Angular

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Ground Rules

- Turn off cell phone. If you cannot please keep it on silent mode. You can go out and attend your call.
- If you have any questions or issues please let me know immediately.
- Let us be punctual.

Agenda

Discuss

Rich Internet Applications
AJAX

TypeScript

Typescript

- Why
  - Javascript is dynamic type
    - Pro– can hold any object, type on the fly
    - Con- Can get messy over the time
  - Migration from server-side to client-side will be hard
  - Hard to manage, difficult to ensure property types
- What
  - Any valid JavaScript is a typescript
  - Typescriptlang.org
    - Typescript lets you write JavaScript the way you really want to.
    - Typescript is a typed superset of JavaScript that compiles to plain JavaScript.
    - Any browser. Any host. Any OS. Open Source.

Typescript Alternatives

- Pure JavaScript
- Apply JavaScript patterns
  - Functions as abstractions
  - Functions to build modules
  - Functions to avoid global variables
- CoffeeScript
- Dart

Typescript Key Features

- Supports standard JavaScript code
- Provide static typing
- Encapsulation through classes and modules
- Support for constructors, properties, functions
- Define interfaces
- Lambda style function support
- Intellisense and syntax checking

Typescript tools

- Typescript playground
- Visual Studio
- sublime
- Node.js
- WebStorm
- Eclipse
- Vi
- IntelliJ
- Emacs

Typescript to JavaScript

Tyepscript BasicTypes

- Boolean
- Number
- String
- Array
- Enum
- Enum as Bit Flag 1,2,4,8,16,32,64,128 and so on
- Any
- Void

Typescript Annotation

- Type Annotation
  - var [identifier]:[type annotation]=value
  - var [identifier]:[type annotation];
  - var [identifier]=value;
- Example

Typescript Interfaces

- Interfaces are used at design time to provide auto completion and at compile time to provide type checking
- Supported features
  - Optional properties
  - Function Types
  - Array Types
  - Class Types
  - Extending Interfaces
  - Hybrid Types

Typescript Interfaces

Typescript Classes

- Object-oriented class based approach
- Key features
  - Inheritance
  - Private/public modifiers
  - Accessors
  - Static properties
  - Constructor functions
  - Using class as an interface

Typescript Classes

Typescript Generics

- Supports generic type variables, types, interfaces, classes and constraints

Typescript Modules

- Encapsulate variables, interfaces, and classes
  - Define unique namespaces
  - Organize symbols and identifiers into a logical namespace hierarchy
  - Similar to namespaces/packages
- Splitting across files
  - Multiple files can use the same module name
- One file can contain multiple module
- Can define Alias to module
- Transpiles to IIFE
- Can define modules as internal or external
- External modules required only when used with node.js and require.js

Typescript Modules

Typescript Definition Files

- Describes the types defined in external libraries
- .d.ts
- Not deployed
- Usually from DefinitelyTyped
- TypeScript Definition manager (tsd)
  - Specialized package manager
  - Locates and installs typescript definition files(d.ts)
  - From the definitelytyped repository

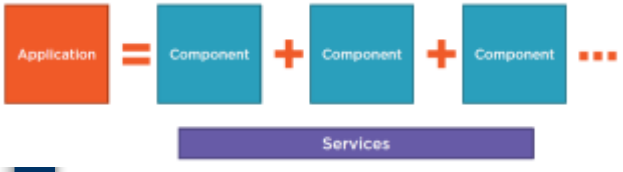
Why Angular?

- Expressive HTML
- Powerful Data Binding
- Modular By Design
- Built-in Back-End Integration

Why Angular 2?

