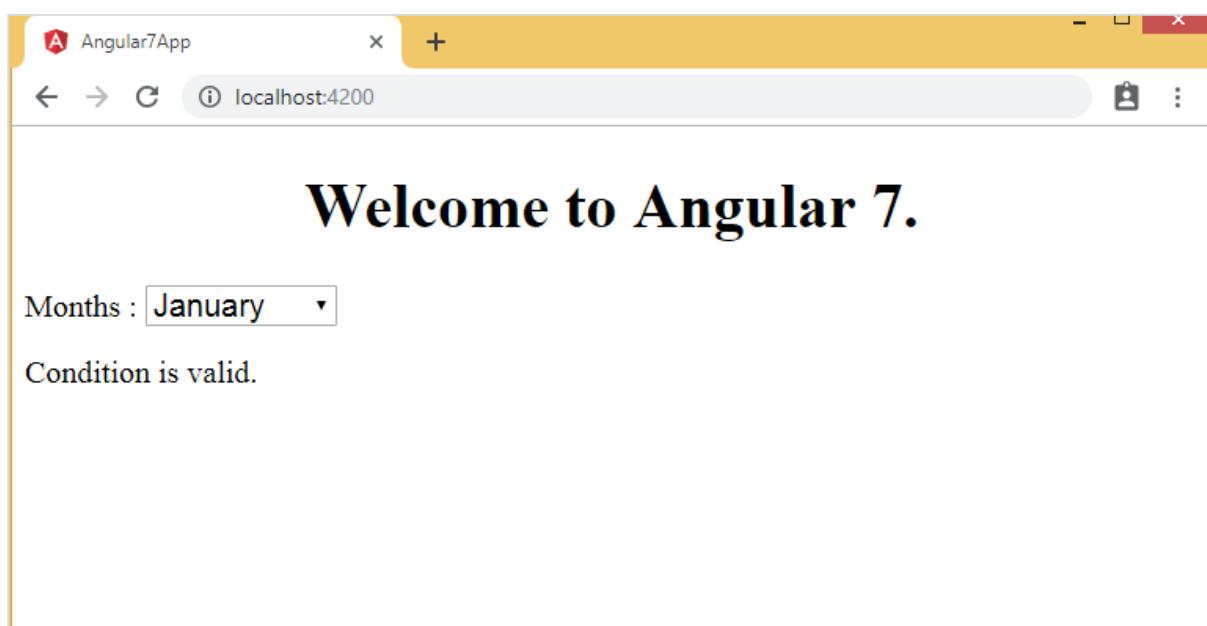
```
}
```

app.component.html

```
<!--The content below is only a placeholder and can be replaced.-->
<div style = "text-align:center">
  <h1>
    Welcome to {{title}}.
  </h1>
</div>

<div> Months :
  <select>
    <option *ngFor = "let i of months">{{i}}</option>
  </select>
</div>
<br/>

<div>
  <span *ngIf = "isavailable">Condition is valid.</span>
  //over here based on if condition the text condition is valid is displayed.
  //If the value of isavailable is set to false it will not display the text.
</div>
```

Output

Let us explain the above example using the **IF THEN ELSE** condition.

Example

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

@Component({
  selector: 'app-root',
  templateUrl: './app.component.html',
  styleUrls: ['./app.component.css']
})
export class AppComponent {
  title = 'Angular 7';
  // declared array of months.
  months = ["January", "February", "March", "April", "May",
  "June", "July", "August", "September",
  "October", "November", "December"];
  isavailable = false; //variable is set to true
}
```

In this case, we have made the **isavailable** variable as false. To print the **else** condition, we will have to create the **ng-template** as follows:

```
<ng-template #condition1>Condition is invalid</ng-template>
```

The full code is given below:

```
<!--The content below is only a placeholder and can be replaced.-->
<div style="text-align:center">
  <h1>
    Welcome to {{title}}.
  </h1>
</div>

<div> Months :
  <select>
    <option *ngFor="let i of months">{{i}}</option>
  </select>
</div>
```

```

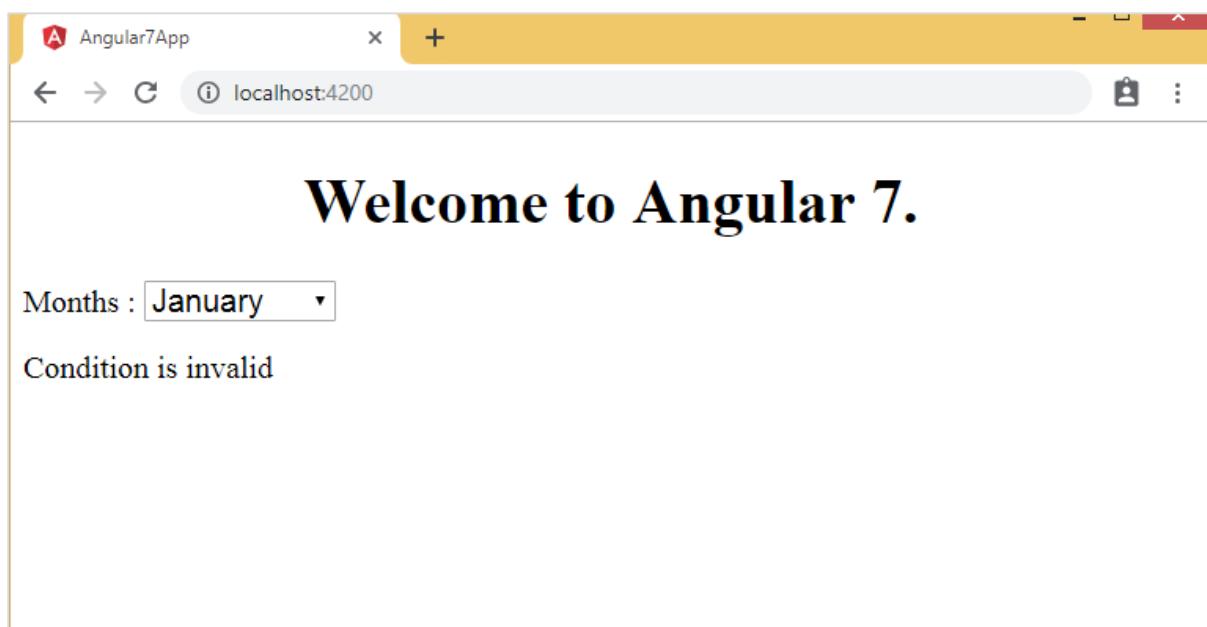
</div>
<br/>

<div>
  <span *ngIf="isavailable; else condition1">Condition is valid.</span>
  <ng-template #condition1>Condition is invalid</ng-template>
</div>

```

If is used with the else condition and the variable used is **condition1**. The same is assigned as an **id** to the **ng-template**, and when the available variable is set to false the text **Condition is invalid** is displayed.

Following screenshot shows the display in the browser:



Let us now use the **if then else** condition.

```

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

@Component({
  selector: 'app-root',
  templateUrl: './app.component.html',
  styleUrls: ['./app.component.css']
})
export class AppComponent {
  title = 'Angular 7';
  // declared array of months.
  months = ["January", "February", "March", "April", "May",

```

```

    "June", "July", "August", "September",
    "October", "November", "December"];
    isavailable = true; //variable is set to true
}

```

Now, we will make the variable **isavailable** as true. In the html, the condition is written in the following way:

```

<!--The content below is only a placeholder and can be replaced.-->
<div style="text-align:center">
    <h1>
        Welcome to {{title}}.
    </h1>
</div>

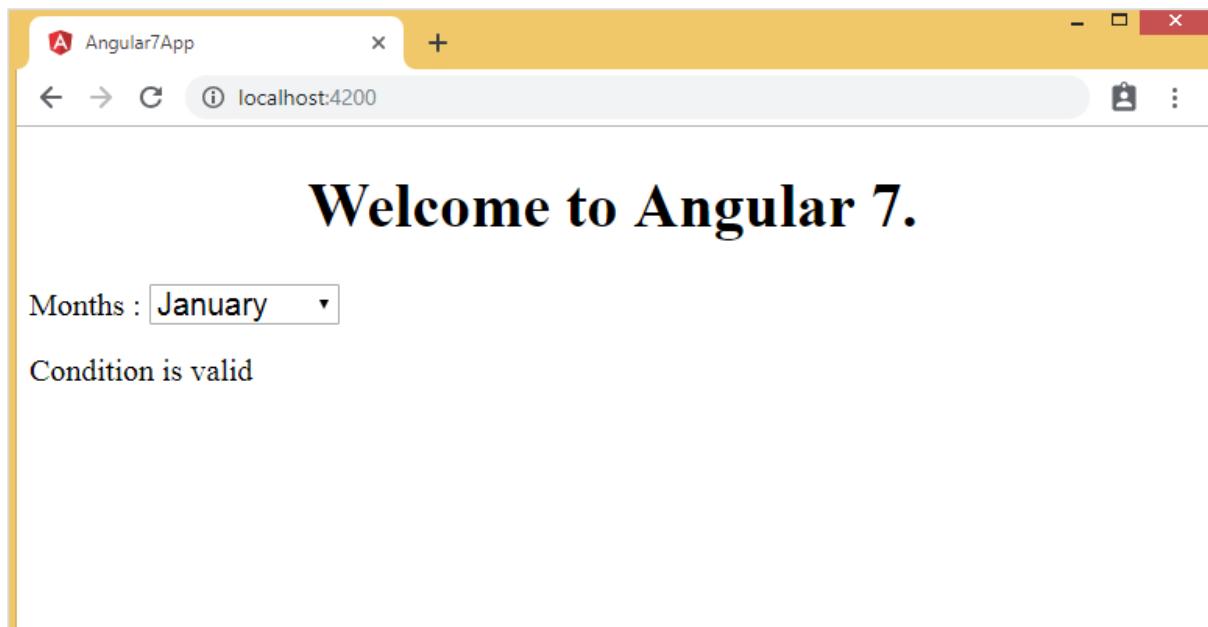
<div> Months :
    <select>
        <option *ngFor="let i of months">{{i}}</option>
    </select>
</div>
<br/>

<div>
    <span *ngIf="isavailable; then condition1 else condition2">Condition is
    valid.</span>
    <ng-template #condition1>Condition is valid</ng-template>
    <ng-template #condition2>Condition is invalid</ng-template>
</div>

```

If the variable is true, then **condition1**, else **condition2**. Now, two templates are created with id **#condition1** and **#condition2**.

The display in the browser is as follows:



7. Angular 7 — Event Binding

In this chapter, we will discuss how Event Binding works in Angular 7. When a user interacts with an application in the form of a keyboard movement, a mouse click, or a mouse over, it generates an event. These events need to be handled to perform some kind of action. This is where event binding comes into picture.

Let us consider an example to understand this better.

app.component.html

```
<!--The content below is only a placeholder and can be replaced.-->
<div style = "text-align:center">
    <h1>
        Welcome to {{title}}.
    </h1>
</div>

<div> Months :
    <select>
        <option *ngFor = "let i of months">{{i}}</option>
    </select>
</div>
<br/>

<div>
    <span *ngIf = "isavailable; then condition1 else condition2">
        Condition is valid.
    </span>
    <ng-template #condition1>Condition is valid</ng-template>
    <ng-template #condition2>Condition is invalid</ng-template>
</div>
<button (click)="myClickFunction($event)">
    Click Me
</button>
```

In the **app.component.html** file, we have defined a button and added a function to it using the click event.

Following is the syntax to define a button and add a function to it.

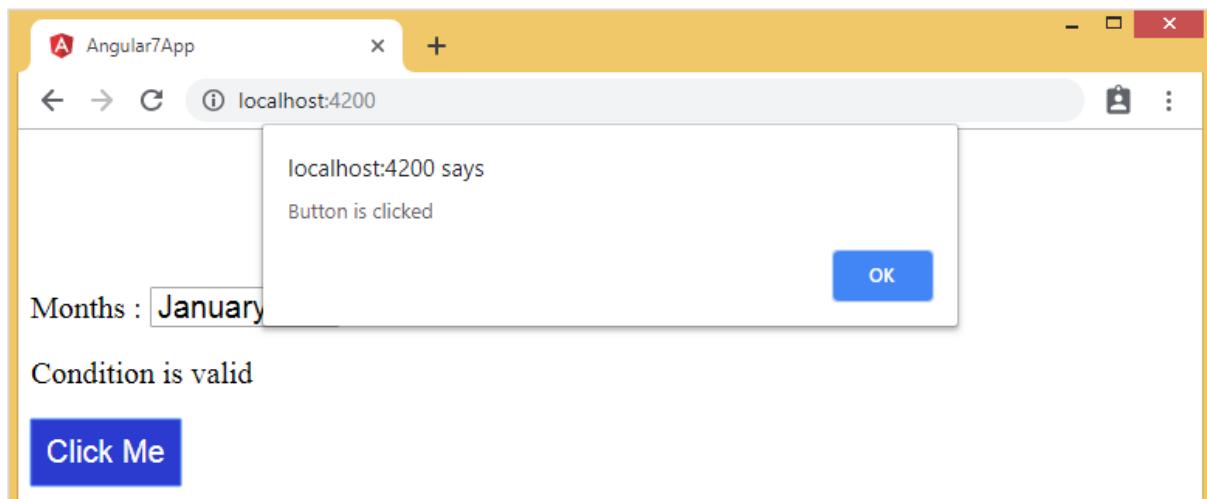
```
(click)="myClickFunction($event)"
```

The function is defined in :**app.component.ts**

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

@Component({
  selector: 'app-root',
  templateUrl: './app.component.html',
  styleUrls: ['./app.component.css']
})
export class AppComponent {
  title = 'Angular 7';
  // declared array of months.
  months = ["January", "February", "March", "April", "May",
  "June", "July", "August", "September",
  "October", "November", "December"];
  isavailable = true; //variable is set to true
  myClickFunction(event) {
    //just added console.log which will display the event details in browser on
    //click of the button.
    alert("Button is clicked");
    console.log(event);
  }
}
```

Upon clicking the button, the control will come to the function **myClickFunction** and a dialog box will appear, which displays the **Button is clicked** as shown in the following screenshot:



The styling for button is added in add.component.css:

```
button {
    background-color: #2B3BCF;
    border: none;
    color: white;
    padding: 10px 10px;
    text-align: center;
    text-decoration: none;
    display: inline-block;
    font-size: 20px;
}
```

Let us now add the onchange event to the dropdown.

The following line of code will help you add the change event to the dropdown:

app.component.html

```
<!--The content below is only a placeholder and can be replaced.-->
<div style = "text-align:center">
    <h1>
        Welcome to {{title}}.
    </h1>
</div>

<div> Months :
    <select (change) = "changemonths($event)">
        <option *ngFor = "let i of months">{{i}}</option>
    </select>
</div>
<br/>

<div>
    <span *ngIf = "isavailable; then condition1 else condition2">
        Condition is valid.
    </span>
    <ng-template #condition1>Condition is valid</ng-template>
    <ng-template #condition2>Condition is invalid</ng-template>
</div>
```

```
<br/>
<button (click)="myClickFunction($event)">
  Click Me
</button>
```

The function is declared in the **app.component.ts** file:

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

@Component({
  selector: 'app-root',
  templateUrl: './app.component.html',
  styleUrls: ['./app.component.css']
})
export class AppComponent {
  title = 'Angular 7';
  // declared array of months.
  months = ["January", "Feburary", "March", "April", "May",
  "June", "July", "August", "September",
  "October", "November", "December"];
  isavailable = true; //variable is set to true
  myClickFunction(event) {
    //just added console.log which will display the event details in browser on
    //click of the button.
    alert("Button is clicked");
    console.log(event);
  }
  changemonths(event) {
    console.log("Changed month from the Dropdown");
    console.log(event);
  }
}
```

Select month from the dropdown and you see the console message "**Changed month from the Dropdown**" is displayed in the console along with the event.

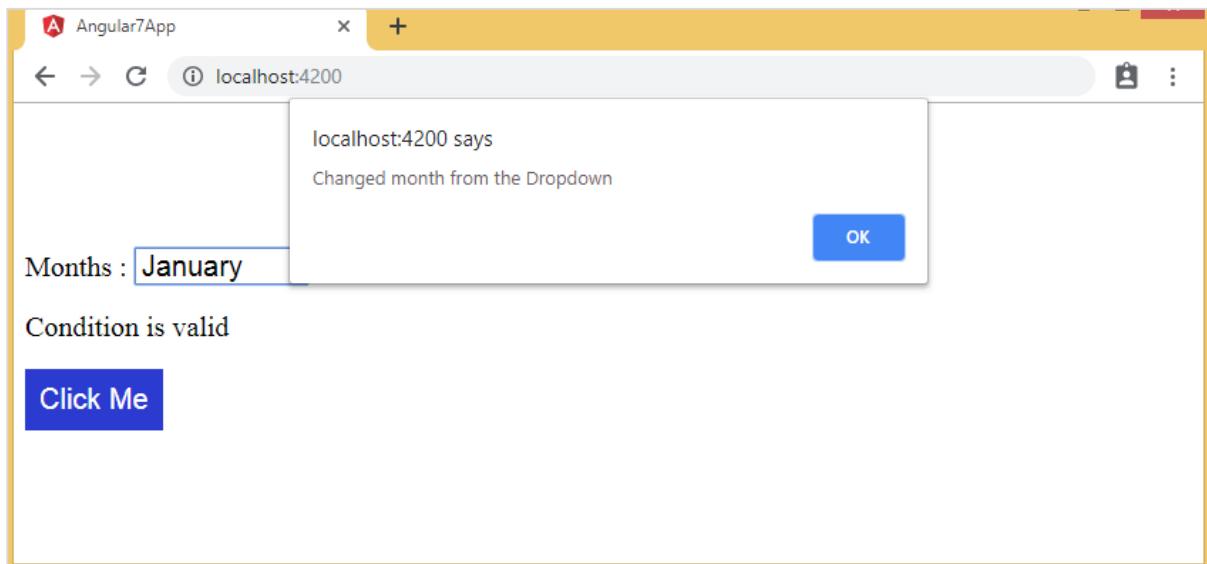
Let us add an alert message in **app.component.ts** when the value from the dropdown is changed as shown below:

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

@Component({
  selector: 'app-root',
  templateUrl: './app.component.html',
  styleUrls: ['./app.component.css']
})
export class AppComponent {
  title = 'Angular 7';
  // declared array of months.
  months = ["January", "February", "March", "April", "May",
  "June", "July", "August", "September",
  "October", "November", "December"];
  isavailable = true; //variable is set to true
  myClickFunction(event) {
    //just added console.log which will display the event details in browser on
    //click of the button.
    alert("Button is clicked");
    console.log(event);
  }
  changemonths(event) {
    alert("Changed month from the Dropdown");
  }
}
```

When the value in dropdown is changed, a dialog box will appear and the following message will be displayed:

"Changed month from the Dropdown".



8. Angular 7 — Templates

Angular 7 uses the `<ng-template>` as the tag instead of `<template>` which is used in Angular2. `<ng-template>` has been in use since the release of Angular 4, and the earlier version i.e Angular 2 uses `<template>` for the same purpose. The reason it started to use `<ng-template>` instead of `<template>` from Angular 4 onwards is because there is a name conflict between the `<template>` tag and the html `<template>` standard tag. It will deprecate completely going ahead. This was one of the major changes made in Angular 4 version.

Let us now use the template along with the **if else condition** and see the output.

app.component.html

```
<!--The content below is only a placeholder and can be replaced.-->
<div style = "text-align:center">
  <h1>
    Welcome to {{title}}.
  </h1>
</div>

<div> Months :
  <select (change) = "changemonths($event)" name = "month">
    <option *ngFor = "let i of months">{{i}}</option>
  </select>
</div>
<br/>

<div>
  <span *ngIf = "isavailable;then condition1 else condition2">Condition is
  valid.</span>
  <ng-template #condition1>Condition is valid from template</ng-template>
  <ng-template #condition2>Condition is invalid from template</ng-template>
</div>
<button (click) = "myClickFunction($event)">Click Me</button>
```

For the Span tag, we have added the **if** statement with the **else** condition and will call template condition1, else condition2.

