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Technologies and Web Programming

Angular Framework

Angular Framework

Introduction to Angular

Angular Introduction (i)

- Angular Framework is a web application development platform based on TypeScript language.

- It makes the switch from MVC (Model-View-Controller) approach, used in AngularJS, to a Components-Based Web Development approach.

Angular Introduction (ii)

- Angular allows to build web applications out of components, which are UI building blocks that are easy to test and reuse.

- Components, neatly encapsulate all the style and function required for a certain feature to work, and so, creating custom HTML elements is a greatly simplified process.

Angular Introduction (iii)

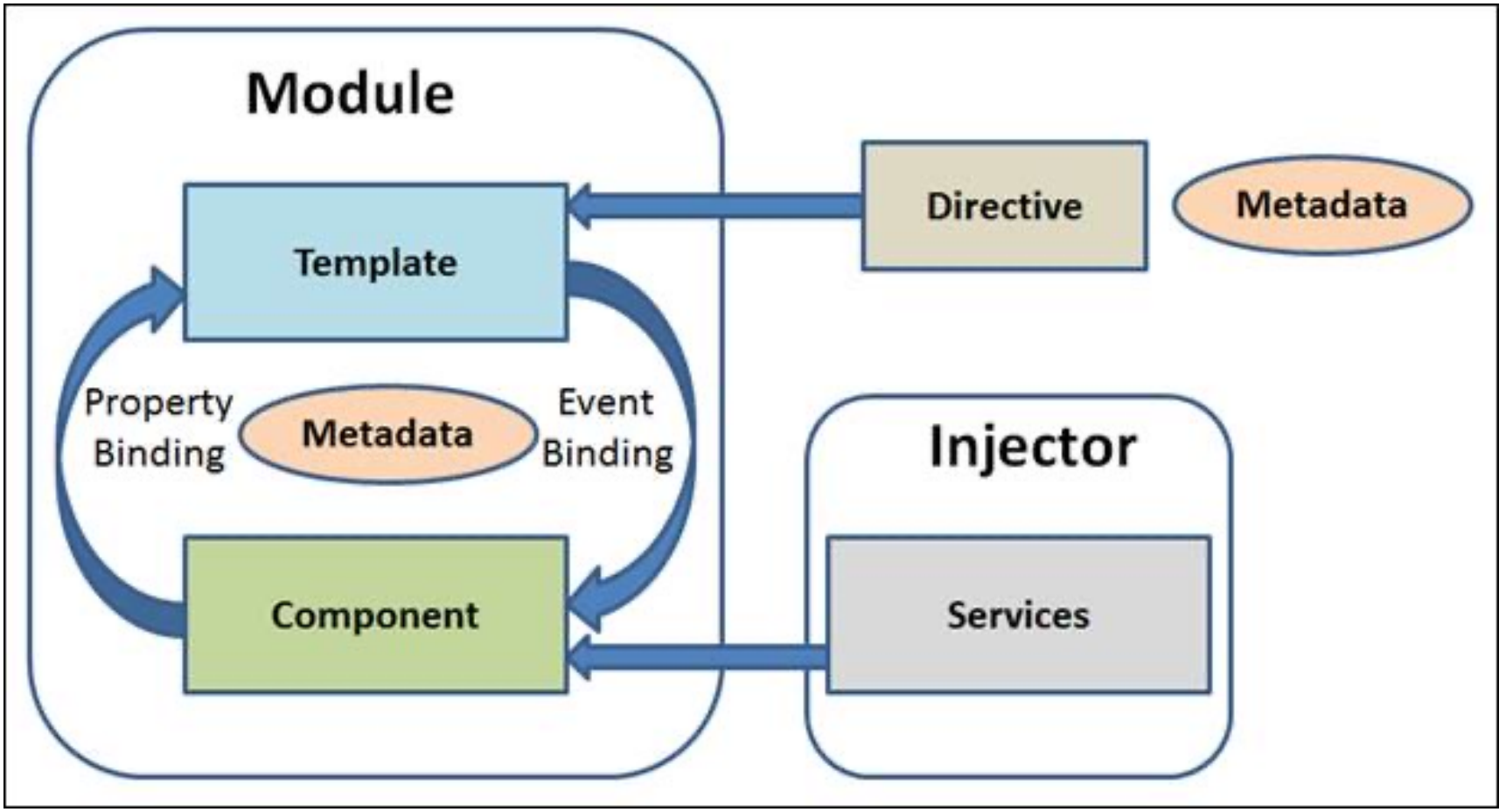
- The idea is to build declarative components that are fully encapsulated.
- They describe their own views, and can be easily packaged and distributed to other developers.
- The application itself consists of a root component that contains a set of components for every UI element, screen, and route.
- This component tree lies at the core of any Angular application.