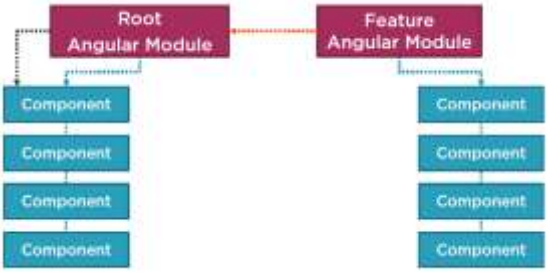
- Built for Speed
- Modern
- Simplified API
- Enhances Productivity

Angular 2 Application



Component

Angular 2 Modules



JavaScript Language Specification

- ECMAScript (ES)
- ES 3
- ES 5
- ES 2015 (formally known as ES 6)
  - Must be transpiled

Selecting a language

- ES 5
  - Runs in the browser
  - No compile required
- ES 2015
  - Lots of new features (classes, let, arrow, etc.)
- TypeScript
  - Superset of JavaScript
  - Strong typing
  - Great IDE tooling
- Dart
  - No JavaScript

What Is TypeScript?

- Open Source Language
- Superset of JavaScript
- Transpiles to plain JavaScript
- Strongly typed
  - TypeScript type definition files (*.d.ts)
- Class-based object-orientation

Setting up environment

- Npm
  - Node Package Manager
  - Command Line Utility
  - Installs libraries, packages and applications
- Set up the Angular 2 application

Setting up an Angular 2 Application

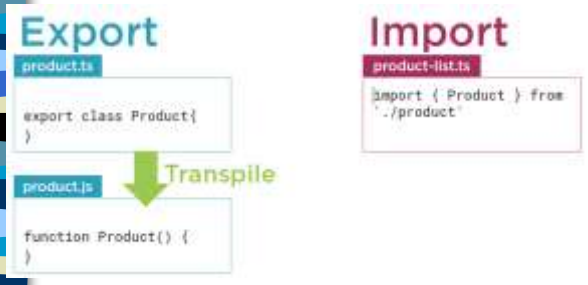
- Create an application folder
- Add package definition and configuration files
- Install the packages
- Create the app's Angular Module
- Create the main.ts file
- Create the host Web page (index.html)

Setting up an Angular 2 Application

- Manually perform each step
  - www.angular.ioQuick Start
- Download the results of these steps
  - https://github.com/angular/quickstart
- AngularCli
  - https://github.com/angular/angular-cli
- Starter files

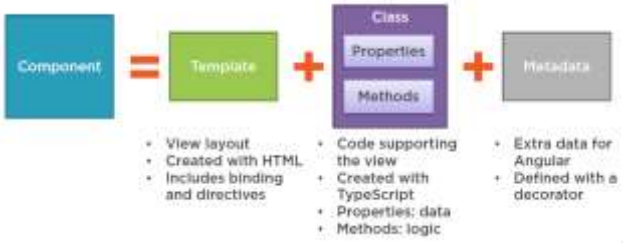
Modules

TypeScript

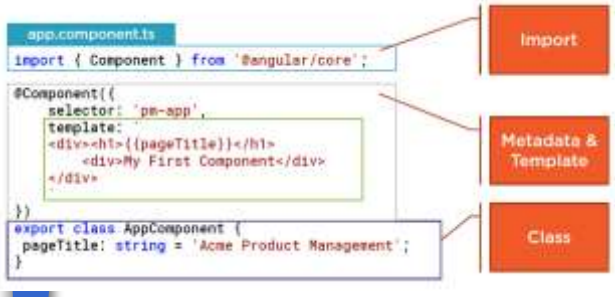


Starting with Components

What Is a Component?



Component



Creating the Component Class

app.component.ts

```
export class AppComponent {
    pageTitle: string = 'Acme Product Management';
}
```

class keyword

Class Name

export keyword

Component Name when used in code

Defining the Metadata

app.component.ts

```
@Component({
    selector: 'pm-app',
    template:
    <div><h1>{{pageTitle}}</h1>
        <div>My First Component</div>
    </div>
    `
})
export class AppComponent {
 pageTitle: string = 'Acme Product Management';
}
```

Decorator

- A function that adds metadata to a class, its members, or its method arguments.
- Prefixed with an @.
- Angular provides built-in decorators.
- @Component()