The templates are to be called as follows:

```
<ng-template #condition1>Condition is valid from template</ng-template>
<ng-template #condition2>Condition is invalid from template</ng-template>
```

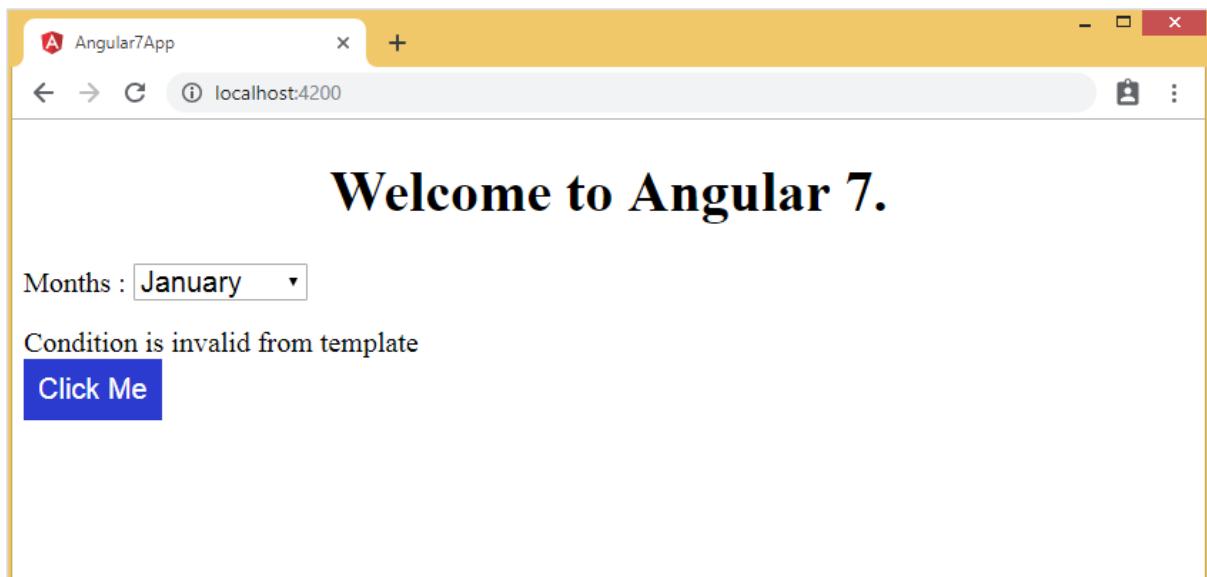
If the condition is true, then the **condition1** template is called, otherwise **condition2**.

app.component.ts

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

@Component({
  selector: 'app-root',
  templateUrl: './app.component.html',
  styleUrls: ['./app.component.css']
})
export class AppComponent {
  title = 'Angular 7';
  // declared array of months.
  months = ["January", "February", "March", "April", "May",
  "June", "July", "August", "September",
  "October", "November", "December"];
  isavailable = false; //variable is set to true
  myClickFunction(event) {
    //just added console.log which will display the event details in browser on
    //click of the button.
    alert("Button is clicked");
    console.log(event);
  }
  changemonths(event) {
    alert("Changed month from the Dropdown");
  }
}
```

The output in the browser is as follows:



The variable **isavailable** is false so the condition2 template is printed. If you click the button, the respective template will be called.

app.component.ts

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

@Component({
  selector: 'app-root',
  templateUrl: './app.component.html',
  styleUrls: ['./app.component.css']
})
export class AppComponent {
  title = 'Angular 7';
  // declared array of months.
  months = ["January", "Feburary", "March", "April", "May",
  "June", "July", "August", "September",
  "October", "November", "December"];
  isavailable = false; //variable is set to true
  myClickFunction(event) {
    this.isavailable = !this.isavailable; // variable is toggled onclick of
    the button
  }
  changemonths(event) {
    alert("Changed month from the Dropdown");
  }
}
```

```
}
```

The **isavailable** variable is toggled on click of the button as shown below:

```
myClickFunction(event) {
  this.isavailable = !this.isavailable;
}
```

When you click on the button based on the value of the **isavailable** variable the respective template will be displayed:

Welcome to Angular 7.

Months :

Condition is valid from template

Welcome to Angular 7.

Months :

Condition is invalid from template

If you inspect the browser, you will see that you never get the span tag in the dom. The following example will help you understand the same.

The screenshot shows the Angular 7 application running in a browser. The main content is "Welcome to Angular 7.". Below it is a dropdown menu set to "January". A blue button labeled "Click Me" is also visible. The browser's developer tools are open, specifically the "Elements" tab, which displays the DOM structure. The DOM includes an "app-root" element with attributes like "ng-version=7.2.5" and "ng-reflect-*". Inside "app-root", there are "ng-content" and "ng-template" sections. The "ng-template" sections are expanded to show their content: "Condition is valid from template" for condition1 and "Condition is invalid from template" for condition2. The browser's status bar at the bottom shows tabs for "html", "body", "app-root", and "div".

Though in **app.component.html** we have added span tag and the **<ng-template>** for the condition as shown below:

```
<span *ngIf = "isavailable;then condition1 else condition2">Condition is
valid.</span>

<ng-template #condition1>Condition is valid from template</ng-template>
<ng-template #condition2>Condition is invalid from template</ng-template>
```

We do not see the span tag and also the **<ng-template>** in the dom structure when we inspect the same in browser.

The following line of code in html will help us get the span tag in the dom:

```
<!--The content below is only a placeholder and can be replaced.-->
<div style = "text-align:center">
  <h1>
    Welcome to {{title}}.
  </h1>
</div>

<div> Months :
  <select (change) = "changemonths($event)" name = "month">
    <option *ngFor = "let i of months">{{i}}</option>
  </select>
</div>
<br/>

<div>
  <span *ngIf = "isavailable; else condition2">Condition is valid.</span>
```

```
<ng-template #condition1>Condition is valid from template</ng-template>  
  
<ng-template #condition2>Condition is invalid from template</ng-template>  
</div>  
  
<button (click)="myClickFunction($event)">Click Me</button>
```

If we remove the **then** condition, we get the “Condition is valid” message in the browser and the span tag is also available in the dom. For example, in **app.component.ts**, we have made the **isavailable** variable as true.

The screenshot shows a browser window with the URL `localhost:4200`. The main content area displays "Welcome to Angular 7." Below it, a dropdown menu shows "Months : January". A message "Condition is valid." is displayed, followed by a blue button labeled "Click Me". The bottom right corner shows the Angular CLI logo.

The developer tools are open, specifically the Elements tab. The DOM tree shows the following structure:

```
<div>
  <br _ngcontent-c0>
  <div _ngcontent-c0>
    <!--bindings={>
      "ng-reflect-ng-if": "true",
      "ng-reflect-ng-if-else": "[object Object]"
    }-->
    <span _ngcontent-c0>Condition is valid.</span> == $0
    <!-->
    <!-->
  </div>
  <button _ngcontent-c0>Click Me</button>
</app-root>
<script type="text/javascript" src="runtime.js"></script>
<script type="text/javascript" src="es2015-polyfills.js" nomodule></script>
<script type="text/javascript" src="polyfills.js"></script>
<script type="text/javascript" src="styles.js"></script>
<script type="text/javascript" src="vendor.js"></script>
<script type="text/javascript" src="main.js"></script>
```

The "Elements" tab is selected. The bottom navigation bar includes "Styles", "Event Listeners", "DOM Breakpoints", "Properties", and "Accessibility". A "Filter" input field is present at the bottom.

9. Angular 7 — Directives

Directives in Angular is a js class, which is declared as @directive. We have 3 directives in Angular. The directives are listed below:

Component Directives

These form the main class having details of how the component should be processed, instantiated and used at runtime.

Structural Directives

A structure directive basically deals with manipulating the dom elements. Structural directives have a ***** sign before the directive. For example, ***ngIf** and ***ngFor**.

Attribute Directives

Attribute directives deal with changing the look and behavior of the dom element. You can create your own directives as explained in the below section.

How to Create Custom Directives?

In this section, we will discuss about Custom Directives to be used in components. Custom directives are created by us and are not standard.

Let us see how to create the custom directive. We will create the directive using the command line. The command to create the directive using the command line is as follows:

```
ng g directive nameofthedirective  
e.g  
ng g directive changeText
```

It appears in the command line as given in the below code:

```
C:\projectA7\angular7-app>ng g directive changeText  
CREATE src/app/change-text.directive.spec.ts (241 bytes)  
CREATE src/app/change-text.directive.ts (149 bytes)  
UPDATE src/app/app.module.ts (565 bytes)
```

The above files, i.e., change-text.directive.spec.ts and change-text.directive.ts get created and the app.module.ts file is updated.

app.module.ts

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

```

import { AppRoutingModule } from './app-routing.module';

import { AppComponent } from './app.component';
import { NewCmpComponent } from './new-cmp/new-cmp.component';
import { ChangeTextDirective } from './change-text.directive';

@NgModule({
  declarations: [
    AppComponent,
    NewCmpComponent,
    ChangeTextDirective
  ],
  imports: [
    BrowserModule,
    AppRoutingModule
  ],
  providers: [],
  bootstrap: [AppComponent]
})
export class AppModule { }

```

The **ChangeTextDirective** class is included in the declarations in the above file. The class is also imported from the file given below:

change-text.directive

```

import { Directive } from '@angular/core';

@Directive({
  selector: '[changeText]'
})
export class ChangeTextDirective {

  constructor() { }

}

```

The above file has a directive and it also has a selector property. Whatever we define in the selector, the same has to match in the view, where we assign the custom directive.

In the app.component.html view, let us add the directive as follows:

```
<!--The content below is only a placeholder and can be replaced.-->
<div style = "text-align:center">
    <h1>
        Welcome to {{title}}.
    </h1>
</div>

<div style="text-align:center">
    <span changeText >Welcome to {{title}}.</span>
</div>
```

We will write the changes in **change-text.directive.ts** file as follows:

change-text.directive.ts

```
import { Directive, ElementRef } from '@angular/core';
@Directive({
    selector: '[changeText]'
})

export class ChangeTextDirective {
    constructor(Element: ElementRef) {
        console.log(Element);
        Element.nativeElement.innerText="Text is changed by changeText Directive.";
    }
}
```

In the above file, there is a class called **ChangeTextDirective** and a constructor, which takes the element of type **ElementRef**, which is mandatory. The element has all the details to which the **Change Text** directive is applied.

We have added the `console.log` element. The output of the same can be seen in the browser console. The text of the element is also changed as shown above.

Now, the browser will show the following:

The screenshot shows a browser window at localhost:4200 displaying the message "Welcome to Angular 7." Below it, a span element contains the text "Text is changed by changeText Directive. Welcome to Angular 7.". The browser's developer tools are open, specifically the "Console" tab, which displays the following object details:

```
change-text.directive.ts:8
 ElementRef {nativeElement: span}
  nativeElement: span
    accessKey: ""
    assignedSlot: null
    attributeStyleMap: StylePropertyMap {size: 0}
    attributes: NamedNodeMap {0: _ngcontent-c0, 1: changetext, ...}
    autocapitalize: ""
    baseURI: "http://localhost:4200/"
    childElementCount: 0
    childNodes: NodeList(2) [text, text]
    children: HTMLCollection []
    classList: DOMTokenList {value: ""}
    className: ""
    clientHeight: 0
    clientLeft: 0
    clientTop: 0
    clientWidth: 0
    contentEditable: "inherit"
    dataset: DOMStringMap {}
    dir: ""
    draggable: false
```

The details of the element on which the directive selector is given in the console. Since we have added the **changeText** directive to a span tag, the details of the span element is displayed.

10. Angular 7 — Pipes

In this chapter, we will discuss about Pipes in Angular 7. Pipes were earlier called filters in Angular1 and called pipes from Angular2 onwards.

The | character is used to transform data. Following is the syntax for the same:

```
 {{ Welcome to Angular 7 | lowercase}}
```

It takes integers, strings, arrays, and date as input separated with | to be converted in the format as required and display the same in the browser.

Let us consider a few examples using pipes. Here, we want to display the text given to uppercase. This can be done using pipes as follows:

In the app.component.ts file, we have defined the title variable as follows:

app.component.ts

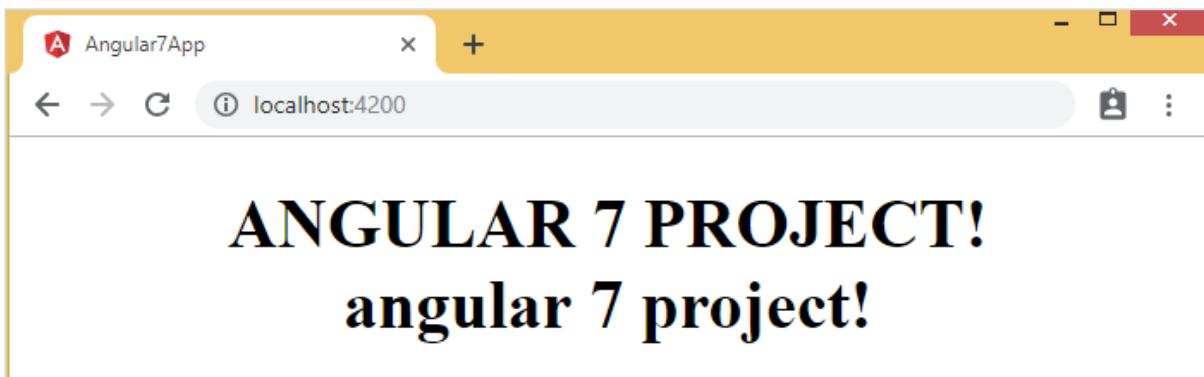
```
import { Component } from '@angular/core';

@Component({
  selector: 'app-root',
  templateUrl: './app.component.html',
  styleUrls: ['./app.component.css']
})
export class AppComponent {
  title = 'Angular 7 Project!';
}
```

The following line of code goes into the **app.component.html** file:

```
<b>{{title | uppercase}}</b><br/>
<b>{{title | lowercase}}</b>
```

The browser appears as shown in the following screenshot:



Here are some built-in pipes available with angular:

- [Lowercasepipe](#)
- [Uppercasepipe](#)
- [Datepipe](#)
- [Currencypipe](#)
- [Jsonpipe](#)
- [Percentpipe](#)
- [Decimalpipe](#)
- [Slicepipe](#)

We have already seen the lowercase and uppercase pipes. Let us now see how the other pipes work. The following line of code will help us define the required variables in **app.component.ts** file:

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

@Component({
  selector: 'app-root',
  templateUrl: './app.component.html',
  styleUrls: ['./app.component.css']
})

export class AppComponent {
  title = 'Angular 7 Project!';
  todaydate = new Date();
  jsonval = {name:'Rox', age:'25', address:{a1:'Mumbai', a2:'Karnataka'}};
  months = ["Jan", "Feb", "Mar", "April", "May", "Jun",
            "July", "Aug", "Sept", "Oct", "Nov", "Dec"];
}
```

We will use the pipes in the **app.component.html** file as shown below:

```
<!--The content below is only a placeholder and can be replaced.-->
<div style = "width:100%;">
  <div style = "width:40%;float:left;border:solid 1px black;">
    <h1>Uppercase Pipe</h1>
    <b>{{title | uppercase}}</b><br/>

    <h1>Lowercase Pipe</h1>
    <b>{{title | lowercase}}</b>

    <h1>Currency Pipe</h1>
    <b>{{6589.23 | currency:"USD"}}</b><br/>
    <b>{{6589.23 | currency:"USD":true}}</b> //Boolean true is used to get the
sign of the currency.

    <h1>Date pipe</h1>
    <b>{{todaydate | date:'d/M/y'}}</b><br/>
    <b>{{todaydate | date:'shortTime'}}</b>

    <h1>Decimal Pipe</h1>
    <b>{{ 454.78787814 | number: '3.4-4' }}</b> // 3 is for main integer, 4 -4
are for integers to be displayed.

  </div>

  <div style = "width:40%;float:left;border:solid 1px black;">
    <h1>Json Pipe</h1>
    <b>{{ jsonval | json }}</b>
    <h1>Percent Pipe</h1>
    <b>{{00.54565 | percent}}</b>
    <h1>Slice Pipe</h1>
    <b>{{months | slice:2:6}}</b>
    // here 2 and 6 refers to the start and the end index
  </div>
</div>
```

The following screenshots show the output for each pipe:

Uppercase Pipe	Json Pipe
ANGULAR 7 PROJECT!	{ "name": "Rox", "age": "25", "address": { "a1": "Mumbai", "a2": "Karnataka" } }
Lowercase Pipe	Percent Pipe
angular 7 project!	55%
Currency Pipe	Slice Pipe
\$6,589.23 \$6,589.23 // Boolean true is used to get the sign of the currency.	Mar,April,May,Jun // here 2 and 6 refers to the start and the end index
Date pipe	
2/3/2019 9:18 PM	
Decimal Pipe	
454.7879 // 3 is for main integer, 4 -4 are for integers to be displayed.	

How to Create a Custom Pipe?

To create a custom pipe, we have created a new ts file. Here, we want to create the sqrt custom pipe. We have given the same name to the file and it looks as follows:

app.sqrt.ts

```
import {Pipe, PipeTransform} from '@angular/core';
@Pipe ({
  name : 'sqrt'
})
export class SqrtPipe implements PipeTransform {
  transform(val : number) : number {
    return Math.sqrt(val);
  }
}
```

To create a custom pipe, we have to import Pipe and Pipe Transform from Angular/core. In the @Pipe directive, we have to give the name to our pipe, which will be used in our .html file. Since, we are creating the sqrt pipe, we will name it sqrt.

As we proceed further, we have to create the class and the class name is SqrtPipe. This class will implement the PipeTransform.

The transform method defined in the class will take argument as the number and will return the number after taking the square root.

Since we have created a new file, we need to add the same in **app.module.ts**. This is done as follows:

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

import { AppRoutingModule } from './app-routing.module';
import { AppComponent } from './app.component';
import { NewCmpComponent } from './new-cmp/new-cmp.component';
import { ChangeTextDirective } from './change-text.directive';
import { SqrtPipe } from './app.sqrt';

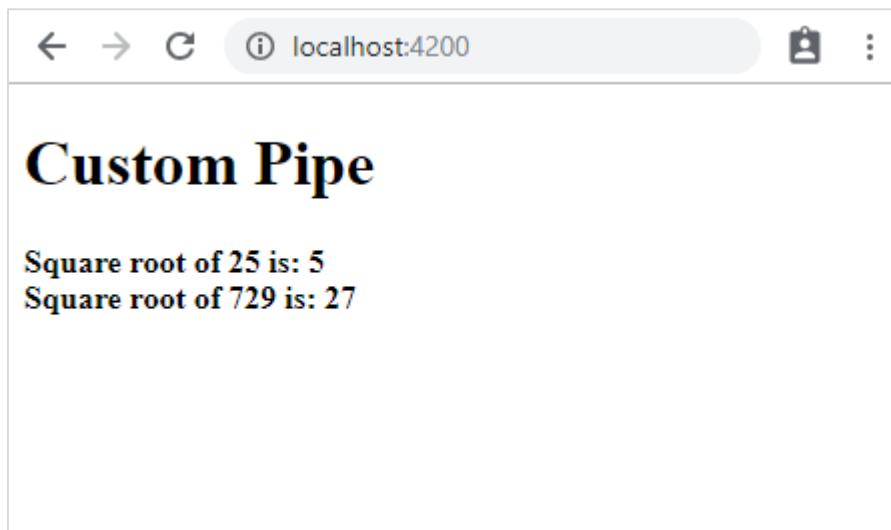
@NgModule({
  declarations: [
    SqrtPipe,
    AppComponent,
    NewCmpComponent,
    ChangeTextDirective
  ],
  imports: [
    BrowserModule,
    AppRoutingModule
  ],
  providers: [],
  bootstrap: [AppComponent]
})
export class AppModule { }
```

We have created the **app.sqrt.ts** class. We have to import the same in **app.module.ts** and specify the path of the file. It also has to be included in the declarations as shown above.