Angular Framework

Angular Architecture

Angular Architecture

- The main eight blocks of an Angular Application



Angular – Modules (i)

- A Module is a block of code which is designed to perform a single task.
- It can be exported in form of class.
- Angular applications can have several modules. Although, every Angular application must have at least one.
- Every Angular application has one root module and can have many more featured modules.

Angular – Modules (ii)

- An Angular module is a class which uses the @NgModule decorator.
- Decorators provide a way to add both annotations and a meta-programming syntax for class declarations and members.
- @NgModule takes a single metadata object and its properties to describe the module.

Angular – Modules (iii)

- Following are the important properties of @NgModule:
  - exports – it's the subset of declarations which would be used in the component template of other module.
  - imports - imports other modules
  - providers - It is a creator of services. They can be accessible in all the parts of the application.
  - bootstrap - The root module has to set the bootstrap property. It is used to host all other views.
  - declarations - It declare the view class that belong to current module. There are three types of view classes supported by Angular: components, directives, and pipes.

Angular – Components

- A component is the combination of a class, containing the core logic for a page, and a an associated template that deals with its View.
- The application logic is written inside the class which is used by the View. The class interacts with the View through methods and properties of its API.
- Angular creates and updates the required components, and destroys the unused ones as the user moves through an application.

Angular – Metadata

- Metadata is the way to define how Angular process a class, a method or a property, for particular reasons.
- In TypeScript, metadata is defined by using decorators.
- For example, if we want to define a component in an Angular application, we need to tell Angular that a particular class is a component.
  - This is done associating metadata to the class using @Component decorator.

Angular – Template

- A template is the component View that tells Angular how to display the component.

- It looks like normal HTML.

Angular – Data Binding

- Data binding is a powerful feature of software development technologies.
- It is the connection bridge between View and the business logic of the application.
- There are four types of data binding supported by Angular:
  - Interpolation - used to display the component value within HTML.
  - Property Binding - It passes the property's value of a parent component to its child's property.

Angular – Data Binding

- Four types of data binding, continuation:
  - Event Binding – used to fire an event when we click on a component's name, or some change occurs in an input component.
  - Two-way Binding – it combines event and property binding in single notation by using ngModel directive, in order to have automatic change between the data model and the view.

Angular – Directives

- Directives extend HTML attributes.
- These are markers on the DOM elements which provides some special behavior to them and tell Angular HTML compiler to attach it.
- There are three types of directives:
  - Decorator Directive - it decorates (@Directive) the elements using additional behavior. There are many built-in directives like ngModel, and others.
  - Component Directive - it is extended from @Directive decorator with template-oriented features.
  - Template Directive - it converts HTML into a reusable template. It is also known as structural directive.

Angular – Service

- A service is a broad category encompassing any value, function, or feature that an app needs.
- A service is typically a class with a narrow, well-defined purpose.
- Angular distinguishes components from services in order to increase modularity and reusability.
- Typical examples of services are logging service, data service, message service etc. And there is no base class to define a service.

Angular – Dependency Injection

- Dependency Injection is a software design pattern in which objects are passed as dependencies.
- It helps us remove the hard coded dependencies, and makes dependencies configurable.
- Using Dependency Injection, we can make components more maintainable, reusable, and testable.
- Dependency Injection (DI) is wired into the Angular framework and used everywhere to provide new components with the services or other things they need.