Defining the Metadata

app.component.ts

```
@Component({
    selector: 'pm-app',
    template:
    <div><h1>{{pageTitle}}</h1>
        <div>My First Component</div>
    </div>
    `
})
export class AppComponent {
 pageTitle: string = 'Acme Product Management';
}
```

Component decorator

Directive Name used in HTML

View Layout

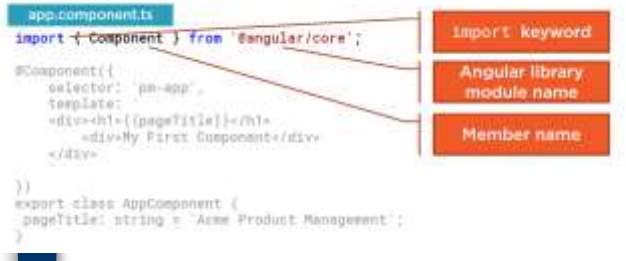
Binding

Importing What We Need

- Before we use an external function or class, we define where to find it
- Import statement
- Import allows us to use exported members from external ES modules
- Import from a third-party library, our own ES modules, or from Angular

Angular Is Modular

Importing What We Need



Completed Component

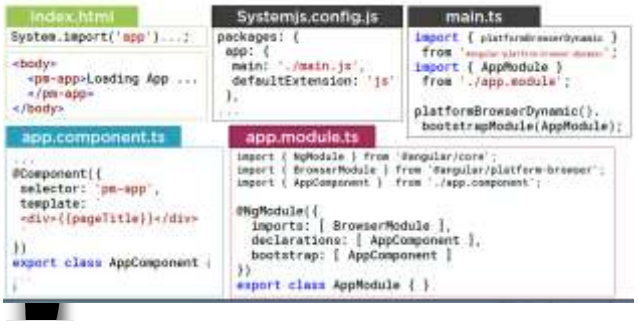
app.component.ts

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

@Component({
    selector: 'pm-app',
    template: `
    <div><h1>{{pageTitle}}</h1>
        <div>My First Component</div>
    </div>
    `
})
export class AppComponent {
 pageTitle: string = 'Acme Product Management';
}
```

Bootstrapping Our App Component

- Load the root component (bootstrapping)
- Host the application

Angular Application Startup



Component Recap

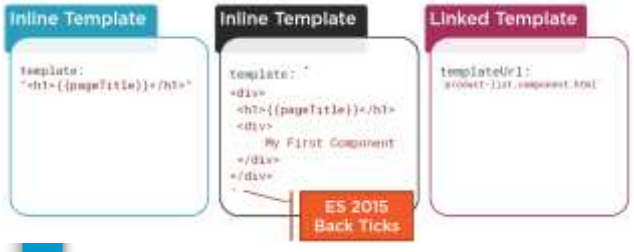
- Class -> Code
  - Clear name
    - Use PascalCasing
    - Append "Component" to the name
  - Export keyword
  - Data in properties
    - Appropriate data type
    - Appropriate default value
    - camelCase with first letter lowercase
  - Logic in methods
    - camelCase
    - with first letter lowercase
- Decorator -> Metadata
  - Component decorator
    - Prefix with @; Suffix with ()
  - Selector : Component name in HTML
    - Prefix for clarity
  - Template : View's HTML
    - Correct HTML syntax
- Import what we need
  - Defines where to find the members that this component needs
  - Import keyword
  - Member name
    - Correct spelling/casing
  - Module path
    - Enclose in quotes
    - Correct spelling/casing

Templates and Directives

app.component.ts

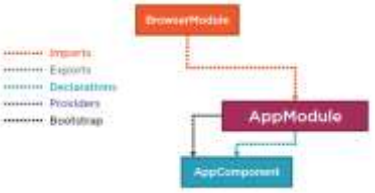
```
import { Component } from '@angular/core';

@Component({
    selector: 'pm-app',
    template:
    <div><h1>{{pageTitle}}</h1>
        <div>My First Component</div>
    </div>
    `
})
export class AppComponent {
 pageTitle: string = 'Acme Product Management';
}
```

Defining a Template



Directives

- <selector>content</selector>



Bindings

- Coordinates communication between the component's class and its template and often involves passing data.

Interpolation

Template

```
<h1>{{pageTitle}}</h1>
{{'Title: ' + pageTitle}}
{{2*20+1}}
{{'Title: ' + getTitle()}}
<h1 innerText={{pageTitle}}></h1>
```

Class

```
export class AppComponent {
 pageTitle: string =
     'Acme Product Management';
}getTitle(): string {...};
}
```

Directives

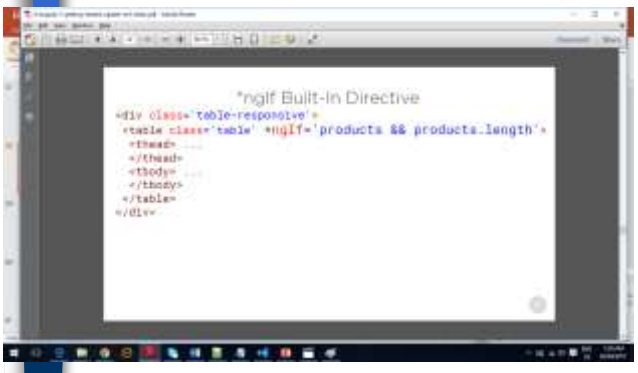
- Custom HTML element or attribute used to power up and extend our HTML.
  - Built-In
    - *ngIf, *ngFor
  - Custom

app.component.ts

```
@Component({
  selector: 'pm-app',
  template:
    <div><h1>{{pageTitle}}</h1>
      <pm-products></pm-products>
    </div>
})
export class AppComponent { }
```

product-list.component.ts

```
@Component({
  selector: 'pm-products',
  templateURL:
    'app/products/product-list.component.html'
})
export class ProductListComponent { }
```



Built-in Directives

```
<div class='table-responsive'>
 <table class='table' *ngIf='products && products.length'>
  <thead> ...
  </thead>
  <tbody> ...
  </tbody>
 </table>
</div>
```

```
<tr *ngFor='let product of products'>
    <td></td>
    <td>{{ product.productName }}</td>
```

Template input variable

Data Binding

Binding

- Property Binding
  - <img [src]='imageUrl'>
  - <img src={{imageUrl}}>
  - <img src='http://localhost:3000/{{imageUrl}}'>
- Event Binding
  - <button(click)='toggleImage()'>

Two-way Binding

- FormsModule

Template

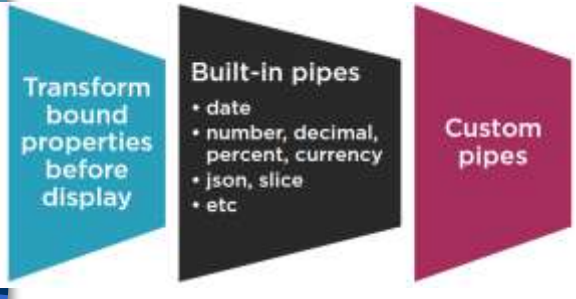
```
<input [(ngModel)]='listFilter'>
```

Class

```
export class ListComponent {
 listFilter: string = 'cart';
}
```

Data Binding

Transforming Data with Pipes



Pipe Examples

- {{ product.productCode| lowercase }}
- <img [src]='imageUrl'
  [title]='product.productName|
  uppercase'>
- {{ product.price| currency | lowercase }}
- {{ product.price|
  currency:'USD':true:'1.2-2' }}

ngModel

product-list.component.html

```
<div class='col-md-4'>
  <input type='text'
    [(ngModel)]='listFilter' />
</div>
```

app.module.ts

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

Improving Components

- Strong typing & interfaces
- Encapsulating styles
- Lifecycle hooks
- Custom pipes
- Relative Paths with Module Id

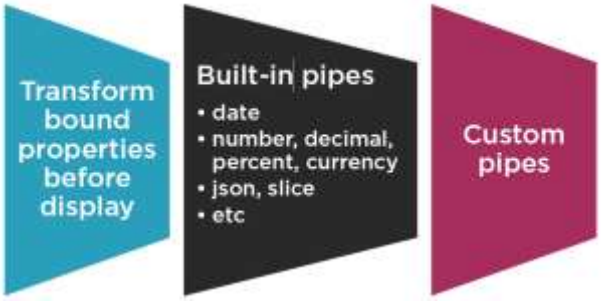
Strong Typing

```
export class ProductListComponent {
   pageTitle: string = 'Product List';
   showImage: boolean = false;
   listFilter: string = 'cart';
   message: string;

   products: any[] = […];

   toggleImage(): void {
      this.showImage = !this.showImage;
   }

   onRatingClicked(message: string): void {
        this.message = message;
   }
```

Interface

- A specification identifying a related set of properties and methods.
- A class commits to supporting the specification by implementing the interface.
- Use the interface as a data type.
- Development time only!
- Interface

Transforming Data with Pipes

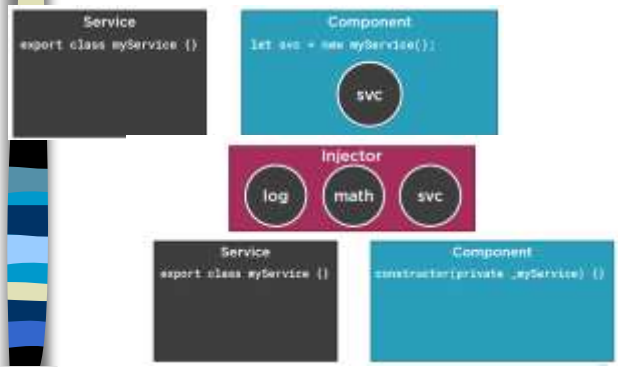


Services and Dependency Injection

Service

- A class with a focused purpose.
- Used for features that:
  - Are independent from any particular component
  - Provide shared data or logic across components
  - Encapsulate external interactions

How does it work?



Dependency Injection

- A coding pattern in which a class receives the instances of objects it needs (called dependencies) from an external source rather than creating them itself.

Building a Service

Building a Service

product.service.ts

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

@Injectable()
export class ProductService {

  getProducts(): IProduct[] {
  }

}
```

Registering a Provider

app.component.ts

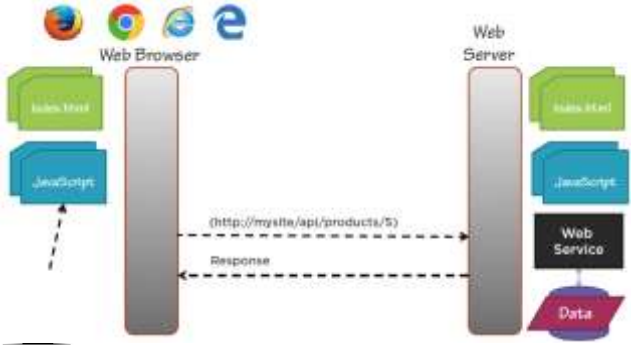
```
...
import { ProductService } from './products/product.service';

@Component({
  selector: 'pm-app',
  template:
    <div><h1>{{pageTitle}}</h1>
      <pm-products></pm-products>
    </div>
  `,
  providers: [ProductService]
})
export class AppComponent { }
```

Injecting the Service

product-list.component.ts

```
...
import { ProductService } from './products/product.service';

@Component({
  selector: 'pm-products',
  templateUrl: 'product-list.component.html'
})
export class ProductListComponent {
 private _productService;
 constructor(productService: ProductService) {
   _productService = productService;
 }

}
```

Retrieving Data Using HTTP



Observables and Reactive Extensions

- Help manage asynchronous data
- Treat events as a collection
  - An array whose items arrive asynchronously over time
- Are a proposed feature for ES 2016
- Use Reactive Extensions (RxJS)
- Are used within Angular

Observable Operators

- Methods on observables that compose new observables
- Transform the source observable in some way
- Process each value as it is emitted
- Examples: map, filter, take, merge, …

Promise vs Observable

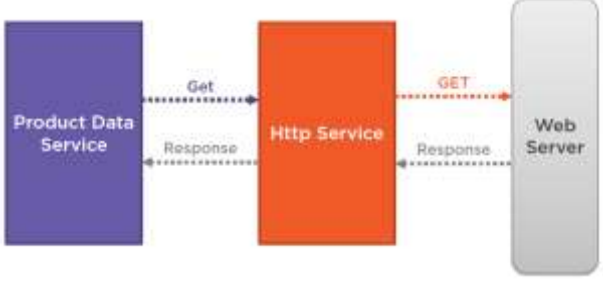
Promise

- Provides a single future value
- Not lazy
- Not cancellable

Observable

- Emits multiple values over time
- Lazy
- Cancellable
- Supports map, filter, reduce and similar operators

Sending an Http Request



Sending an Http Request

product.service.ts

```
...
import { Http } from '@angular/http';


@Injectable()
export class ProductService {
  private _productUrl = 'www.myWebService.com/api/products';

  constructor(private _http: Http) { }

  getProducts() {
   return this._http.get(this._productUrl);

  }
}
```

Registering the Http Service Provider

app.module.ts

```
...
import { HttpModule } from '@angular/http';

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

Sending an Http Request

product.service.ts

```
...
import { Http } from '@angular/http';


@Injectable()
export class ProductService {
  private _productUrl = 'www.myWebService.com/api/products';

  constructor(private _http: Http) { }

  getProducts() {
   return this._http.get(this._productUrl);

  }
}
```

Sending an Http Request with observable

product.service.ts

```
...
import { Http, Response} from '@angular/http';
import { Observable } from 'rxjs/Observable';
import 'rxjs/add/operator/map';

@Injectable()
export class ProductService {
  private _productUrl = 'www.myWebService.com/api/products';

  constructor(private _http: Http) { }

  getProducts(): Observable<IProduct[]> {
   return this._http.get(this._productUrl)
              .map((response: Response) => <IProduct[]>response.json());
  }
}
```

Exception Handling

product.service.ts

```
...
import 'rxjs/add/operator/do';
import 'rxjs/add/operator/catch';
...

  getProducts(): Observable<IProduct[]> {
   return this._http.get(this._productUrl)
              .map((response: Response) => <IProduct[]>response.json())
              .do(data => console.log('All: ' + JSON.stringify(data)))
              .catch(this.handleError);
  }

  private handleError(error: Response) {
  }
```

Subscribing to an Observable

```
x.then(valueFn, errorFn)                    //Promise
x.subscribe(valueFn, errorFn)               //Observable
x.subscribe(valueFn, errorFn, completeFn)   //Observable
let sub = x.subscribe(valueFn, errorFn, completeFn)
```

product-list.component.ts

```
ngOnInit(): void {
    this._productService.getProducts()
            .subscribe(products => this.products = products,
                       error => this.errorMessage = <any>error);
}
```

Navigation & Routing Basics

How Routing Works?

- Configure a route for each component
- Define options/actions
- Tie a route to each option/action
- Activate the route based on user action
- Activating a route displays the component's view

How Routing Works?

Configuring Routes

app.module.ts

```
...
import { RouterModule } from '@angular/router';

@NgModule({
  imports: [
    BrowserModule,
    FormsModule,
    HttpModule,
    RouterModule.forRoot([], { useHash: true })
  ],
  declarations: [
    ...
  ],
  bootstrap: [ AppComponent ]
})
export class AppModule { }
```

QUESTION / ANSWERS

THANKING YOU !