Let us now see the call made to the sqrt pipe in the **app.component.html** file.

```
<h1>Custom Pipe</h1>
<b>Square root of 25 is: {{25 | sqrt}}</b>
<br/>
<b>Square root of 729 is: {{729 | sqrt}}</b>
```

Following is the output:



11. Angular 7 — Routing

Routing basically means **navigating between pages**. You have seen many sites with links that direct you to a new page. This can be achieved using routing. Here the pages that we are referring to will be in the form of components. We have already seen how to create a component. Let us now create a component and see how to use routing with it.

During the project setup, we have already included the routing module and the same is available in app.module.ts as shown below:

app.module.ts

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

import { AppRoutingModule } from './app-routing.module';

import { AppComponent } from './app.component';
import { NewCmpComponent } from './new-cmp/new-cmp.component';
import { ChangeTextDirective } from './change-text.directive';
import { SqrtPipe } from './app.sqrt';

@NgModule({
  declarations: [
    SqrtPipe,
    AppComponent,
    NewCmpComponent,
    ChangeTextDirective
  ],
  imports: [
    BrowserModule,
    AppRoutingModule
  ],
  providers: [],
  bootstrap: [AppComponent]
})
export class AppModule { }
```

AppRoutingModule is added as shown above and included in the imports array.

File details of **app-routing.module** are given below:

```
import { NgModule } from '@angular/core';
import { Routes, RouterModule } from '@angular/router';

const routes: Routes = [];

@NgModule({
  imports: [RouterModule.forRoot(routes)],
  exports: [RouterModule]
})
export class AppRoutingModule { }
```

Here, we have to note that this file is generated by default when the routing is added during project setup. If not added, the above files have to be added manually.

So in the above file, we have imported **Routes** and **RouterModule** from `@angular/router`.

There is a const routes defined which is of type Routes. It is an array which holds all the routes we need in our project.

The `const routes` is given to the `RouterModule` as shown in `@NgModule`. To display the routing details to the user, we need to add `<router-outlet>` directive where we want the view to be displayed.

The same is added in `app.component.html` as shown below:

```
<h1>Angular 7 Routing Demo</h1>
<router-outlet></router-outlet>
```

Now let us create 2 components called as **Home** and **Contact Us** and navigate between them using routing.

Component Home

First, we shall discuss about Home. Following is the syntax for Component Home:

```
ng g component home
```

```
C:\projectA7\angular7-app>ng g component home
CREATE src/app/home/home.component.html (23 bytes)
CREATE src/app/home/home.component.spec.ts (614 bytes)
CREATE src/app/home/home.component.ts (261 bytes)
CREATE src/app/home/home.component.css (0 bytes)
UPDATE src/app/app.module.ts (692 bytes)
```

Component Contact Us

Following is the syntax for Component Contact Us:

```
ng g component contactus
```

```
C:\projectA7\angular7-app>ng g component contactus
CREATE src/app/contactus/contactus.component.html (28 bytes)
CREATE src/app/contactus/contactus.component.spec.ts (649 bytes)
CREATE src/app/contactus/contactus.component.ts (281 bytes)
CREATE src/app/contactus/contactus.component.css (0 bytes)
UPDATE src/app/app.module.ts (786 bytes)
```

We are done with creating components home and contact us. Below are the details of the components in app.module.ts:

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

import { AppRoutingModule } from './app-routing.module';
import { AppComponent } from './app.component';
import { NewCmpComponent } from './new-cmp/new-cmp.component';
import { ChangeTextDirective } from './change-text.directive';
import { SqrtPipe } from './app.sqrt';
import { HomeComponent } from './home/home.component';
import { ContactusComponent } from './contactus/contactus.component';

@NgModule({
  declarations: [
    SqrtPipe,
    AppComponent,
    NewCmpComponent,
    ChangeTextDirective,
    HomeComponent,
    ContactusComponent
  ],
  imports: [
    BrowserModule,
    AppRoutingModule
  ],
  providers: []
})
```

```

    providers: [],
    bootstrap: [AppComponent]
})
export class AppModule { }

```

Now let us add the routes details in **app-routing.module.ts** as shown below:

```

import { NgModule } from '@angular/core';
import { Routes, RouterModule } from '@angular/router';
import { HomeComponent } from './home/home.component';
import { ContactusComponent } from './contactus/contactus.component';

const routes: Routes = [
  {path:"home", component:HomeComponent},
  {path:"contactus", component:ContactusComponent}
];

@NgModule({
  imports: [RouterModule.forRoot(routes)],
  exports: [RouterModule]
})
export class AppRoutingModule { }

```

The routes array has the component details with path and component. The required component is imported as shown above.

Here, we need to notice that the components we need for routing are imported in app.module.ts and also in app-routing.module.ts. Let us import them in one place, i.e., in app-routing.module.ts.

So we will create an array of component to be used for routing and will export the array in app-routing.module.ts and again import it in app.module.ts. So we have all the components to be used for routing in app-routing.module.ts.

This is how we have done it **app-routing.module.ts**:

```

import { NgModule } from '@angular/core';
import { Routes, RouterModule } from '@angular/router';
import { HomeComponent } from './home/home.component';
import { ContactusComponent } from './contactus/contactus.component';
const routes: Routes = [
  {path:"home", component:HomeComponent},

```

```

    {path:"contactus", component:ContactusComponent}
];

@NgModule({
  imports: [RouterModule.forRoot(routes)],
  exports: [RouterModule]
})

export class AppRoutingModule { }

export const RoutingComponent = [ HomeComponent, ContactusComponent];

```

The array of components i.e., RoutingComponent is imported in app.module.ts as follows:

```

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

import { AppRoutingModule , RoutingComponent} from './app-routing.module';
import { AppComponent } from './app.component';
import { NewCmpComponent } from './new-cmp/new-cmp.component';
import { ChangeTextDirective } from './change-text.directive';
import { SqrtPipe } from './app.sqrt';

@NgModule({
  declarations: [
    SqrtPipe,
    AppComponent,
    NewCmpComponent,
    ChangeTextDirective,
    RoutingComponent
  ],
  imports: [
    BrowserModule,
    AppRoutingModule
  ],
  providers: [],
  bootstrap: [AppComponent]
})

```

```
export class AppModule { }
```

So now we are done with defining the routes. We need to display the same to the user, so let us add two buttons, Home and Contact Us in app.component.html and on click of the respective buttons, it will display the component view inside <router-outlet> directive which we have added in add.component.html.

Create button inside app.component.html and give the path to the routes created.

app.component.html

```
<h1>Angular 7 Routing Demo</h1>
<nav>
  <a routerLink="/home">Home</a>
  <a routerLink="/contactus">Contact Us </a>
</nav>
<router-outlet></router-outlet>
```

In .html, we have added anchor links, Home and Contact us and used routerLink to give the path to the routes we have created in app-routing.module.ts.

Let us now test the same in the browser:



This is how we get it in browser. Let us add some styling to make the links look good.

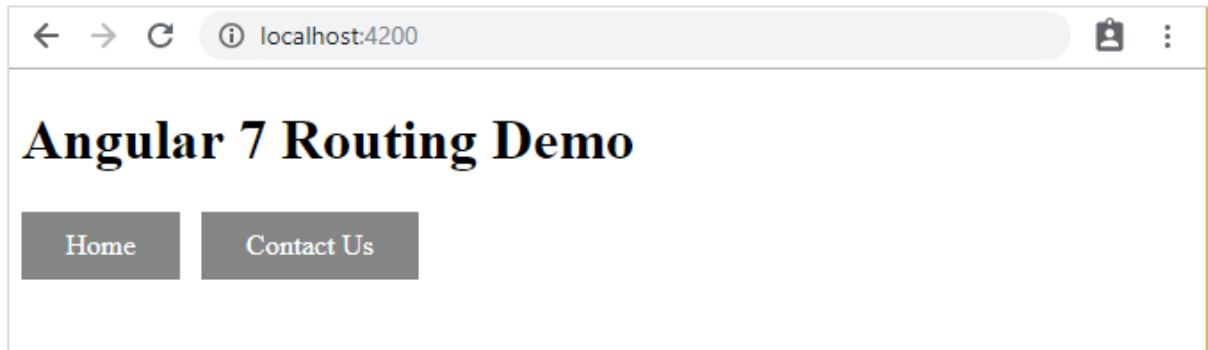
We have added following css in app.component.css:

```
a:link, a:visited {
  background-color: #848686;
  color: white;
  padding: 10px 25px;
  text-align: center;
  text-decoration: none;
  display: inline-block;
}

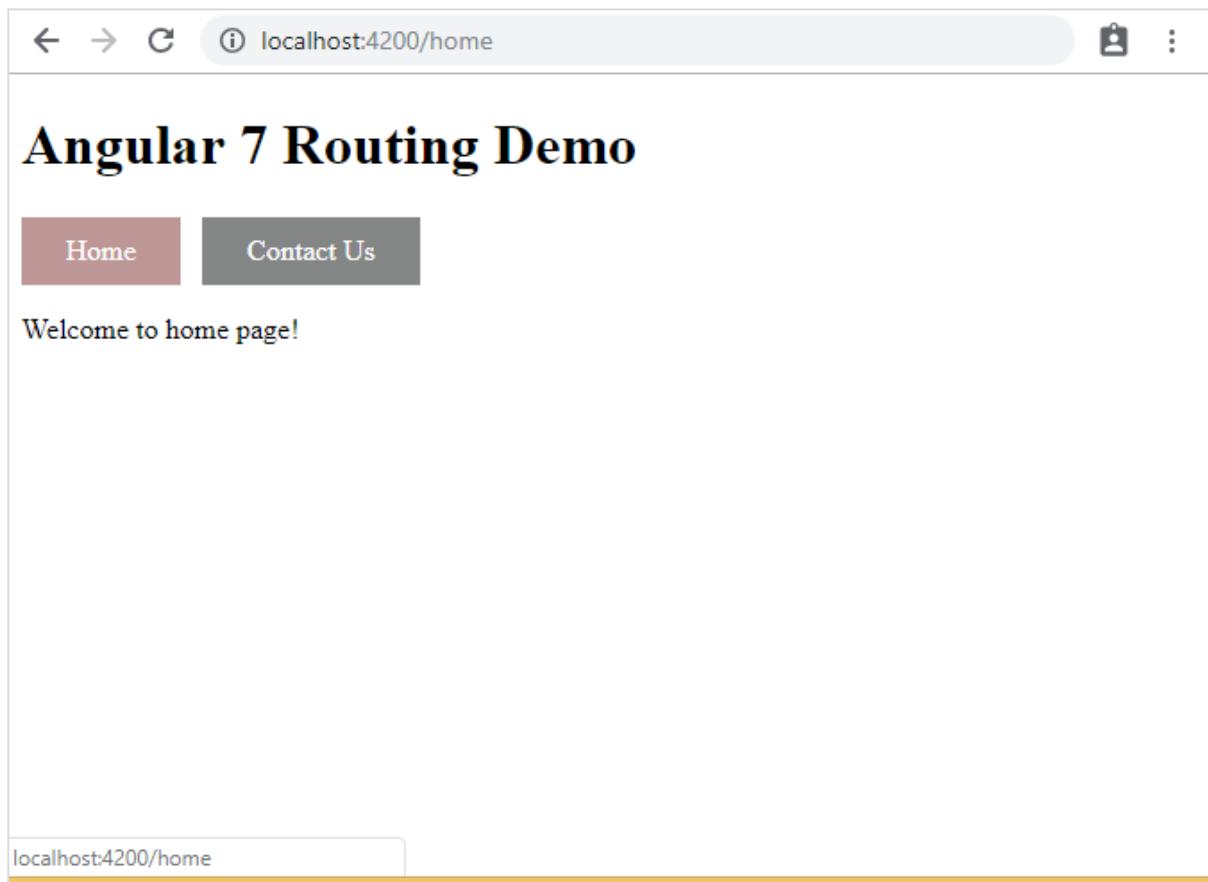
a:hover, a:active {
```

```
background-color: #BD9696;  
}
```

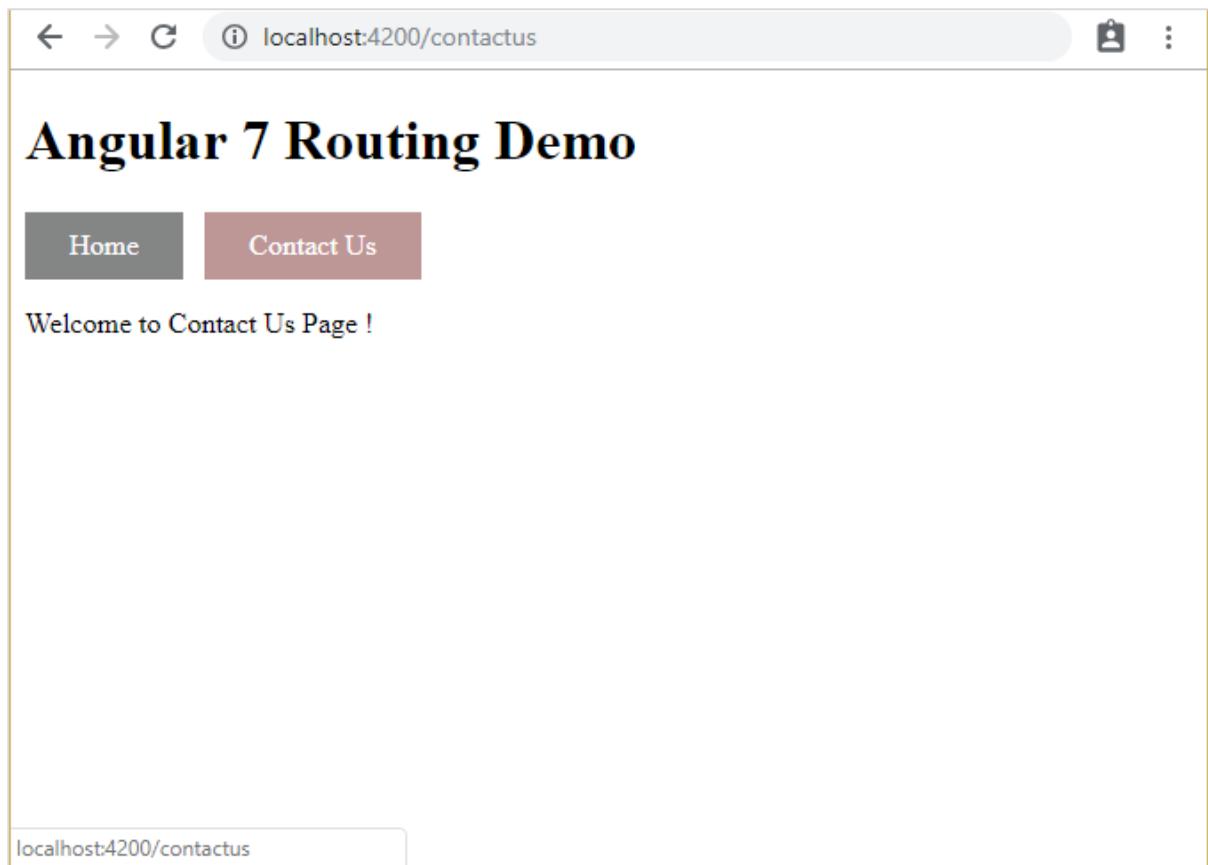
This is the display of the links in the browser:



Click on Home link, to see the component details of home as shown below:



Click on Contact Us, to see its component details as given below:



As you click on the link, you will also see the page url in the address bar changing. It appends the path details at the end of the page as seen in the screenshot shown above.

12. Angular 7 — Services

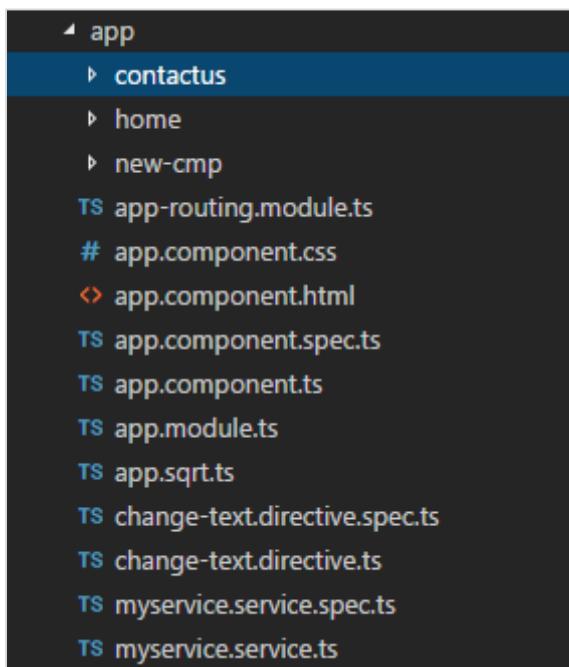
We might come across a situation where we need some code to be used everywhere on the page. For example, it can be for data connection that needs to be shared across components. This is achieved with the help of Services. With services, we can access methods and properties across other components in the entire project.

To create a service, we need to make use of the command line as given below:

```
ng g service myservice
```

```
C:\projectA7\angular7-app>ng g service myservice
CREATE src/app/myservice.service.spec.ts (348 bytes)
CREATE src/app/myservice.service.ts (138 bytes)
```

The files created in app folder are as follows:



Following are the files created which are shown at the bottom — myservice.service.specs.ts and myservice.service.ts.

myservice.service.ts

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

@Injectable({
```

```

    providedIn: 'root'
})

export class MyserviceService {

  constructor() { }

}

```

Here, the injectable module is imported from the `@angular/core`. It contains the `@Injectable` method and a class called `MyserviceService`. We will create our service function in this class.

Before creating a new service, we need to include the service created in the main parent **app.module.ts**.

```

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

import { AppRoutingModule , RoutingComponent} from './app-routing.module';
import { AppComponent } from './app.component';
import { NewCmpComponent } from './new-cmp/new-cmp.component';
import { ChangeTextDirective } from './change-text.directive';
import { SqrtPipe } from './app.sqrt';
import { MyserviceService } from './myservice.service';

@NgModule({
  declarations: [
    SqrtPipe,
    AppComponent,
    NewCmpComponent,
    ChangeTextDirective,
    RoutingComponent
  ],
  imports: [
    BrowserModule,
    AppRoutingModule
  ],
  providers: [MyserviceService],
  bootstrap: [AppComponent]
})

```

```
export class AppModule { }
```

We have imported the Service with the class name, and the same class is used in the providers. Let us now switch back to the service class and create a service function.

In the service class, we will create a function which will display today's date. We can use the same function in the main parent component `app.component.ts` and also in the new component `new-cmp.component.ts` that we created in the previous chapter.

Let us now see how the function looks in the `service` and how to use it in components.

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

@Injectable({
  providedIn: 'root'
})
export class MyserviceService {
  constructor() { }
  showTodayDate() {
    let ndate = new Date();
    return ndate;
  }
}
```

In the above service file, we have created a function `showTodayDate`. Now we will return the new Date () created. Let us see how we can access this function in the component class.

app.component.ts

```
import { Component } from '@angular/core';
import { MyserviceService } from './myservice.service';

@Component({
  selector: 'app-root',
  templateUrl: './app.component.html',
  styleUrls: ['./app.component.css']
})

export class AppComponent {
  title = 'Angular 7 Project!';
  todaydate;
  constructor(private myservice: MyserviceService) {}
```

```
ngOnInit() {
  this.todaydate = this.myservice.showTodayDate();
}

}
```

The ngOnInit function gets called by default in any component created. The date is fetched from the service as shown above. To fetch more details of the service, we need to first include the service in the component ts file.