Angular Framework

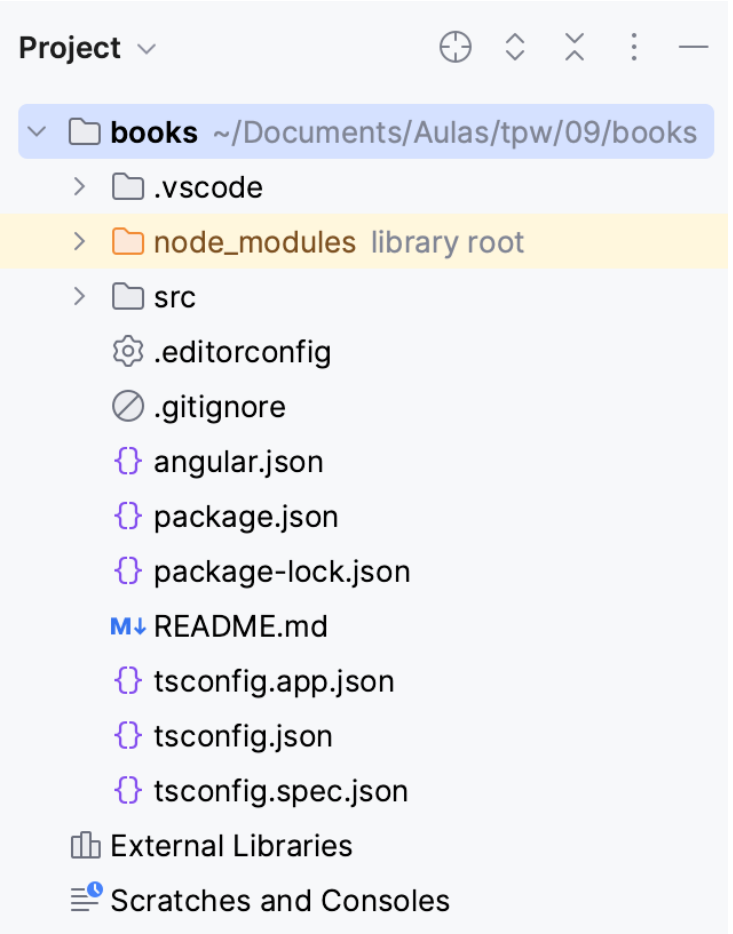
Developing

Angular – Developing

- Installation:
  - Install Node.js and npm if they are not already on your machine.
  - Install Angular CLI (Command Line Interface) globally.
    - command: npm install -g @angular/cli
- Creating a project
  - Use a know IDE, like WebStorm to create and develop a Angular project, or use the following command:
    - command: ng new angular-app
- Running the project
  - Use IDE to run it or use the following command, inside project folder:
    - command: ng serve

Angular – Project Books

- Create a new Angular project, named “books”, using the command line or WebStorm IDE, load it and run it.



Angular – Developing books (i)

- Change title in main component.
  - Open “src/app/app.component.ts” and change it.

app.component.ts

```ts
import { Component } from '@angular/core';
import { CommonModule } from '@angular/common';
import { RouterOutlet } from '@angular/router';

5+ usages  Helder Zagalo *
@Component({
  selector: 'app-root',
  standalone: true,
  imports: [CommonModule, RouterOutlet],
  templateUrl: './app.component.html',
  styleUrl: './app.component.css'
})
export class AppComponent {
  title : string  = 'My Books';
}
```

  - Open “src/app/app.component.html” and change it.

app.component.html

```html

<h1>{{ title }}</h1>
```

Angular – Developing books (ii)

- Create application styles and save them on file "src/styles.css".

```
h1 {
  color: #369;
  font-family: Arial, Helvetica, sans-serif;
  font-size: 250%;
}
h2, h3 {
  color: #444;
  font-family: Arial, Helvetica, sans-serif;
  font-weight: lighter;
}
body {
  margin: 2em;
}
body, input[text], button {
  color: #888;
  font-family: Cambria, Georgia;
}
* {
  font-family: Arial, Helvetica, sans-serif;
}
```

Angular – Developing books (iii)

- Create a component named “authors”, running the command inside project folder:
“ng generate component authors”

authors.component.ts

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

5+ usages
@Component({
  selector: 'app-authors',
  standalone: true,
  imports: [CommonModule],
  templateUrl: './authors.component.html',
  styleUrl: './authors.component.css'
})
export class AuthorsComponent {

}
```

Angular – Developing books (iv)

- Open “src/app/app.component.ts” and change it.

app.component.ts

```ts
import { Component } from '@angular/core';
import { CommonModule } from '@angular/common';
import { RouterOutlet } from '@angular/router';
import { AuthorsComponent} from "./authors/authors.component";

5+ usages  Helder Zagalo *
@Component({
  selector: 'app-root',
  standalone: true,
  imports: [CommonModule, RouterOutlet, AuthorsComponent],
  templateUrl: './app.component.html',
  styleUrl: './app.component.css'
})
export class AppComponent {
  title : string  = 'My Books';
}
```

- Open “src/app/app.component.html” and change it.

app.component.html

```html

<h1>{{ title }}</h1>
<app-authors></app-authors>
```

Angular – Developing books (v)

- Create Author class in file “src/app/author.ts”

author.ts

```
1
   2 usages  new *
2  export interface Author {
3    num: number;
4    name: string;
5    email: string;
6  }
```

Angular – Developing books (vi)

- Create authors list file “src/app/authorslist.ts”

authorslist.ts