We will display the date in the .html file as shown below:

app.component.html

```
{{todaydate}}
<app-new-cmp></app-new-cmp>
```

Let us now see how to use the service in the new component created.

new-cmp.component.ts

```
import { Component, OnInit } from '@angular/core';
import { MyserviceService } from './.../myservice.service';

@Component({
  selector: 'app-new-cmp',
  templateUrl: './new-cmp.component.html',
  styleUrls: ['./new-cmp.component.css']
})

export class NewCmpComponent implements OnInit {
  newcomponent = "Entered in new component created";
  todaydate;

  constructor(private myservice: MyserviceService) { }

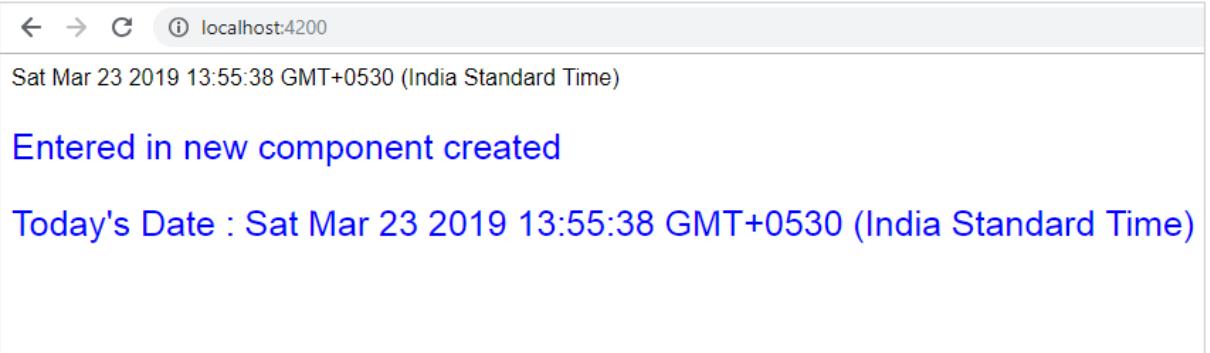
  ngOnInit() {
    this.todaydate = this.myservice.showTodayDate();
  }
}
```

In the new component that we have created, we need to first import the service that we want and access the methods and properties of the same. Check the code highlighted. todaydate is displayed in the component html as follows:

new-cmp.component.html

```
<p>
  {{newcomponent}}
</p>
<p>
  Today's Date : {{todaydate}}
</p>
```

The selector of the new component is used in the app.component.html file. The contents from the above html file will be displayed in the browser as shown below:



If you change the property of the service in any component, the same is changed in other components too. Let us now see how this works.

We will define one variable in the service and use it in the parent and the new component. We will again change the property in the parent component and will see if the same is changed in the new component or not.

In **myservice.service.ts**, we have created a property and used the same in other parent and new component.

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

@Injectable({
  providedIn: 'root'
})
export class MyserviceService {
  serviceproperty = "Service Created";
  constructor() { }
  showTodayDate() {
    let ndate = new Date();
    return ndate;
  }
}
```

Let us now use the **serviceproperty** variable in other components. In **app.component.ts**, we are accessing the variable as follows:

```
import { Component } from '@angular/core';
import { MyserviceService } from './myservice.service';

@Component({
  selector: 'app-root',
  templateUrl: './app.component.html',
  styleUrls: ['./app.component.css']
})

export class AppComponent {
  title = 'Angular 7 Project!';
  todaydate;
  componentproperty;
  constructor(private myservice: MyserviceService) {}
  ngOnInit() {
    this.todaydate = this.myservice.showTodayDate();
    console.log(this.myservice.serviceproperty);
    this.myservice.serviceproperty = "component created"; // value is
changed.
    this.componentproperty = this.myservice.serviceproperty;
  }
}
```

We will now fetch the variable and work on the `console.log`. In the next line, we will change the value of the variable to "component created". We will do the same in `new-cmp.component.ts`.

```
import { Component, OnInit } from '@angular/core';
import { MyserviceService } from '../../myservice.service';

@Component({
  selector: 'app-new-cmp',
  templateUrl: './new-cmp.component.html',
  styleUrls: ['./new-cmp.component.css']
})
export class NewCmpComponent implements OnInit {
  todaydate;
```

```

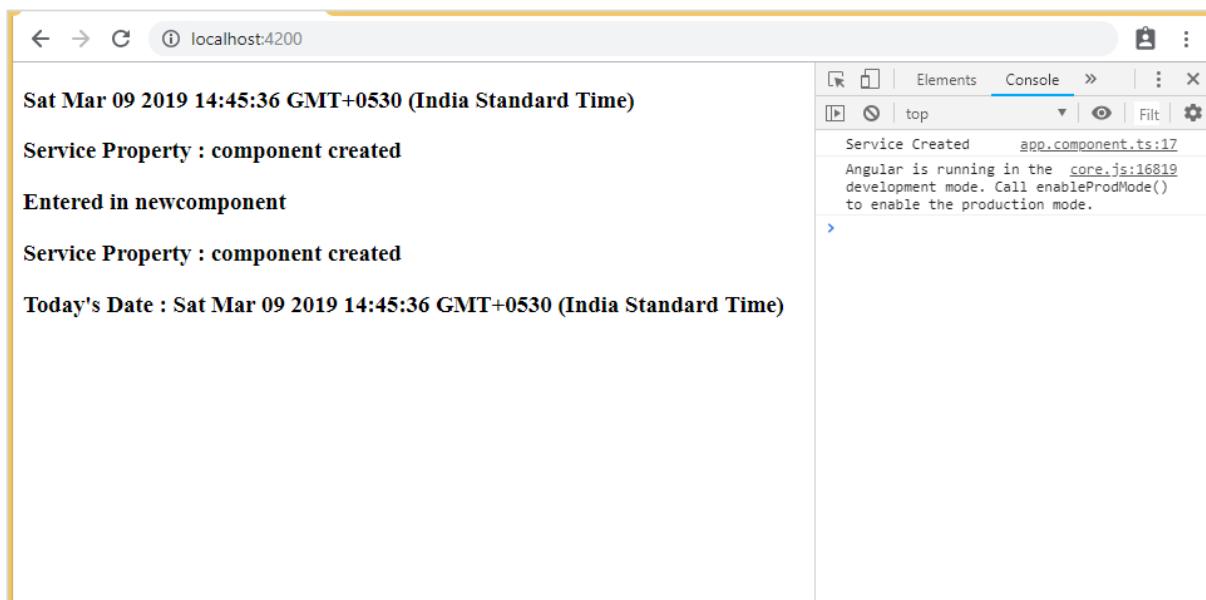
newcomponentproperty;
newcomponent = "Entered in newcomponent";
constructor(private myservice: MyserviceService) {}
ngOnInit() {
    this.todaydate = this.myservice.showTodayDate();
    this.newcomponentproperty = this.myservice.serviceproperty;
}
}

```

In the above component, we are not changing anything but directly assigning the property to the component property.

Now when you execute it in the browser, the service property will be changed since the value of it is changed in app.component.ts and the same will be displayed for the new-cmp.component.ts.

Also check the value in the console before it is changed.



Here is the app.component.html and new-cmp.component.html files:

app.component.html

```

<h3>{{todaydate}}</h3>
<h3>
    Service Property : {{componentproperty}}
</h3>
<app-new-cmp></app-new-cmp>

```

new-cmp.component.html

```
<h3>
```

```
{newcomponent}  
</h3>  
<h3>  
  Service Property : {{newcomponentproperty}}  
</h3>  
<h3>  
  Today's Date : {{todaydate}}  
</h3>
```

13. Angular 7 — Http Client

HttpClient will help us fetch external data, post to it, etc. We need to import the http module to make use of the http service. Let us consider an example to understand how to make use of the http service.

To start using the http service, we need to import the module in app.module.ts as shown below:

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

import { AppRoutingModule , RoutingComponent} from './app-routing.module';
import { AppComponent } from './app.component';
import { NewCmpComponent } from './new-cmp/new-cmp.component';
import { ChangeTextDirective } from './change-text.directive';
import { SqrtPipe } from './app.sqrt';
import { MyserviceService } from './myservice.service';
import { HttpClientModule } from '@angular/common/http';

@NgModule({
  declarations: [
    SqrtPipe,
    AppComponent,
    NewCmpComponent,
    ChangeTextDirective,
    RoutingComponent
  ],
  imports: [
    BrowserModule,
    AppRoutingModule,
    HttpClientModule
  ],
  providers: [MyserviceService],
  bootstrap: [AppComponent]
})
export class AppModule { }
```

If you see the highlighted code, we have imported the **HttpClientModule** from **@angular/common/http** and the same is also added in the imports array.

We will fetch the data from the server using httpclient module declared above. We will do that inside a service we created in the previous chapter and use the data inside the components which we want.

myservice.service.ts

```
import { Injectable } from '@angular/core';
import { HttpClient } from '@angular/common/http';

@Injectable({
  providedIn: 'root'
})
export class MyserviceService {
  private finaldata = [];
  private apiurl = "http://jsonplaceholder.typicode.com/users";
  constructor(private http: HttpClient) { }
  getData() {
    return this.http.get(this.apiurl);
  }
}
```

There is a method added called `getData` that returns the data fetched for the url given.

The method `getData` is called from `app.component.ts` as follows:

```
import { Component } from '@angular/core';
import { MyserviceService } from './myservice.service';

@Component({
  selector: 'app-root',
  templateUrl: './app.component.html',
  styleUrls: ['./app.component.css']
})

export class AppComponent {
  title = 'Angular 7 Project!';
  public persondata = [];
  constructor(private myservice: MyserviceService) {}
  ngOnInit() {
```

```

    this.myservice.getData().subscribe((data) => {
      this.personadata = Array.from(Object.keys(data), k=>data[k]);
      console.log(this.personadata);
    });
}

```

We are calling the method `getData` which gives back an **observable** type data. The `subscribe` method is used on it which has an arrow function with the data we need.

When we check in the browser, the console displays the data as shown below:

```

Angular is running in the development mode. Call enableProdMode() to enable the production mode. core.js:16819
app.component.ts:18
▼(10) [{}]
▶ 0: {id: 1, name: "Leanne Graham", username: "Bret", email: "Sincere@april.biz", address: {}, ...}
▶ 1: {id: 2, name: "Ervin Howell", username: "Antonette", email: "Shanna@melissa.tv", address: {}, ...}
▶ 2: {id: 3, name: "Clementine Bauch", username: "Samantha", email: "Nathan@yesenia.net", address: {}, ...}
▶ 3: {id: 4, name: "Patricia Lebsack", username: "Karianne", email: "Julianne.OConner@kory.org", address: {}, ...}
▶ 4: {id: 5, name: "Chelsey Dietrich", username: "Kamren", email: "Lucio_Hettinger@annie.ca", address: {}, ...}
▶ 5: {id: 6, name: "Mrs. Dennis Schulist", username: "Leopoldo_Corkery", email: "Karley_Dach@jasper.info", address: {}, ...}
▶ 6: {id: 7, name: "Kurtis Weissnat", username: "Elwyn.Skiles", email: "Telly.Hoeger@billy.biz", address: {}, ...}
▶ 7: {id: 8, name: "Nicholas Runolfsdottir V", username: "Maxime_Nienow", email: "Sherwood@rosamond.me", address: {}, ...}
▶ 8: {id: 9, name: "Glenna Reichert", username: "Delphine", email: "Chaim_McDermott@dana.io", address: {}, ...}
▶ 9: {id: 10, name: "Clementina DuBuque", username: "Moriah.Stanton", email: "Rey.Padberg@karina.biz", address: {}, ...}
  length: 10
  ▶ __proto__: Array(0)
  >

```

Let us use the data in `app.component.html` as follows:

```

<h3>Users Data</h3>

<ul>
  <li *ngFor="let item of personadata; let i = index">
    {{item.name}}
  </li>
</ul>

```

Output

The screenshot shows a web browser window with the URL 'localhost:4200' in the address bar. The page title is 'Users Data'. The content is a list of ten user names, each preceded by a bullet point:

- Leanne Graham
- Ervin Howell
- Clementine Bauch
- Patricia Lebsack
- Chelsey Dietrich
- Mrs. Dennis Schulist
- Kurtis Weissnat
- Nicholas Runolfsdottir V
- Glenna Reichert
- Clementina DuBuque

14. Angular 7 — CLI Prompts

Angular CLI makes it easy to start with any Angular project. Angular CLI comes with commands that help us create and start our project very fast. Let us now go through the commands available to create a project, a component and services, change the port, etc.

To work with Angular CLI, we need to have it installed on our system. Let us use the following command for the same:

```
npm install -g @angular/cli
```

To create a new project, we can run the following command in the command line and the project will be created.

```
ng new PROJECT-NAME  
cd PROJECT-NAME  
ng serve //
```

ng serve // will compile and you can see the output of your project in the browser:

```
http://localhost:4200/
```

4200 is the default port used when a new project is created. You can change the port with the following command:

```
ng serve --host 0.0.0.0 --port 4201
```

Command for Angular Update

In case you want to update your application and its dependencies, you can use the following command:

```
ng update @angular/cli @angular/core
```

It will update core framework to the recent version, i.e., Angular 7 and also angular-cli. You can use above command with following options:

Angular Important Command List

The following table lists down a few important commands required while working with Angular 7 projects:

Component	ng g component new-component
Directive	ng g directive new-directive
Pipe	ng g pipe new-pipe
Service	ng g service new-service
Module	ng g module my-module
Test	ng test
Build	ng build --configuration=production // for production environment ng build --configuration=staging // for staging environment

Whenever a new module, a component, or a service is created, the reference of the same is updated in the parent module **app.module.ts**.

15. Angular 7 – Forms

In this chapter, we will see how forms are used in Angular 7. We will discuss two ways of working with forms:

- Template driven form
- Model driven form

Template Driven Form

With a template driven form, most of the work is done in the template. With the model driven form, most of the work is done in the component class.

Let us now consider working on the Template driven form. We will create a simple login form and add the **email id**, **password** and **submit button** in the form. To start with, we need to import to **FormsModule** from **@angular/core** which is done in **app.module.ts** as follows:

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

import { AppRoutingModule , RoutingComponent} from './app-routing.module';
import { AppComponent } from './app.component';
import { NewCmpComponent } from './new-cmp/new-cmp.component';
import { ChangeTextDirective } from './change-text.directive';
import { SqrtPipe } from './app.sqrt';
import { MyserviceService } from './myservice.service';
import { HttpClientModule } from '@angular/common/http';
import { ScrollDispatchModule } from '@angular/cdk/scrolling';
import { DragDropModule } from '@angular/cdk/drag-drop';
import { FormsModule } from '@angular/forms';

@NgModule({
  declarations: [
    SqrtPipe,
    AppComponent,
    NewCmpComponent,
    ChangeTextDirective,
    RoutingComponent
  ],
  imports: [
    BrowserModule,
    AppRoutingModule,
    HttpClientModule,
    FormsModule,
    ScrollDispatchModule,
    DragDropModule
  ]
})
export class AppModule { }
```

```

imports: [
  BrowserModule,
  AppRoutingModule,
  HttpClientModule,
  ScrollDispatchModule,
  DragDropModule,
  FormsModule
],
providers: [MyserviceService],
bootstrap: [AppComponent]
)
export class AppModule { }

```

So in **app.module.ts**, we have imported the **FormsModule** and the same is added in the imports array as shown in the highlighted code.

Let us now create our form in the **app.component.html** file.

```

<form #userlogin = "ngForm" (ngSubmit) = "onClickSubmit(userlogin.value)" >
  <input type = "text" name = "emailid" placeholder = "emailid" ngModel>
  <br/>
  <input type = "password" name = "passwd" placeholder = "passwd" ngModel>
  <br/>
  <input type = "submit" value = "submit">
</form>

```

We have created a simple form with input tags having email id, password and the submit button. We have assigned type, name, and placeholder to it.

In template driven forms, we need to create the model form controls by adding the **ngModel** directive and the **name** attribute. Thus, wherever we want Angular to access our data from forms, add ngModel to that tag as shown above. Now, if we have to read the emailid and passwd, we need to add the ngModel across it.

If you see, we have also added the ngForm to the **#userlogin**. The **ngForm** directive needs to be added to the form template that we have created. We have also added function **onClickSubmit** and assigned **userlogin.value** to it.

Let us now create the function in the **app.component.ts** and fetch the values entered in the form.

```

import { Component } from '@angular/core';
import { MyserviceService } from './myservice.service';

```

```

@Component({
  selector: 'app-root',
  templateUrl: './app.component.html',
  styleUrls: ['./app.component.css']
})

export class AppComponent {
  title = 'Angular 7 Project!';
  constructor(private myservice: MyserviceService) { }
  ngOnInit() {
  }
  onClickSubmit(data) {
    alert("Entered Email id : " + data.emailid);
  }
}

```

In the above app.component.ts file, we have defined the function onClickSubmit. When you click on the form submit button, the control will come to the above function.

The css for the login form is added in **app.component.css**:

```

input[type=text], input[type=password] {
  width: 40%;
  padding: 12px 20px;
  margin: 8px 0;
  display: inline-block;
  border: 1px solid #B3A9A9;
  box-sizing: border-box;
}

input[type=submit] {
  padding: 12px 20px;
  margin: 8px 0;
  display: inline-block;
  border: 1px solid #B3A9A9;
  box-sizing: border-box;
}

```

This is how the browser is displayed:

A screenshot of a web browser showing a simple form. The address bar says 'localhost:4200'. The form contains two input fields: one labeled 'emailid' and another labeled 'passwd'. Below the inputs is a blue 'submit' button.

The form looks like as shown below. Let us enter the data in it and in the submit function, the email id is alerted as shown below:

A screenshot of a web browser showing the same form. The 'emailid' field now contains 'sites@gmail.com'. A modal dialog box is overlaid on the page, displaying the message 'localhost:4200 says' followed by 'Entered Email id : sites@gmail.com' and a blue 'OK' button.

Model Driven Form

In the model driven form, we need to import the `ReactiveFormsModule` from `@angular/forms` and use the same in the imports array.

There is a change which goes in `app.module.ts`.

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

import { AppRoutingModule , RouterModule} from './app-routing.module';
import { AppComponent } from './app.component';
import { NewCmpComponent } from './new-cmp/new-cmp.component';
import { ChangeTextDirective } from './change-text.directive';
import { SqrtPipe } from './app.sqrt';
import { MyserviceService } from './myservice.service';
import { HttpClientModule } from '@angular/common/http';
import { ScrollDispatchModule } from '@angular/cdk/scrolling';
import { DragDropModule } from '@angular/cdk/drag-drop';
```

```

import { ReactiveFormsModule } from '@angular/forms';

@NgModule({
  declarations: [
    SqrtPipe,
    AppComponent,
    NewCmpComponent,
    ChangeTextDirective,
    RoutingComponent
  ],
  imports: [
    BrowserModule,
    AppRoutingModule,
    HttpClientModule,
    ScrollDispatchModule,
    DragDropModule,
    ReactiveFormsModule
  ],
  providers: [MyserviceService],
  bootstrap: [AppComponent]
})
export class AppModule { }

```

In **app.component.ts**, we need to import a few modules for the model driven form. For example, **import { FormGroup, FormControl } from '@angular/forms'**.

```

import { Component } from '@angular/core';
import { MyserviceService } from './myservice.service';
import { FormGroup, FormControl } from '@angular/forms';

@Component({
  selector: 'app-root',
  templateUrl: './app.component.html',
  styleUrls: ['./app.component.css']
})

export class AppComponent {

```

```

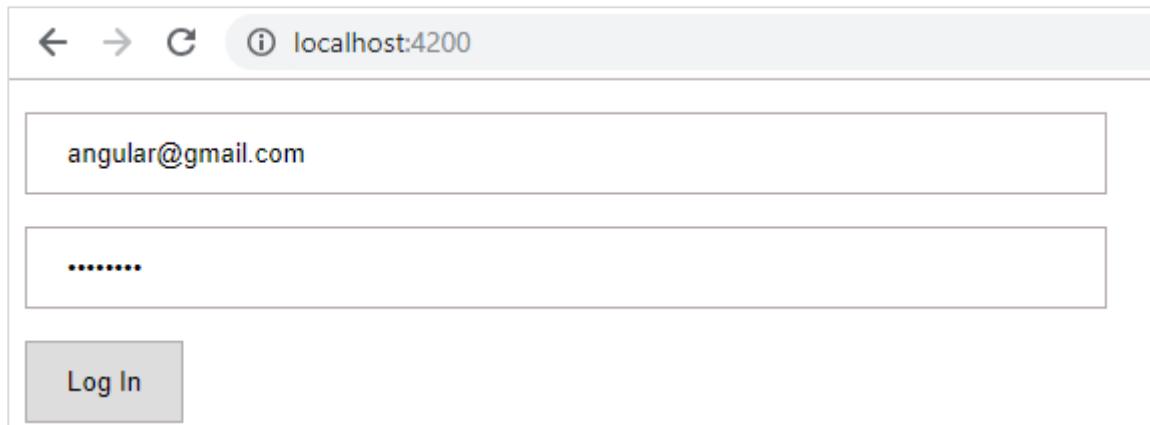
title = 'Angular 7 Project!';
emailid;

formdata;
constructor(private myservice: MyserviceService) { }
ngOnInit() {
  this.formdata = new FormGroup({
    emailid: new FormControl("angular@gmail.com"),
    passwd: new FormControl("abcd1234")
  });
}
onClickSubmit(data) {this.emailid = data.emailid;}
}

```

The variable formdata is initialized at the start of the class and the same is initialized with FormGroup as shown above. The variables emailid and passwd are initialized with default values to be displayed in the form. You can keep it blank in case you want to.

This is how the values will be seen in the form UI.



We have used formdata to initialize the form values; we need to use the same in the form UI **app.component.html**.

```

<div>
  <form [FormGroup]="formdata" (ngSubmit) = "onClickSubmit(formdata.value)" >
    <input type="text" class="fortextbox" name="emailid" placeholder="emailid"
      FormControlName="emailid">
    <br/>

    <input type="password" class="fortextbox" name="passwd"
      placeholder="passwd" FormControlName="passwd">
    <br/>

```

```

<input type="submit" class="forsubmit" value="Log In">
</form>
</div>
<p>
  Email entered is : {{emailid}}
</p>

```

In the .html file, we have used `formGroup` in square bracket for the form; for example, `[formGroup]="formdata"`. On submit, the function is called **onClickSubmit** for which **formdata.value** is passed.

The input tag **FormControlName** is used. It is given a value that we have used in the **app.component.ts** file.

On clicking submit, the control will pass to the function **onClickSubmit**, which is defined in the **app.component.ts** file.

On clicking Login, the value will be displayed as shown in the above screenshot.

Form Validation

Let us now discuss form validation using model driven form. You can use the built-in form validation or also use the custom validation approach. We will use both the approaches in the form. We will continue with the same example that we created in one of our previous sections. With Angular 7, we need to import **Validators** from **@angular/forms** as shown below:

```
import { FormGroup, FormControl, Validators } from '@angular/forms'
```

Angular has built-in validators such as **mandatory field**, **minlength**, **maxlength**, and **pattern**. These are to be accessed using the Validators module.

You can just add validators or an array of validators required to tell Angular if a particular field is mandatory. Let us now try the same on one of the input textboxes, i.e., email id. For the email id, we have added the following validation parameters:

- Required
- Pattern matching

This is how a code undergoes validation in **app.component.ts**.

```
import { Component } from '@angular/core';
import { FormGroup, FormControl, Validators} from '@angular/forms';

@Component({
  selector: 'app-root',
  templateUrl: './app.component.html',
  styleUrls: ['./app.component.css']
})

export class AppComponent {
  title = 'Angular 4 Project!';
  todaydate;
  componentproperty;
  emailid;
  formdata;
  ngOnInit() {
    this.formdata = new FormGroup({
      emailid: new FormControl("", Validators.compose([
        Validators.required,
        Validators.pattern("[^ @]*@[^ @]*")
      ])),
      passwd: new FormControl("")
    });
  }
  onClickSubmit(data) {this.emailid = data.emailid;}
}
```

In **Validators.compose**, you can add the list of things you want to validate on the input field. Right now, we have added the **required** and the **pattern matching** parameters to take only valid email.

In the **app.component.html**, the submit button is disabled if any of the form inputs are not valid. This is done as follows:

```

<div>
  <form [formGroup] = "formdata" (ngSubmit) = "onClickSubmit(formdata.value)" >
    <input type = "text" class = "fortextbox" name = "emailid" placeholder =
    "emailid"
      formControlName = "emailid">
    <br/>
    <input type = "password" class = "fortextbox" name = "passwd"
      placeholder = "passwd" formControlName = "passwd">
    <br/>
    <input type = "submit" [disabled] = "!formdata.valid" class = "forsubmit"
      value = "Log In">
  </form>
</div>

<p>
  Email entered is : {{emailid}}
</p>

```

For the submit button, we have added disabled in the square bracket, which is given the following value

```
!formdata.valid.
```

Thus, if the `formdata.valid` is not valid, the button will remain disabled and the user will not be able to submit it.

Let us see how this works in the browser:

Email entered is :

In the above case, the email id entered is invalid, hence the login button is disabled. Let us now try entering the valid email id and see the difference.

sites@gmail.com

Log In

Email entered is : sites@gmail.com

Now, the email id entered is valid. Thus, we can see the login button is enabled and the user will be able to submit it. With this, the email id entered is displayed at the bottom.

Let us now try **custom validation** with the same form. For custom validation, we can define our own custom function and add the required details in it. We will now see the below example for the same.

```
import { Component } from '@angular/core';
import { FormGroup, FormControl, Validators} from '@angular/forms';

@Component({
  selector: 'app-root',
  templateUrl: './app.component.html',
  styleUrls: ['./app.component.css']
})

export class AppComponent {
  title = 'Angular 7 Project!';
  todaydate;
  componentproperty;
  emailid;
  formdata;
  ngOnInit() {
    this.formdata = new FormGroup({
      emailid: new FormControl("", Validators.compose([
        Validators.required,

```

```

        Validators.pattern("[^ @]*@[^ @]*")
    ])),  

    passwd: new FormControl("", this.passwordvalidation)  

});  

}  

passwordvalidation(formcontrol) {  

    if (formcontrol.value.length < 5) {  

        return {"passwd" : true};  

    }  

}  

onClickSubmit(data) {this.emailid = data.emailid;}  

}

```

In the above example, we have created a function **passwordvalidation** and the same is used in a previous section in the formcontrol - **passwd: new FormControl("", this.passwordvalidation)**.

In the function that we have created, we will check if the length of the characters entered is appropriate. If the characters are less than five, it will return with the passwd true as shown above - return {"passwd" : true};. If the characters are more than five, it will consider it as valid and the login will be enabled.

Let us now see how this is displayed in the browser:

sites@gmail.com

....

Log In

Email entered is :

We have entered only three characters in the password and the login is disabled. To enable login, we need more than five characters. Let us now enter a valid length of characters and check.

The screenshot shows a web browser window with the URL "localhost:4200" in the address bar. Below the address bar are two input fields: the first contains the email "sites@gmail.com" and the second contains a password represented by five dots ("....."). Below these fields is a blue "Log In" button. At the bottom of the page, the text "Email entered is : sites@gmail.com" is displayed.

The login is enabled as both the email id and the password are valid. The email is displayed at the bottom as we log in.

16. Angular 7 — Materials/CDK-Virtual Scrolling

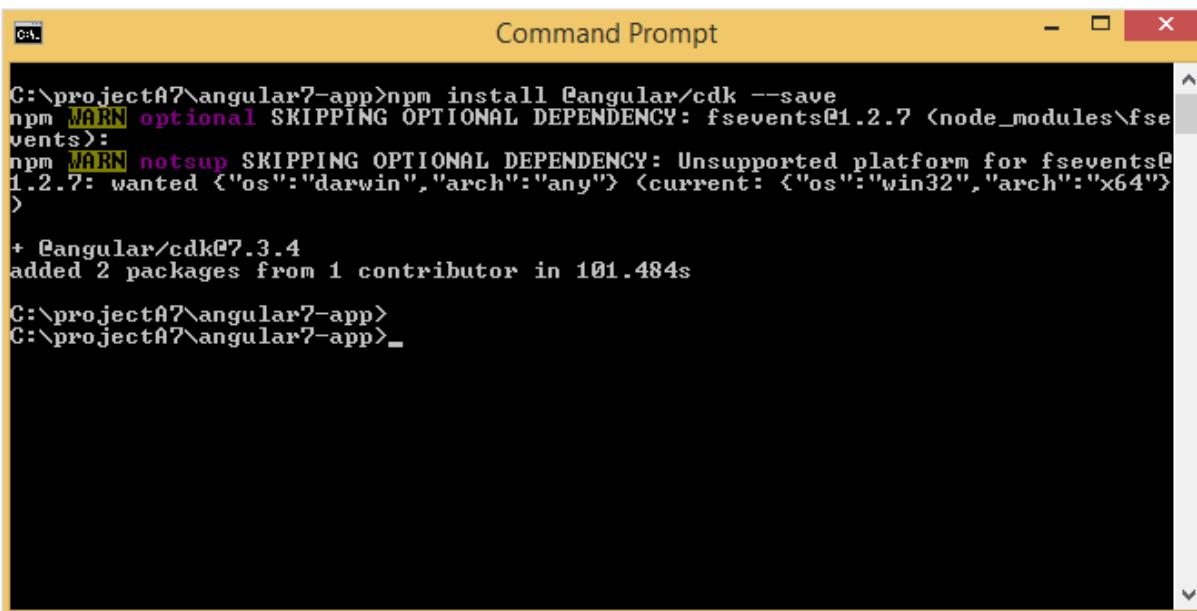
This is one of the new features added to Angular 7 called as Virtual Scrolling. This feature is added to CDK (Component Development Kit). Virtual scrolling shows up the visible dom elements to the user, as the user scrolls, the next list is displayed. This gives faster experience as the full list is not loaded at one go and only loaded as per the visibility on the screen.

Why do we need Virtual Scrolling Module?

Consider you have a UI which has a big list where loading all the data together can have performance issues. The new feature of Angular 7 Virtual Scrolling takes care of loading the elements which are visible to the user. As the user scrolls, the next list of dom elements visible to user is displayed. This gives faster experience and the scrolling is also very smooth.

Let us add the dependency to our project:

```
npm install @angular/cdk --save
```



```
C:\projectA7\angular7-app>npm install @angular/cdk --save
npm WARN optional SKIPPING OPTIONAL DEPENDENCY: fsevents@1.2.7 (node_modules\fsevents):
npm WARN notsup SKIPPING OPTIONAL DEPENDENCY: Unsupported platform for fsevents@1.2.7: wanted {"os":"darwin","arch":"any"} (current: {"os":"win32","arch":"x64"})
+
+ @angular/cdk@7.3.4
added 2 packages from 1 contributor in 101.484s

C:\projectA7\angular7-app>
C:\projectA7\angular7-app>
```

We are done with installing the dependency for virtual scrolling module.

We will work on an example to get a better understanding on how we can use virtual scrolling module in our project.

We will first add the virtual scrolling module inside **app.module.ts** as follows:

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

```

import { AppRoutingModule , RoutingComponent} from './app-routing.module';
import { AppComponent } from './app.component';
import { NewCmpComponent } from './new-cmp/new-cmp.component';
import { ChangeTextDirective } from './change-text.directive';
import { SqrtPipe } from './app.sqrt';
import { MyserviceService } from './myservice.service';
import { HttpClientModule } from '@angular/common/http';
import { ScrollDispatchModule } from '@angular/cdk/scrolling';

@NgModule({
  declarations: [
    SqrtPipe,
    AppComponent,
    NewCmpComponent,
    ChangeTextDirective,
    RoutingComponent
  ],
  imports: [
    BrowserModule,
    AppRoutingModule,
    HttpClientModule,
    ScrollDispatchModule
  ],
  providers: [MyserviceService],
  bootstrap: [AppComponent]
})
export class AppModule { }

```

In app.module.ts, we have imported the ScrollDispatchModule and the same is added to imports array as shown in the code above.

Next step is to get data to be displayed on the screen. We will continue to use the service we created in the last chapter.

We will fetch data from the url, <https://jsonplaceholder.typicode.com/photos> which has data for around 5000 images. We will get the data from it and display to the user using virtual scrolling module.

The details in the url, <https://jsonplaceholder.typicode.com/photos> are as follows:



```
[  
  {  
    "albumId": 1,  
    "id": 1,  
    "title": "accusamus beatae ad facilis cum similique qui sunt",  
    "url": "https://via.placeholder.com/600/92c952",  
    "thumbnailUrl": "https://via.placeholder.com/150/92c952"  
  },  
  {  
    "albumId": 1,  
    "id": 2,  
    "title": " reprehenderit est deserunt velit ipsam",  
    "url": "https://via.placeholder.com/600/771796",  
    "thumbnailUrl": "https://via.placeholder.com/150/771796"  
  },  
  {  
    "albumId": 1,  
    "id": 3,  
    "title": " officia porro iure quia iusto qui ipsa ut modi",  
    "url": "https://via.placeholder.com/600/24f355",  
    "thumbnailUrl": "https://via.placeholder.com/150/24f355"  
  },  
  {  
    "albumId": 1,  
    "id": 4,  
    "title": " culpa odio esse rerum omnis laboriosam voluptate repudiandae",  
    "url": "https://via.placeholder.com/600/d32776",  
    "thumbnailUrl": "https://via.placeholder.com/150/d32776"  
  },  
  {  
    "albumId": 1,  
    "id": 5,  
    "title": " natus nisi omnis corporis facere molestiae rerum in",  
    "url": "https://via.placeholder.com/600/f66b97",  
    "thumbnailUrl": "https://via.placeholder.com/150/f66b97"  
  },  
]
```

It is json data that has image url and thumbnail url. We will show the thumbnail url to the users.

Following is the service which will fetch data:

myservice.service.ts

```
import { Injectable } from '@angular/core';  
  
import { HttpClient } from '@angular/common/http';  
  
@Injectable({  
  providedIn: 'root'  
})  
export class MyserviceService {
```

```

private finaldata = [];
private apiurl = "https://jsonplaceholder.typicode.com/photos";
constructor(private http: HttpClient) { }
getData() {
  return this.http.get(this.apiurl);
}
}

```

We will call the service from app.component.ts as follows:

```

import { Component } from '@angular/core';
import { MyserviceService } from './myservice.service';

@Component({
  selector: 'app-root',
  templateUrl: './app.component.html',
  styleUrls: ['./app.component.css']
})

export class AppComponent {
  title = 'Angular 7 Project!';
  public albumdetails = [];
  constructor(private myservice: MyserviceService) {}
  ngOnInit() {
    this.myservice.getData().subscribe((data) => {
      this.albumdetails = Array.from(Object.keys(data), k=>data[k]);
      console.log(this.albumdetails);
    });
  }
}

```

Now the variable **albumdetails** has all the data from the api and the total count is 5000.

Now that we have the data ready to be displayed, let us work inside app.component.html to display the data.

We need to add the tag, **<cdk-virtual-scroll-viewport></cdk-virtual-scroll-viewport>** to work with virtual scroll module. The tag needs to be added to .html file where we want the data to be displayed.

Here is the working of **<cdk-virtual-scroll-viewport>** in app.component.html.

```

<h3>Angular 7 - Virtual Scrolling</h3>

<cdk-virtual-scroll-viewport [itemSize]="20">
  <table>
    <thead>
      <tr>
        <td>ID</td>
        <td>ThumbNail</td>
      </tr>
    </thead>
    <tbody>
      <tr *cdkVirtualFor="let album of albumdetails">
        <td>{{album.id}}</td>
        <td></td>
      </tr>
    </tbody>
  </table>
</cdk-virtual-scroll-viewport>

```

We are displaying the id and thumbnail url to the user on the screen. We have mostly used *ngFor so far, but inside **<cdk-virtual-scroll-viewport>**, we have to use *cdkVirtualFor to loop through the data.

We are looping through albumdetails variable which is populated inside app.component.html. There is a size assigned to the virtual tag [itemSize]="20" which will display the number of items based on the height of the virtual scroll module.

The css related to the virtual scroll module is as follows:

```

table {
  width: 100%;
}
cdk-virtual-scroll-viewport {
  height: 500px;
}

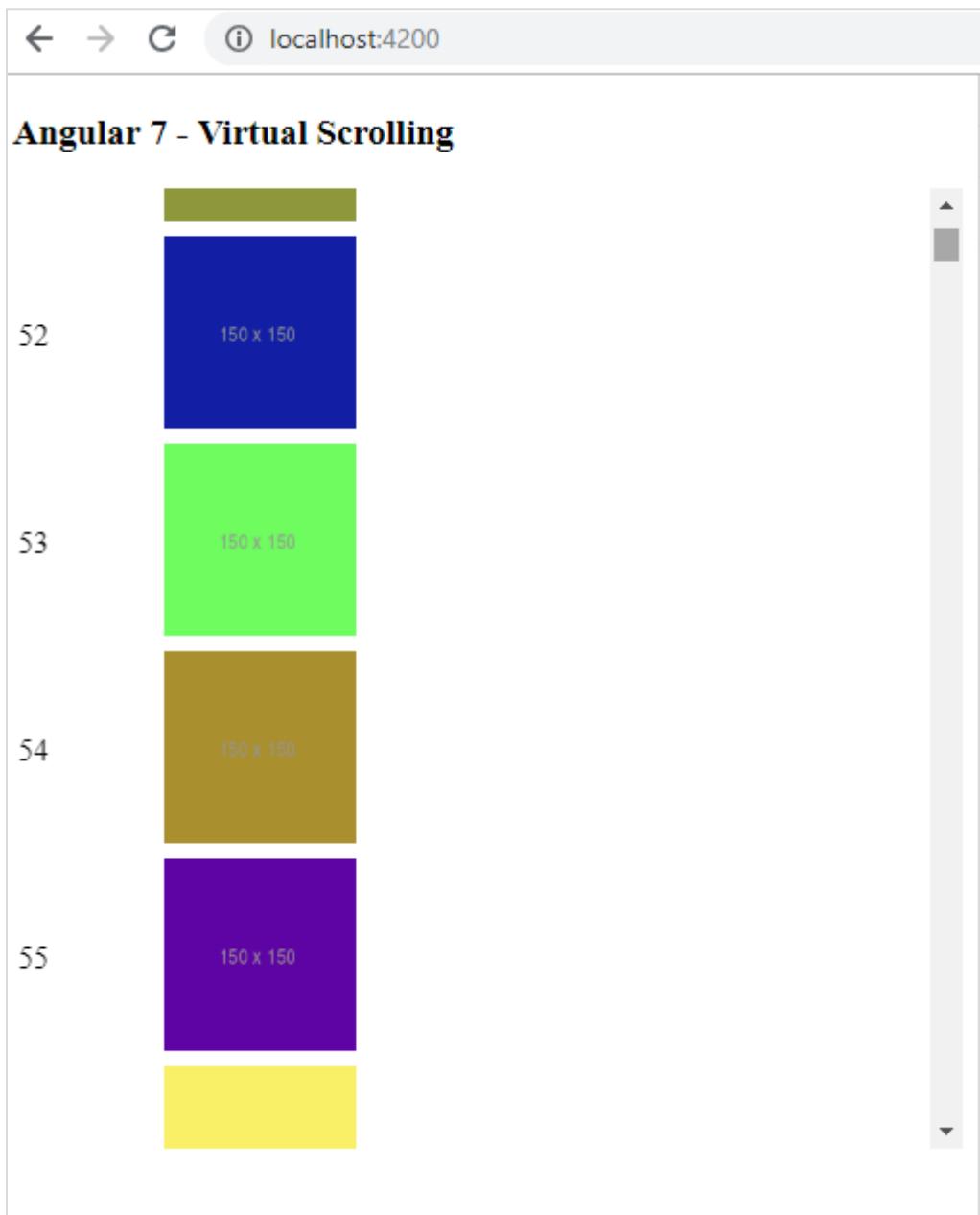
```

The height given to the virtual scroll is 500px. The images that fit within that height will be displayed to the user. We are done with adding the necessary code to get our virtual scroll module to be viewed.

The output of Virtual Scroll Module in the browser is as follows:

The screenshot shows a web browser window with the URL `localhost:4200`. The title of the page is **Angular 7 - Virtual Scrolling**. Inside the browser, there is a table with two columns. The first column is labeled "ID" and contains the values 1, 2, 3, and 4. The second column is labeled "ThumbNail" and contains four colored squares, each labeled "150 x 150". The colors of the squares are green, purple, green, and pink respectively. A vertical scroll bar is visible on the right side of the table area.

We can see the first 4 images are displayed to the user. We have specified the height of 500px. There is scroll displayed for the table, as the user scrolls, the images which will fit in that height will be displayed as shown below:

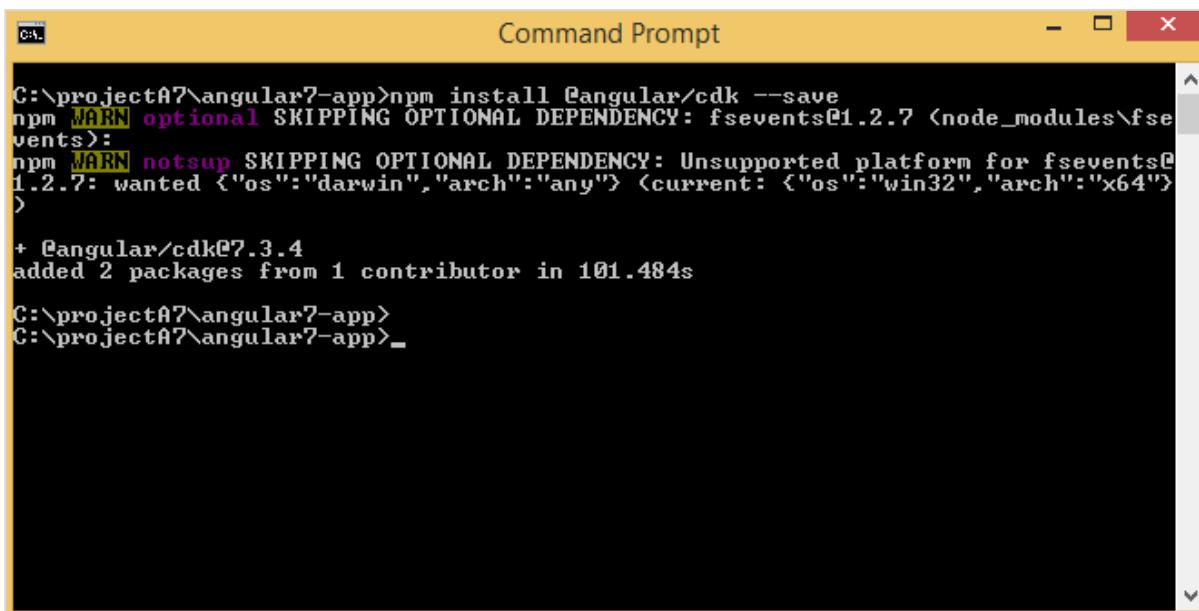


The required images are loaded as the user scrolls. This feature is very useful in terms of performance. At first go, it does not load all the 5000 images, instead as the user scrolls, the urls are called and displayed.

17. Angular 7 — Materials/CDK-Drag and Drop

The new Drag and Drop feature added to Angular 7 CDK helps to drag and drop the elements from the list. We will understand the working of Drag and Drop Module with the help of an example. The feature is added to cdk. We need to first download the dependency as shown below:

```
npm install @angular/cdk --save
```



```
C:\>cd angular7-app>npm install @angular/cdk --save
npm WARN optional SKIPPING OPTIONAL DEPENDENCY: fsevents@1.2.7 (node_modules\fsevents):
npm WARN notsup SKIPPING OPTIONAL DEPENDENCY: Unsupported platform for fsevents@1.2.7: wanted {"os":"darwin","arch":"any"} (current: {"os":"win32","arch":"x64"})
>

+ @angular/cdk@7.3.4
added 2 packages from 1 contributor in 101.484s

C:\>cd angular7-app>
C:\>
```

Once the above step is done. Let us import the drag and drop module in app.module.ts as shown below:

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

import { AppRoutingModule , RoutingComponent} from './app-routing.module';
import { AppComponent } from './app.component';
import { NewCmpComponent } from './new-cmp/new-cmp.component';
import { ChangeTextDirective } from './change-text.directive';
import { SqrtPipe } from './app.sqrt';
import { MyserviceService } from './myservice.service';
import { HttpClientModule } from '@angular/common/http';
import { ScrollDispatchModule } from '@angular/cdk/scrolling';
import { DragDropModule } from '@angular/cdk/drag-drop';
```

```

@NgModule({
  declarations: [
    SqrtPipe,
    AppComponent,
    NewCmpComponent,
    ChangeTextDirective,
    RoutingComponent
  ],
  imports: [
    BrowserModule,
    AppRoutingModule,
    HttpClientModule,
    ScrollDispatchModule,
    DragDropModule
  ],
  providers: [MyserviceService],
  bootstrap: [AppComponent]
})
export class AppModule { }

```

The DragDropModule is imported from '**@angular/cdk/drag-drop**' and the module is added to import array as shown above.

We will use details from the api, (<http://jsonplaceholder.typicode.com/users>) to be displayed on the screen. We have service which will fetch the data from the api as shown below:

myservice.service.ts

```

import { Injectable } from '@angular/core';
import { HttpClient } from '@angular/common/http';

@Injectable({
  providedIn: 'root'
})
export class MyserviceService {
  private finaldata = [];
  private apiurl = "http://jsonplaceholder.typicode.com/users";
  constructor(private http: HttpClient) { }
  getData() {

```

```

        return this.http.get(this.apiurl);
    }
}

```

Once done call the service inside app.component.ts as shown below:

```

import { Component } from '@angular/core';
import { MyserviceService } from './myservice.service';

@Component({
  selector: 'app-root',
  templateUrl: './app.component.html',
  styleUrls: ['./app.component.css']
})

export class AppComponent {
  title = 'Angular 7 Project!';
  public personaldetails = [];
  constructor(private myservice: MyserviceService) {}
  ngOnInit() {
    this.myservice.getData().subscribe((data) => {
      this.personaldetails = Array.from(Object.keys(data), k=>data[k]);
      console.log(this.personaldetails);
    });
  }
}

```

We have the required data available in personaldetails variable. Now let us use the same to display to the user as shown below:

```

<h3>Angular 7 - Drag and Drop Module</h3>
<div>
  <div *ngFor="let item of personaldetails; let i = index" class="divlayout">
    {{item.name}}
  </div >
</div>

```

We have added class="divlayout" and the details of the class are in app.component.css.

```
.divlayout{
```

```

width: 40%;
background-color: #ccc;
margin-bottom: 5px;
padding: 10px 10px;
border: 3px solid #73AD21;
}

```

Following screen will be displayed in the browser:

The screenshot shows a browser window with the URL `localhost:4200`. The title bar says "Angular 7 - Drag and Drop Module". Below the title, there is a vertical list of ten names, each contained within its own rectangular box with a thin green border:

- Leanne Graham
- Ervin Howell
- Clementine Bauch
- Patricia Lebsack
- Chelsey Dietrich
- Mrs. Dennis Schulist
- Kurtis Weissnat
- Nicholas Runolfsdottir V
- Glenna Reichert
- Clementina DuBuque

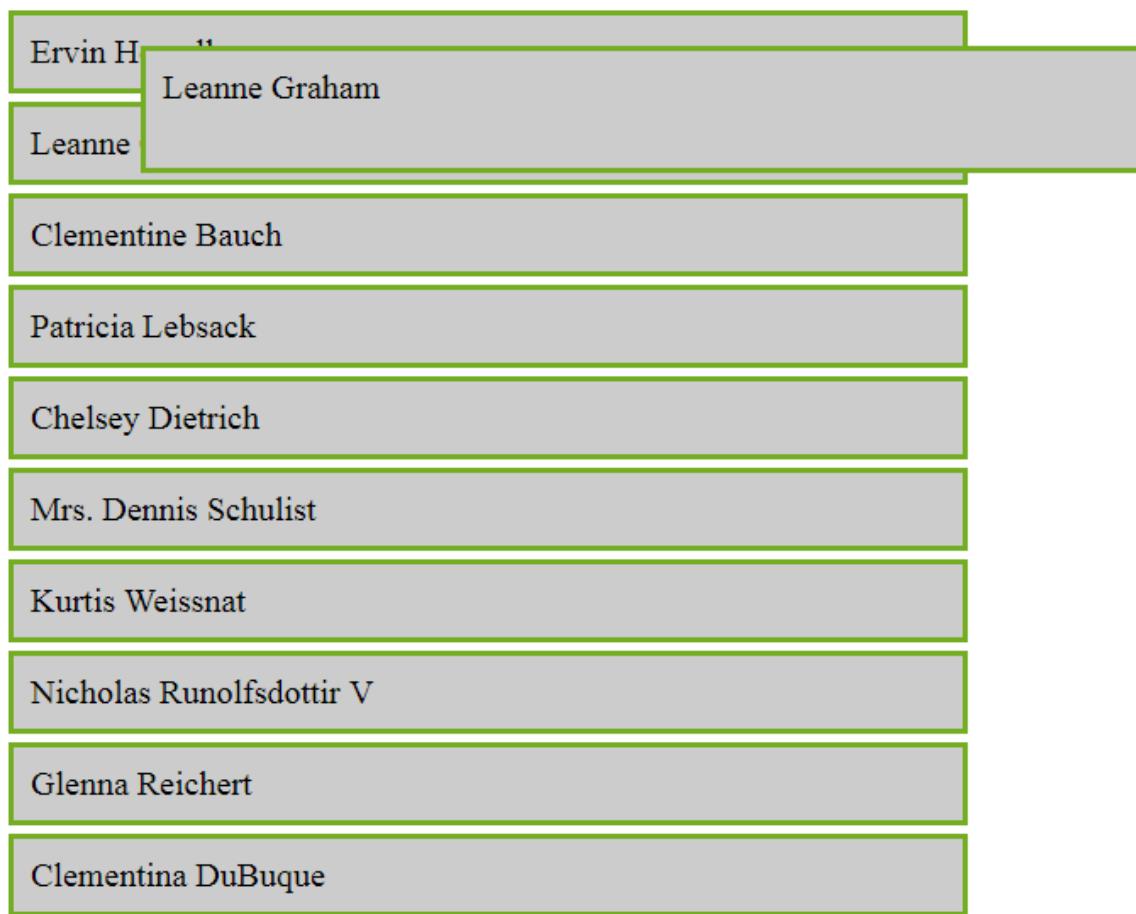
It will not drag and drop anything, we need to add the dragdrop cdk properties in `app.component.html` as shown below:

```
<h3>Angular 7 - Drag and Drop Module</h3>

<div
  cdkDropList
  #personList="cdkDropList"
  [cdkDropListData]="personaldetails"
  [cdkDropListConnectedTo]="[userlist]"
  class="example-list"
  (cdkDropListDropped)="onDrop($event)"
>
  <div *ngFor="let item of personaldetails; let i = index" class="divlayout"
    cdkDrag>
    {{item.name}}
  </div >
</div>
```

The highlighted ones are all the properties required to perform drag and drop. When you check in the browser, it allows you to drag the item. It will not drop it in the list and will remain as it is when you leave the mouse pointer.

Angular 7 - Drag and Drop Module



Here it allows to drag the item from the list but once you leave the mouse pointer it will go and settle in the same place. To add the drop feature, we need to add the event `onDrop` in `app.component.ts` as shown below:

First we have to import the dragdrop cdk modules as shown below:

```
import {CdkDragDrop, moveItemInArray, transferArrayItem} from
'@angular/cdk/drag-drop';
```

Here is the full code in `app.component.ts`:

```
import { Component } from '@angular/core';
import { MyserviceService } from './myservice.service';
import {CdkDragDrop, moveItemInArray, transferArrayItem} from
'@angular/cdk/drag-drop';

@Component({
  selector: 'app-root',
  templateUrl: './app.component.html',
```

```

styleUrls: ['./app.component.css']
})

export class AppComponent {
  title = 'Angular 7 Project!';
  public personaldetails = [];
  constructor(private myservice: MyserviceService) {}
  ngOnInit() {
    this.myservice.getData().subscribe((data) => {
      this.personaldetails = Array.from(Object.keys(data), k=>data[k]);
      console.log(this.personaldetails);
    });
  }

  onDrop(event: CdkDragDrop<string[]>) {
    if (event.previousContainer === event.container) {
      moveItemInArray(event.container.data, event.previousIndex,
      event.currentIndex);
    } else {
      transferArrayItem(event.previousContainer.data,
        event.container.data,
        event.previousIndex,
        event.currentIndex);
    }
  }
}

```

The function onDrop takes care of dropping the item dragged in the position required.

It makes use of the **moveItemInArray** and **transferArrayItem** we have imported from cdk dragdrop module.

Now let us see the demo again in the browser:

Angular 7 - Drag and Drop Module

The screenshot illustrates the Angular 7 Drag and Drop module. A list of names is displayed in a grid-like structure. The name "Leanne Graham" is currently being dragged, as evidenced by a green border around its box. The other names are static and contained within their own boxes.

Names
Ervin Howell
Clementine Bauch
Patricia Lebsack
Chelsey Dietrich
Mrs. Dennis Schulist
Kurtis Weissnat
Leanne Graham
Nicholas Runolfsdottir V
Glenna Reichert
Clementina DuBuque

Now it allows you to drag and drop the item in the position required as shown above. The feature works very smoothly without any flicker issues and can be used in your application wherever the need arises.

18. Angular 7 — Animations

Animations add a lot of interaction between the html elements. Animation was available with Angular 2, from Angular 4 onwards animation is no more a part of the @angular/core library, but is a separate package that needs to be imported in app.module.ts.

To start with, we need to import the library with the below line of code:

```
import { BrowserAnimationsModule } from '@angular/platform-browser/animations';
```

The **BrowserAnimationsModule** needs to be added to the import array in **app.module.ts** as shown below:

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

import { AppRoutingModule , RoutingComponent} from './app-routing.module';
import { AppComponent } from './app.component';
import { NewCmpComponent } from './new-cmp/new-cmp.component';
import { ChangeTextDirective } from './change-text.directive';
import { SqrtPipe } from './app.sqrt';
import { MyserviceService } from './myservice.service';
import { HttpClientModule } from '@angular/common/http';
import { ScrollDispatchModule } from '@angular/cdk/scrolling';
import { DragDropModule } from '@angular/cdk/drag-drop';
import { ReactiveFormsModule } from '@angular/forms';
import { BrowserAnimationsModule } from '@angular/platform-browser/animations';

@NgModule({
  declarations: [
    SqrtPipe,
    AppComponent,
    NewCmpComponent,
    ChangeTextDirective,
    RoutingComponent
  ],
  imports: [
    BrowserModule,
```

```

    AppRoutingModule,
    HttpClientModule,
    ScrollDispatchModule,
    DragDropModule,
    ReactiveFormsModule,
    BrowserAnimationsModule
  ],
  providers: [MyserviceService],
  bootstrap: [AppComponent]
))
export class AppModule { }

```

In **app.component.html**, we have added the html elements, which are to be animated.

```

<div>
  <button (click)="animate()">Click Me</button>
  <div [@myanimation] = "state" class="rotate">
    
  </div>
</div>

```

For the main div, we have added a button and a div with an image. There is a click event for which the animate function is called. And for the div, the **@myanimation** directive is added and given the value as state.

Let us now see the **app.component.ts** where the animation is defined.

```

import { Component } from '@angular/core';
import { FormGroup, FormControl, Validators} from '@angular/forms';
import { trigger, state, style, transition, animate } from
  '@angular/animations';

@Component({
  selector: 'app-root',
  templateUrl: './app.component.html',
  styleUrls: ['./app.component.css'],
  styles:[` 
    div{
      margin: 0 auto;
      text-align: center;
    }
  `]
})

```

```

        width:200px;
    }

    .rotate{
        width:100px;
        height:100px;
        border:solid 1px red;
    }
`],
animations: [
    trigger('myanimation',[

        state('smaller',style({
            transform : 'translateY(100px)'

        })),
        state('larger',style({
            transform : 'translateY(0px)'

        })),
        transition('smaller <=> larger',animate('300ms ease-in'))
    ])
})
}

export class AppComponent {
    state: string = "smaller";
    animate() {

        this.state= this.state == 'larger' ? 'smaller' : 'larger';
    }
}

```

We have to import the animation function that is to be used in the .ts file as shown above.

```

import { trigger, state, style, transition, animate } from
'@angular/animations';

```

Here we have imported trigger, state, style, transition, and animate from @angular/animations.

Now, we will add the animations property to the @Component () decorator:

```

animations: [
    trigger('myanimation',[


```

```

state('smaller',style({
  transform : 'translateY(100px)'
}),
state('larger',style({
  transform : 'translateY(0px)'
}),
transition('smaller <=> larger',animate('300ms ease-in'))
])
]

```

Trigger defines the start of the animation. The first param to it is the name of the animation to be given to the html tag to which the animation needs to be applied. The second param are the functions we have imported - state, transition, etc.

The state function involves the animation steps, which the element will transition between. Right now we have defined two states, smaller and larger. For smaller state, we have given the style **transform:translateY(100px)** and **transform:translateY(0px)**.

Transition function adds animation to the html element. The first argument takes the start and end states, the second argument accepts the animate function. The animate function allows you to define the length, delay, and ease of a transition.

Let us now see the .html file to see how the transition function works:

```

<div>
  <button (click)="animate()">Click Me</button>
  <div [@myanimation] = "state" class="rotate">
    
  </div>
</div>

```

There is a style property added in the @component directive, which centrally aligns the div. Let us consider the following example to understand the same:

```

styles:[` 
  div{
    margin: 0 auto;
    text-align: center;
    width:200px;
  }
  .rotate{
    width:100px;
    height:100px;
    border:solid 1px red;
  }
`]

```

```

    }
`],

```

Here, a special character [``] is used to add styles to the html element, if any. For the div, we have given the animation name defined in the **app.component.ts** file.

On the click of a button it calls the animate function, which is defined in the **app.component.ts** file as follows:

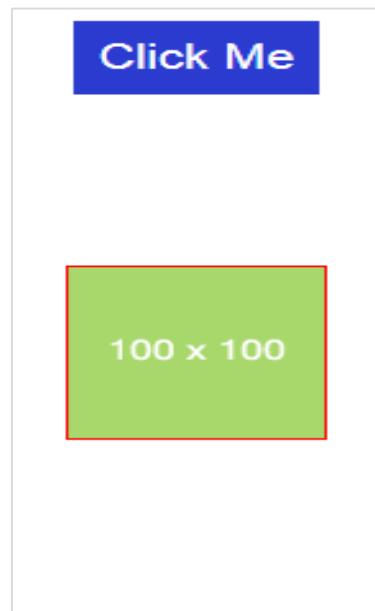
```

export class AppComponent {
  state: string = "smaller";
  animate() {
    this.state= this.state == 'larger'? 'smaller' : 'larger';
  }
}

```

The state variable is defined and is given the default value as smaller. The animate function changes the state on click. If the state is larger, it will convert to smaller; and if smaller, it will convert to larger.

This is how the output in the browser (<http://localhost:4200/>) will look like:



Upon clicking the **Click Me** button, the position of the image is changed as shown in the following screenshot:



The transform function is applied in the y direction, which is changed from 0 to 100px when we click the Click Me button. The image is stored in the **assets/images** folder.

19. Angular 7 – Materials

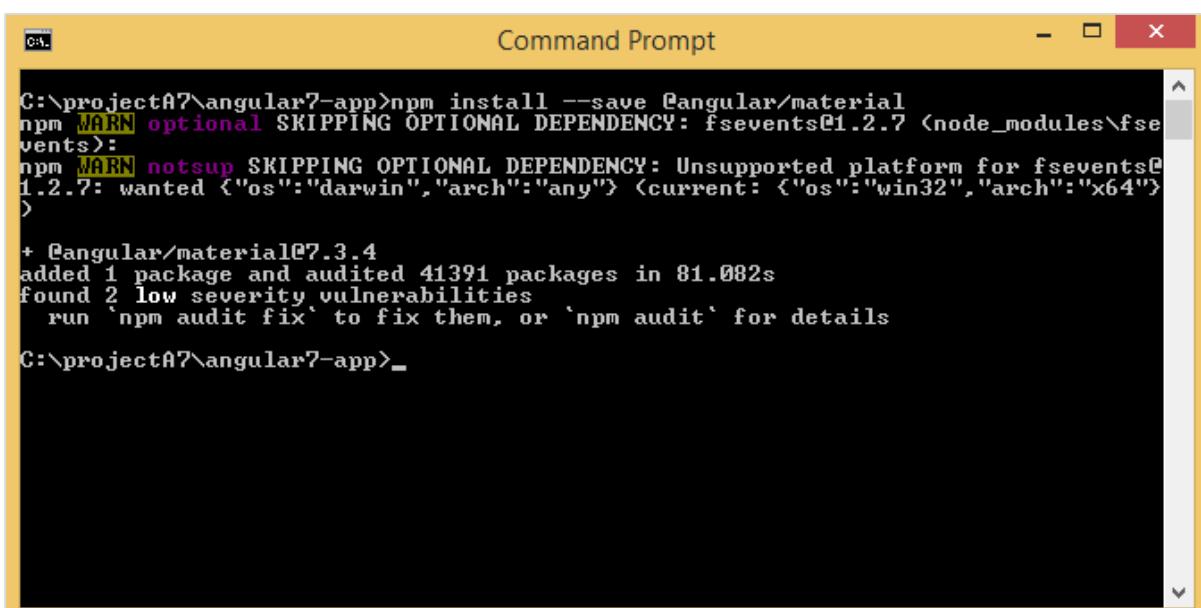
Materials offer a lot of built-in modules for your project. Features such as autocomplete, datepicker, slider, menus, grids, and toolbar are available for use with materials in Angular 7.

To use materials, we need to import the package. Angular 2 also has all the above features but they are available as part of the **@angular/core module**. From Angular 4, Materials module has been made available with a separate module @angular/materials. This helps the user to import only the required materials in their project.

To start using materials, you need to install two packages: **materials and cdk**. Material components depend on the animation module for advanced features. Hence you need the animation package for the same, **@angular/animations**. The package has already been updated in the previous chapter. We have already installed @angular/cdk packages in previous chapters for virtual and drag drop module.

Following is the command to add materials to your project:

```
npm install --save @angular/material
```



The screenshot shows a Windows Command Prompt window titled "Command Prompt". The command entered was "npm install --save @angular/material". The output indicates that the package was installed successfully, adding 1 package and auditing 41391 packages in 81.082s. It found 2 low severity vulnerabilities and suggests running 'npm audit fix' or 'npm audit' for details. The command prompt then ends with a closing bracket.

```
C:\projectA7\angular7-app>npm install --save @angular/material
npm WARN optional SKIPPING OPTIONAL DEPENDENCY: fsevents@1.2.7 (node_modules\fsevents):
npm WARN notsup SKIPPING OPTIONAL DEPENDENCY: Unsupported platform for fsevents@1.2.7: wanted {"os":"darwin","arch":"any"} (current: {"os":"win32","arch":"x64"})
+ @angular/material@7.3.4
added 1 package and audited 41391 packages in 81.082s
found 2 low severity vulnerabilities
  run 'npm audit fix' to fix them, or 'npm audit' for details
C:\projectA7\angular7-app>_
```

Let us now see the package.json. **@angular/material** and **@angular/cdk** are installed.

```
{
  "name": "angular7-app",
  "version": "0.0.0",
  "scripts": {
    "ng": "ng",
    "start": "ng serve",
```

```
"build": "ng build",
"test": "ng test",
"lint": "ng lint",
"e2e": "ng e2e"
},
"private": true,
"dependencies": {
  "@angular/animations": "~7.2.0",
  "@angular/cdk": "^7.3.4",
  "@angular/common": "~7.2.0",
  "@angular/compiler": "~7.2.0",
  "@angular/core": "~7.2.0",
  "@angular/forms": "~7.2.0",
  "@angular/material": "^7.3.4",
  "@angular/platform-browser": "~7.2.0",
  "@angular/platform-browser-dynamic": "~7.2.0",
  "@angular/router": "~7.2.0",
  "core-js": "^2.5.4",
  "rxjs": "~6.3.3",
  "tslib": "^1.9.0",
  "zone.js": "~0.8.26"
},
"devDependencies": {
  "@angular-devkit/build-angular": "~0.13.0",
  "@angular/cli": "~7.3.2",
  "@angular/compiler-cli": "~7.2.0",
  "@angular/language-service": "~7.2.0",
  "@types/node": "~8.9.4",
  "@types/jasmine": "~2.8.8",
  "@types/jasminewd2": "~2.0.3",
  "codelyzer": "~4.5.0",
  "jasmine-core": "~2.99.1",
  "jasmine-spec-reporter": "~4.2.1",
  "karma": "~3.1.1",
  "karma-chrome-launcher": "~2.2.0",
  "karma-coverage-istanbul-reporter": "~2.0.1",
}
```

```

    "karma-jasmine": "~1.1.2",
    "karma-jasmine-html-reporter": "^0.2.2",
    "protractor": "~5.4.0",
    "ts-node": "~7.0.0",
    "tslint": "~5.11.0",
    "typescript": "~3.2.2"
  }
}

```

We have highlighted the packages that are installed to work with materials.

We will now import the modules in the parent module - **app.module.ts** as shown below.

```

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

import { AppRoutingModule , RoutingComponent} from './app-routing.module';
import { AppComponent } from './app.component';
import { NewCmpComponent } from './new-cmp/new-cmp.component';
import { ChangeTextDirective } from './change-text.directive';
import { SqrtPipe } from './app.sqrt';
import { MyserviceService } from './myservice.service';
import { HttpClientModule } from '@angular/common/http';
import { ScrollDispatchModule } from '@angular/cdk/scrolling';
import { DragDropModule } from '@angular/cdk/drag-drop';
import { ReactiveFormsModule } from '@angular/forms';
import { BrowserAnimationsModule } from '@angular/platform-browser/animations';
import { MatButtonModule, MatMenuModule, MatSidenavModule } from
'@angular/material';

@NgModule({
  declarations: [
    SqrtPipe,
    AppComponent,
    NewCmpComponent,
    ChangeTextDirective,
    RoutingComponent
  ],
}

```

```

imports: [
  BrowserModule,
  AppRoutingModule,
  HttpClientModule,
  ScrollDispatchModule,
  DragDropModule,
  ReactiveFormsModule,
  BrowserAnimationsModule,
  MatButtonModule,
  MatMenuModule,
  MatSidenavModule
],
providers: [MyserviceService],
bootstrap: [AppComponent]
})
export class AppModule { }

```

In the above file, we have imported the following modules from **@angular/materials**.

```

import { MatButtonModule, MatMenuModule, MatSidenavModule } from
'@angular/material';

```

And the same is used in the imports array as shown below:

```

imports: [
  BrowserModule,
  AppRoutingModule,
  HttpClientModule,
  ScrollDispatchModule,
  DragDropModule,
  ReactiveFormsModule,
  BrowserAnimationsModule,
  MatButtonModule,
  MatMenuModule,
  MatSidenavModule
],

```

The app.component.ts is as shown below:

```
import { Component } from '@angular/core';
@Component({
  selector: 'app-root',
  templateUrl: './app.component.html',
  styleUrls: ['./app.component.css']
})
export class AppComponent {
  constructor() {}
}
```

Let us now add the material-css support in **styles.css**.

```
@import "~@angular/material/prebuilt-themes/indigo-pink.css";
```

Let us now add materials inside app.component.html

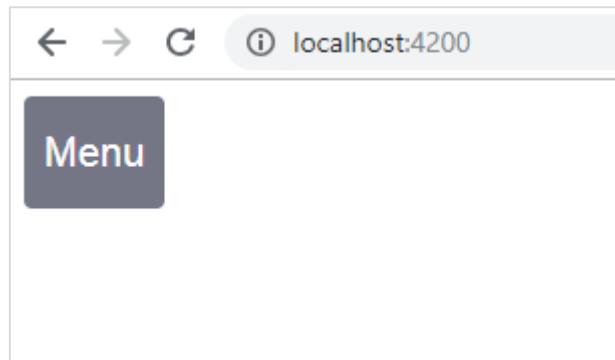
Menu

To add menu, **<mat-menu></mat-menu>** is used. The **file** and **Save As** items are added to the button under mat-menu. There is a main button added **Menu**. The reference of the same is given the **<mat-menu>** by using **[matMenuTriggerFor] = "menu"** and using the menu with # in**<mat-menu>**.

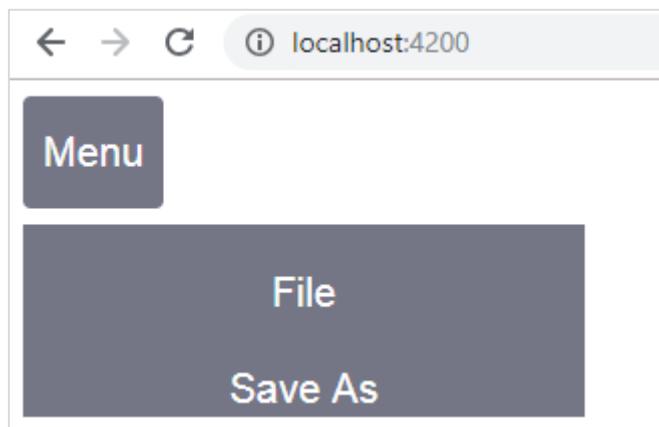
app.component.html

```
<button mat-button [matMenuTriggerFor] = "menu">Menu</button>
<mat-menu #menu = "matMenu">
  <button mat-menu-item>
    File
  </button>
  <button mat-menu-item>
    Save As
  </button>
</mat-menu>
```

The below image is displayed in the browser:



Clicking on Menu will display the items inside it:



SideNav

To add sidenav, we need **<mat-sidenav-container></mat-sidenav-container>**. **<mat-sidenav></mat-sidenav>** is added as a child to the container. There is another div added, which triggers the sidenav by using **(click)="sidenav.open()"**.

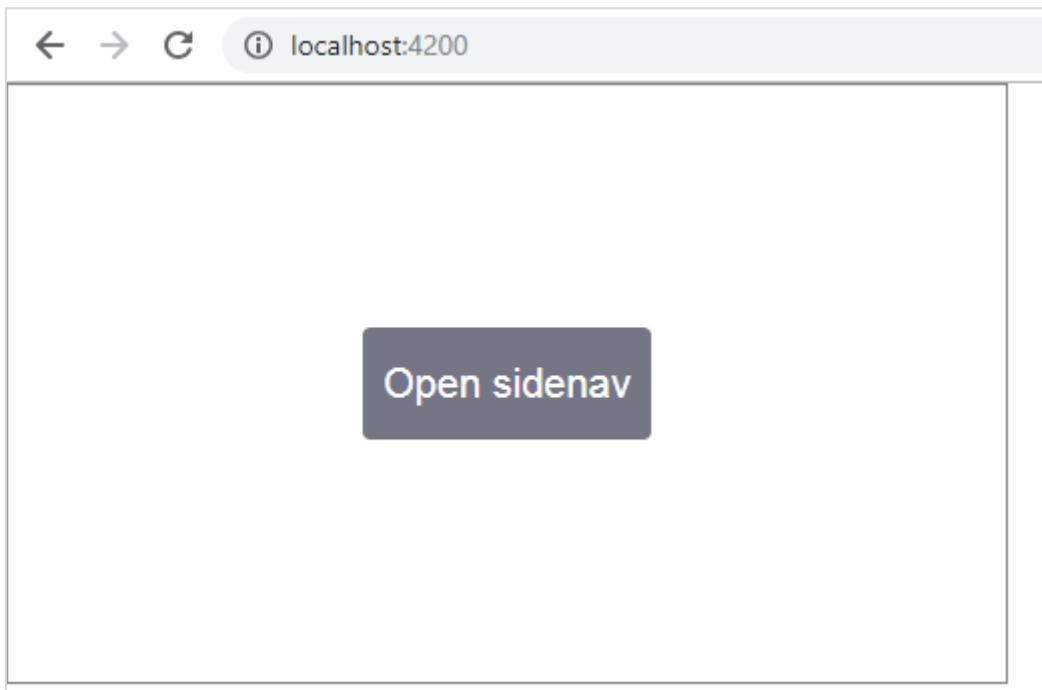
app.component.html

```
<mat-sidenav-container class="example-container" fullscreen>
  <mat-sidenav #sidenav class = "example-sidenav">
    Angular 7
  </mat-sidenav>
  <div class = "example-sidenav-content">
    <button type = "button" mat-button (click) = "sidenav.open()">
      Open sidenav
    </button>
  </div>
</mat-sidenav-container>
```

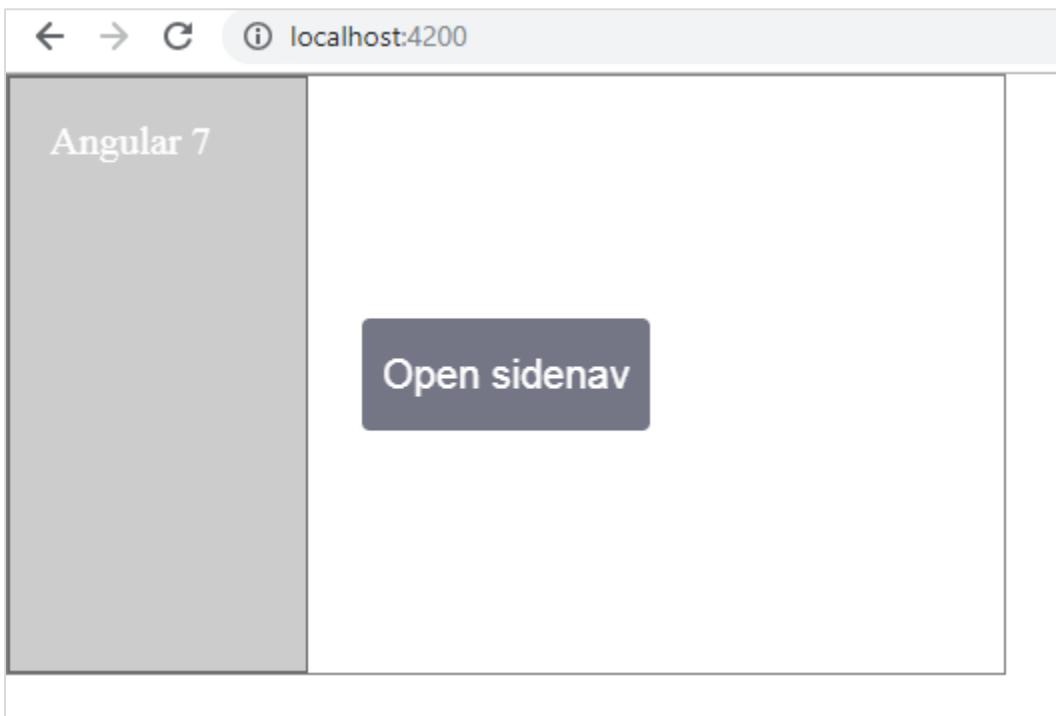
app.component.css

```
.example-container {  
    width: 500px;  
    height: 300px;  
    border: 1px solid rgba(0, 0, 0, 0.5);  
}  
  
.example-sidenav {  
    padding: 20px;  
    width: 150px;  
    font-size: 20px;  
    border: 1px solid rgba(0, 0, 0, 0.5);  
    background-color: #ccc;  
    color:white;  
}
```

Following is the display of menu and sidenav in the browser:



Following panel opens up on the left side if we click on Open Sidenav:



Datepicker

Let us now add a datepicker using materials. To add a datepicker, we need to import the modules required to show the datepicker.

In **app.module.ts**, we have imported the following module as shown below for datepicker:

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

import { AppRoutingModule , RouterModule} from './app-routing.module';
import { AppComponent } from './app.component';
import { NewCmpComponent } from './new-cmp/new-cmp.component';
import { ChangeTextDirective } from './change-text.directive';
import { SqrtPipe } from './app.sqrt';
import { MyserviceService } from './myservice.service';
import { HttpClientModule } from '@angular/common/http';
import { ScrollDispatchModule } from '@angular/cdk/scrolling';
import { DragDropModule } from '@angular/cdk/drag-drop';
import { ReactiveFormsModule } from '@angular/forms';
import { BrowserAnimationsModule } from '@angular/platform-browser/animations';
import { MatDatepickerModule, MatInputModule, MatNativeDateModule } from '@angular/material';
```

```

@NgModule({
  declarations: [
    SqrtPipe,
    AppComponent,
    NewCmpComponent,
    ChangeTextDirective,
    RoutingComponent
  ],
  imports: [
    BrowserModule,
    AppRoutingModule,
    HttpClientModule,
    ScrollDispatchModule,
    DragDropModule,
    ReactiveFormsModule,
    BrowserAnimationsModule,
    MatDatepickerModule,
    MatInputModule,
    MatNativeDateModule
  ],
  providers: [MyserviceService],
  bootstrap: [AppComponent]
})
export class AppModule { }

```

Here, we have imported modules such as MatDatepickerModule, MatInputModule, and MatNativeDateModule.

Now, the app.component.ts is as shown below:

```

import { Component } from '@angular/core';
@Component({
  selector: 'app-root',
  templateUrl: './app.component.html',
  styleUrls: ['./app.component.css']
})
export class AppComponent {
  constructor() {}
}

```

The **app.component.html** is as shown below:

```
<mat-form-field>
  <input matInput [matDatepicker] = "picker" placeholder = "Choose a date">
  <mat-datepicker-toggle matSuffix [for] = "picker"></mat-datepicker-toggle>
  <mat-datepicker #picker></mat-datepicker>
</mat-form-field>
```

Global css added in style.css:

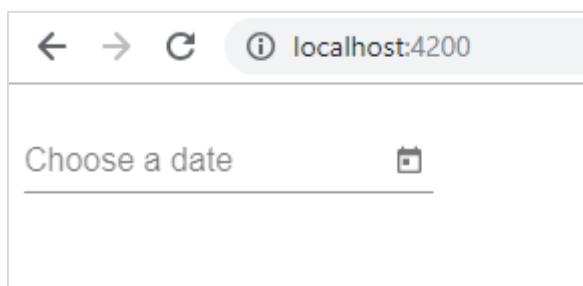
```
/* You can add global styles to this file, and also import other style files */
@import '~@angular/material/prebuilt-themes/deeppurple-amber.css';

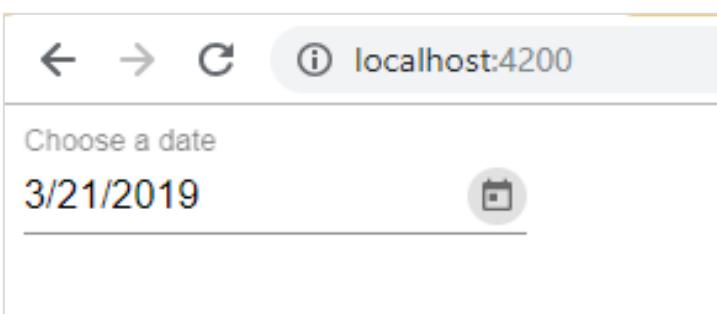
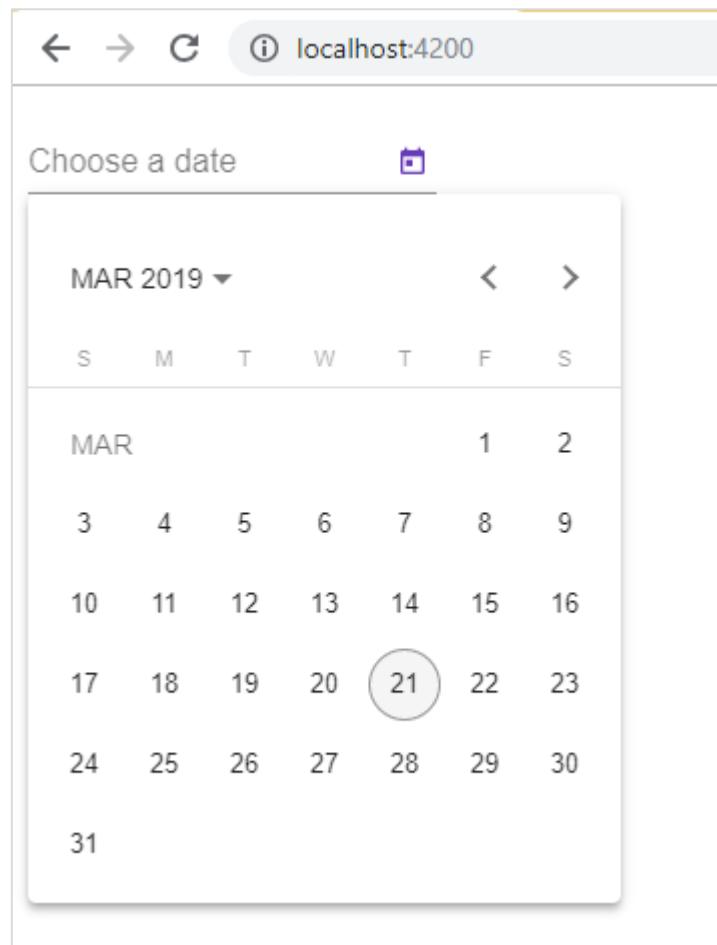
body {
  font-family: Roboto, Arial, sans-serif;
  margin: 10;
}

.basic-container {
  padding: 30px;
}

.version-info {
  font-size: 8pt;
  float: right;
}
```

The datepicker is displayed in the browser as shown below:





20. Angular 7 — Testing and Building Angular 7 Project

In this chapter will discuss the following topics:

- To test Angular 7 Project
- To build Angular 7 Project

Testing Angular 7 Project

During the project setup, the required packages for testing are already installed. There is a **.spec.ts** file created for every new component, service, directive, etc. We are going to use jasmine to write our test cases.

For any changes added to your component, services, directives or any other files created, you can include your test cases in the respective .spec.ts files. So most of the unit testing can be covered at the beginning itself.

To run the test cases, the command used is as follows:

```
ng test
```

Below is the app.component.spec.ts file for **app.component.ts**:

```
import { TestBed, async } from '@angular/core/testing';
import { RouterTestingModule } from '@angular/router/testing';
import { AppComponent } from './app.component';

describe('AppComponent', () => {
  beforeEach(async(() => {
    TestBed.configureTestingModule({
      imports: [
        RouterTestingModule
      ],
      declarations: [
        AppComponent
      ],
    }).compileComponents();
  }));
  it('should create the app', () => {
    const fixture = TestBed.createComponent(AppComponent);
```

```

const app = fixture.debugElement.componentInstance;
expect(app).toBeTruthy();
});

it(`should have as title 'angular7-app'`, () => {
  const fixture = TestBed.createComponent(AppComponent);
  const app = fixture.debugElement.componentInstance;
  expect(app.title).toEqual('angular7-app');
});

it('should render title in a h1 tag', () => {
  const fixture = TestBed.createComponent(AppComponent);
  fixture.detectChanges();
  const compiled = fixture.debugElement.nativeElement;
  expect(compiled.querySelector('h1').textContent).toContain('Welcome to
angular7-app!');
});
});

```

app.component.ts

```

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

@Component({
  selector: 'app-root',
  templateUrl: './app.component.html',
  styleUrls: ['./app.component.css']
})
export class AppComponent {
  title = 'angular7-app';
}

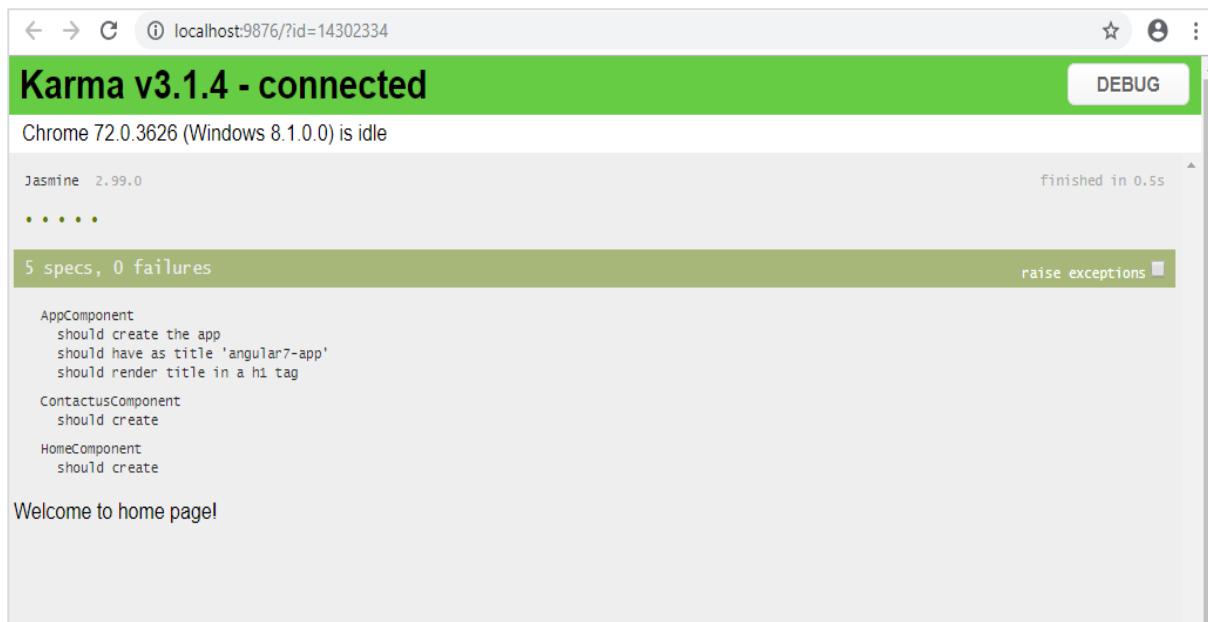
```

Now let us run the command to see the test cases running.

```
C:\projectA7\angular7-app>ng test
11% building 14/15 modules 1 active ...:\projectA7\angular7-app\src\styles.css
21 03 2019 12:23:42.361:WARN [karma]: No captured browser, open http://localhost:9876/
21 03 2019 12:23:42.374:INFO [karma-server]: Karma v3.1.4 server started at http://0.0.0.0:9876/
21 03 2019 12:23:42.375:INFO [launcher]: Launching browsers Chrome with concurrency unlimited
21 03 2019 12:23:42.399:INFO [launcher]: Starting browser Chrome
12% building 18/20 modules 2 active ...de_modules\zone.js\dist\zone-testing.js
```

```
48% building 322/324 modules 2 active ...s\core.js\modules\_to-absolute-index.js
48% building 323/324 modules 1 active ...:\projectA7\angular7-app\src\styles.css
50% building 323/324 modules 1 active ...:\projectA7\angular7-app\src\styles.css
93% after chunk asset optimization SourceMapDevToolPlugin main.js generate Sour
93% after chunk asset optimization SourceMapDevToolPlugin polyfills.js generate
93% after chunk asset optimization SourceMapDevToolPlugin styles.js generate So
93% after chunk asset optimization SourceMapDevToolPlugin vendor.js generate So
93% after chunk asset optimization SourceMapDevToolPlugin main.js attach Source
93% after chunk asset optimization SourceMapDevToolPlugin polyfills.js attach S
93% after chunk asset optimization SourceMapDevToolPlugin styles.js attach Sour
21 03 2019 12:15:48.057:WARN [karma]: No captured browser, open http://localhost:9876/
21 03 2019 12:15:48.263:INFO [Chrome 72.0.3626 <Windows 8.1.0.0>]: Connected on
socket h2U8GQTriTb2LvrAA with id 14302334
Chrome 72.0.3626 <Windows 8.1.0.0>: Executed 1 of 5 SUCCESS <0 secs / 0.232 secs
Chrome 72.0.3626 <Windows 8.1.0.0>: Executed 2 of 5 SUCCESS <0 secs / 0.306 secs
Chrome 72.0.3626 <Windows 8.1.0.0>: Executed 3 of 5 SUCCESS <0 secs / 0.417 secs
Chrome 72.0.3626 <Windows 8.1.0.0>: Executed 4 of 5 SUCCESS <0 secs / 0.451 secs
Chrome 72.0.3626 <Windows 8.1.0.0>: Executed 5 of 5 SUCCESS <0 secs / 0.481 secs
Chrome 72.0.3626 <Windows 8.1.0.0>: Executed 5 of 5 SUCCESS <0.767 secs / 0.481
secs>
TOTAL: 5 SUCCESS
TOTAL: 5 SUCCESS
```

The test cases status is shown in the command line as shown above and will also open up in the browser as shown below:



Incase of any failure, it will show the details as follows:

To do that, let us change the app.component.spec.ts as follows:

```
import { TestBed, async } from '@angular/core/testing';
import { RouterTestingModule } from '@angular/router/testing';
import { AppComponent } from './app.component';

describe('AppComponent', () => {
  beforeEach(async(() => {
    TestBed.configureTestingModule({
      imports: [
        RouterTestingModule
      ],
      declarations: [
        AppComponent
      ],
    }).compileComponents();
  }));

  it('should create the app', () => {
    const fixture = TestBed.createComponent(AppComponent);
    const app = fixture.debugElement.componentInstance;
    expect(app).toBeTruthy();
  });
});
```

```

it(`should have as title 'angular7-app'`, () => {
  const fixture = TestBed.createComponent(AppComponent);
  const app = fixture.debugElement.componentInstance;
  expect(app.title).toEqual('Angular 7'); // change the title from angular7-
app to Angular 7
});

it('should render title in a h1 tag', () => {
  const fixture = TestBed.createComponent(AppComponent);
  fixture.detectChanges();
  const compiled = fixture.debugElement.nativeElement;
  expect(compiled.querySelector('h1').textContent).toContain('Welcome to
angular7-app!');
});
}
);

```

In the above file, the test cases check for the title, **Angular 7**. But in app.component.ts, we have the title, **angular7-app** as shown below:

```

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

@Component({
  selector: 'app-root',
  templateUrl: './app.component.html',
  styleUrls: ['./app.component.css']
})
export class AppComponent {
  title = 'angular7-app';
}

```

Here the test case will fail and below are the details shown in command line and browser.

In command line

Following screen is displayed in command line:

```
ng test
    at ZoneDelegate../node_modules/zone.js/dist/zone.js.ZoneDelegate.invoke <node_modules/zone.js/dist/zone.js:391:1>
    at ProxyZoneSpec.push../node_modules/zone.js/dist/zone-testing.js.ProxyZoneSpec.onInvoke <node_modules/zone.js/dist/zone-testing.js:289:1>
        at ZoneDelegate../node_modules/zone.js/dist/zone.js.ZoneDelegate.invoke <node_modules/zone.js/dist/zone.js:390:1>
Chrome 72.0.3626 (Windows 8.1.0.0): Executed 2 of 5 <1 FAILED> <0 secs / 1.153 secs>
Chrome 72.0.3626 (Windows 8.1.0.0) AppComponent should have as title 'angular7-app' FAILED
    Expected 'angular7-app' to equal 'Angular 7'.
        at UserContext.<anonymous> (src/app/app.component.spec.ts:26:23)
        at ZoneDelegate../node_modules/zone.js/dist/zone.js.ZoneDelegate.invoke <node_modules/zone.js/dist/zone.js:391:1>
        at ProxyZoneSpec.push../node_modules/zone.js/dist/zone-testing.js.ProxyZoneSpec.onInvoke <node_modules/zone.js/dist/zone-testing.js:289:1>
        at ZoneDelegate../node_modules/zone.js/dist/zone.js.ZoneDelegate.invoke <node_modules/zone.js/dist/zone.js:391:1>
Chrome 72.0.3626 (Windows 8.1.0.0): Executed 3 of 5 <1 FAILED> <0 secs / 1.239 secs>
Chrome 72.0.3626 (Windows 8.1.0.0): Executed 4 of 5 <1 FAILED> <0 secs / 1.27 secs>
Chrome 72.0.3626 (Windows 8.1.0.0): Executed 5 of 5 <1 FAILED> <0 secs / 1.367 secs>
Chrome 72.0.3626 (Windows 8.1.0.0): Executed 5 of 5 <1 FAILED> <1.41 secs / 1.367 secs>
TOTAL: 1 FAILED, 4 SUCCESS
TOTAL: 1 FAILED, 4 SUCCESS
```

In browser

Following screen is displayed in the browser:

Karma v3.1.4 - connected

Chrome 72.0.3626 (Windows 8.1.0.0) is idle

Jasmine 2.99.0

Finished in 1.838s

• x • •

5 specs, 1 failure

Spec List | Failures

AppComponent should have as title 'angular7-app'

Expected 'angular7-app' to equal 'Angular 7'.
Error: Expected 'angular7-app' to equal 'Angular 7'.
at stack (<http://localhost:9876/absoluteC:/projectA7/angular7-app/node_modules/jasmine-core/lib/jasmine-core/jasmine.js?0b1eaf7a13cae32191eadea4c>:1)
at buildExpectationResult (<http://localhost:9876/absoluteC:/projectA7/angular7-app/node_modules/jasmine-core/lib/jasmine-core/jasmine.js?0b1eaf7a13cae32191eadea4c>:1)
at Spec.expectationResultFactory (<http://localhost:9876/absoluteC:/projectA7/angular7-app/node_modules/jasmine-core/lib/jasmine-core/jasmine.js?0b1eaf7a13cae32191eadea4c>:1)
at Spec.addExpectationResult (<http://localhost:9876/absoluteC:/projectA7/angular7-app/node_modules/jasmine-core/lib/jasmine-core/jasmine.js?0b1eaf7a13cae32191eadea4c>:1)
at Expectation.addExpectationResult (<http://localhost:9876/absoluteC:/projectA7/angular7-app/node_modules/jasmine-core/lib/jasmine-core/jasmine.js?0b1eaf7a13cae32191eadea4c>:1)
at Expectation.toEqual (<http://localhost:9876/absoluteC:/projectA7/angular7-app/node_modules/jasmine-core/lib/jasmine-core/jasmine.js?0b1eaf7a13cae32191eadea4c>:1)
at UserContext.<anonymous> (<http://localhost:9876/_karma_webpack_/webpack:/src/app/app.component.spec.ts:26:23>)
at ZoneDelegate../node_modules/zone.js/dist/zone.js.ZoneDelegate.invoke (<http://localhost:9876/_karma_webpack_/webpack:/node_modules/zone.js/dist/zone.js:391:1>)
at ProxyZoneSpec.push..>/node_modules/zone.js/dist/zone-testing.js.ProxyZoneSpec.onInvoke (<http://localhost:9876/_karma_webpack_/webpack:/node_modules/zone.js/dist/zone-testing.js:289:1>)
at ZoneDelegate../node_modules/zone.js/dist/zone.js.ZoneDelegate.invoke (<http://localhost:9876/_karma_webpack_/webpack:/node_modules/zone.js/dist/zone.js:391:1>)

Welcome to home page!

All the failed test-cases for your project will be displayed as shown above in command line and browser.

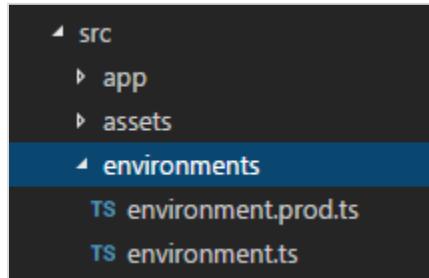
Similarly, you can write test cases for your services, directives and the new components which will be added to your project.

Buiding Angular 7 Project

Once you are done with the project in Angular, we need to build it so that it can be used in production or stating.

The configuration for build, i.e., production, staging, development, testing needs to be defined in your **src/environments**.

At present, we have the following environments defined in src/environment:



You can add files based on your build to src/environment, i.e., environment.staging.ts, environment.testing.ts, etc.

At present, we will try to build for production environment. The file **environment.ts** contains default environment settings and details of the file as follows:

```

export const environment = {
  production: false
};
    
```

To build the file for production, we need to make the **production: true** in environment.ts as follows:

```

export const environment = {
  production: true
};
    
```

The default environment file has to be imported inside components as follows:

app.component.ts

```

import { Component } from '@angular/core';
import { environment } from './environments/environment';

@Component({
  selector: 'app-root',
  templateUrl: './app.component.html',
  styleUrls: ['./app.component.css']
})
export class AppComponent {
  title = 'angular7-app';
}
    
```

The environment replacement from default to production which we are trying to do are defined inside angular.json **fileReplacements** section as follows:

```
"production": {
    "fileReplacements": [
        {
            "replace": "src/environments/environment.ts",
            "with": "src/environments/environment.prod.ts"
        }
    ],
}
```

When the command for build runs, the file gets replaced to **src/environments/environment.prod.ts**. The additional configuration like staging or testing can be added here as shown in the below example:

```
"configurations": {
    "production": { ... },
    "staging": {
        "fileReplacements": [
            {
                "replace": "src/environments/environment.ts",
                "with": "src/environments/environment.staging.ts"
            }
        ]
    }
}
```

So the command to run the build is as follows:

```
ng build --configuration=production // for production environment
ng build --configuration=staging // for staging environment
```

Now let us run the build command for production, the command will create a dist folder inside our project which will have the final files after build.

```
ng build --configuration=production
C:\projectA7\angular7-app>ng build --configuration=production
```

```
Command Prompt
67% building 476/477 modules 1 active ...:\projectA7\angular7-app\src\styles.css
67% building 476/478 modules 2 active ...ules\core-js\modules\_string-context.js
67% building 477/478 modules 1 active ...:\projectA7\angular7-app\src\styles.css
67% building 477/479 modules 2 active ...les\core-js\modules\_fails-is-regexp.js
67% building 478/479 modules 1 active ...:\projectA7\angular7-app\src\styles.css
67% building 478/480 modules 2 active ...ore-js\modules\_array-species-create.js
67% building 479/480 modules 1 active ...:\projectA7\angular7-app\src\styles.css
67% building 479/481 modules 2 active ...s\modules\_array-species-constructor.js
67% building 480/481 modules 1 active ...:\projectA7\angular7-app\src\styles.css
67% building 480/482 modules 2 active ...ules\@angular\cdk\esm5\observers.es5.js
67% building 481/482 modules 1 active ...:\projectA7\angular7-app\src\styles.css
67% building 482/483 modules 1 active ...projectA7\angular7-app\src\styles.css

Date: 2019-03-21T07:54:46.919Z
Hash: 5217686643bc10e154d4
Time: 215500ms
chunk {0} runtime.a5dd35324ddfd942bef1.js (runtime) 1.41 kB [entry] [rendered]
chunk {1} es2015-polyfills.4a4cfea0ce682043f4e9.js (es2015-polyfills) 56.4 kB [initial] [rendered]
chunk {2} main.d69c0acbc6334b7a8362.js (main) 424 kB [initial] [rendered]
chunk {3} polyfills.407a467dedb63cfdd103.js (polyfills) 41 kB [initial] [rendered]
chunk {4} styles.d228bd62c51ed1e59bd7.css (styles) 61.2 kB [initial] [rendered]

C:\projectA7\angular7-app>
```

The final files are build inside dist/ folder which can be hosted on the production server at your end.