```ts

import {Author} from "./author";

no usages  new *
export const AUTHORS: Author[] = [
  {num: 1, name: "Fernando Pessoa", email: "fpessoa@mail.pt"},
  {num: 2, name: "J. K. Rowling", email: "jkrowling@mail.uk"},
  {num: 3, name: "Stephen King", email: "sking@aol.pt"},
  {num: 4, name: "Arthur Conan Doyle", email: "acdoyle@mail.net"},
  {num: 5, name: "John Green", email: "jgreen@mail.com"},
]
```

Angular – Developing books (vii)

- Change “src/app/authors/authors.component.ts” file:

authors.component.ts

```
2   import { CommonModule } from '@angular/common';
3   import { Author } from "../author";
4   import { AUTHORS } from "../authorslist";
5
    5+ usages
6   @Component({
7     selector: 'app-authors',
8     standalone: true,
9     imports: [CommonModule],
10    templateUrl: './authors.component.html',
11    styleUrl: './authors.component.css'
12  })
13  export class AuthorsComponent {
14    authors: Author[];
15
      no usages
16    constructor() {
17      this.authors = AUTHORS;
18    }
19  }
```

Angular – Developing books (viii)

- Change “src/app/authors/authors.component.html” file:

authors.component.html

```
1
2   <h2>Authors</h2>
3   <ul class="authors">
4     <li *ngFor="let author of authors">
5       <span class="badge">{{ author.num }}</span> {{author.name}}
6     </li>
7   </ul>
```

Angular – Developing books (ix)

- Create component styles and save them on file "src/app/authors/authors.component.css".

```
/* AuthorsComponent's private CSS styles */
.selected {
  background-color: #CFD8DC !important;
  color: white;
}
.authors {
  margin: 0 0 2em 0;
  list-style-type: none;
  padding: 0;
  width: 15em;
}
.authors li {
  cursor: pointer;
  position: relative;
  left: 0;
  background-color: #EEE;
  margin: .5em;
  padding: .3em 0;
  height: 1.6em;
  border-radius: 4px;
}
...
```

Angular – Developing books (x)

```
...
.authors li.selected:hover {
  background-color: #BBD8DC !important;
  color: white;
}
.authors li:hover {
  color: #607D8B;
  background-color: #DDD;
  left: .1em;
}
.authors .text {
  position: relative;
  top: -3px;
}
.authors .badge {
  display: inline-block;
  font-size: small;
  color: white;
  padding: 0.8em 0.7em 0 0.7em;
  background-color: #607D8B;
  line-height: 1em;
  position: relative;
  left: -1px;
  top: -4px;
  height: 1.8em;
  margin-right: .8em;
  border-radius: 4px 0 0 4px;
}
```

Angular – Developing books (xi)

- Result:

Angular – Developing books (xii)

- Change “src/app/authors/authors.component.html” file:

authors.component.html

```
1
2   <h2>Authors</h2>
3   <ul class="authors">
4     <li *ngFor="let author of authors" (click)="onSelect(author)">
5       <span class="badge">{{ author.num }}</span> {{author.name}}
6     </li>
7   </ul>
```

Angular – Developing books (xiii)

- Change “src/app/authors/authors.component.ts” file:

authors.component.ts

```
1   import { Component } from '@angular/core';
2   import { CommonModule } from '@angular/common';
3   import { Author } from "../author";
4   import { AUTHORS } from "../authorslist";
5   import {FormsModule} from "@angular/forms";
6
    5+ usages
7   @Component({
8     selector: 'app-authors',
9     standalone: true,
10    imports: [CommonModule, FormsModule],
11    templateUrl: './authors.component.html',
12    styleUrl: './authors.component.css'
13  })
14  export class AuthorsComponent {
15    authors: Author[];
16    selectedAuthor: Author | null = null;
17
      no usages
18    constructor() {
19      this.authors = AUTHORS;
20    }
21
      1 usage
22    onSelect(author: Author) : void  {
23      this.selectedAuthor = author;
24    }
25  }
```

Angular – Developing books (xv)

- Change “src/app/authors/authors.component.html” file:

authors.component.html

```
1
2   <h2>Authors</h2>
3   <ul class="authors">
4     <li *ngFor="let author of authors" (click)="onSelect(author)">
5       <span class="badge">{{ author.num }}</span> {{author.name}}
6     </li>
7   </ul>
8
9   <div *ngIf="selectedAuthor">
10    <h2>Information on {{selectedAuthor.name | uppercase}}</h2>
11    <div><span>Num: </span>{{selectedAuthor.num}}</div>
12    <div>
13      <label>Name:
14        <input [(ngModel)]="selectedAuthor.name" placeholder="name" />
15      </label>
16    </div>
17    <div>
18      <label>Email:
19        <input [(ngModel)]="selectedAuthor.email" placeholder="name" />
20      </label>
21    </div>
22  </div>
```

Angular – Developing books (xvi)

- Result: