

# Angular 2 Components – Displaying Data, Handling User Input, Forms and Validation. Services and DI

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## Agenda I

1. Displaying data using template interpolation and directives: *NgModel*, *NgFor*, *NgIf*, *NgSwitch*, *NgStyle*, *NgClass*.
2. Handling user input – binding event handlers, getting data from the *\$event* object, using local template variables, event filtering, handling multiple events
3. Building forms – two-way data binding: [(ngModel)]
4. Change tracking, validation, and error handling: ngControl, providing custom styles for different control states, resetting and submitting forms, edit/display forms.
5. Template-driven forms – NgForm, NgModel, NgModelGroup

## Agenda II

6. Reactive forms – ReactiveFormsModule: FormControlName, FormGroupName, FormArrayName, FormControlDirective, FormGroupDirective, FormBuilder, etc.
7. Using form validators – RequiredValidator, PatternValidator, MaxLengthValidator, MinLengthValidator,
8. Directives and Validators class.
9. Building custom validator directives by implementing Validator interface.
10. Building asynchronous form validators.
11. Angular 2 services - building custom services

## Agenda III

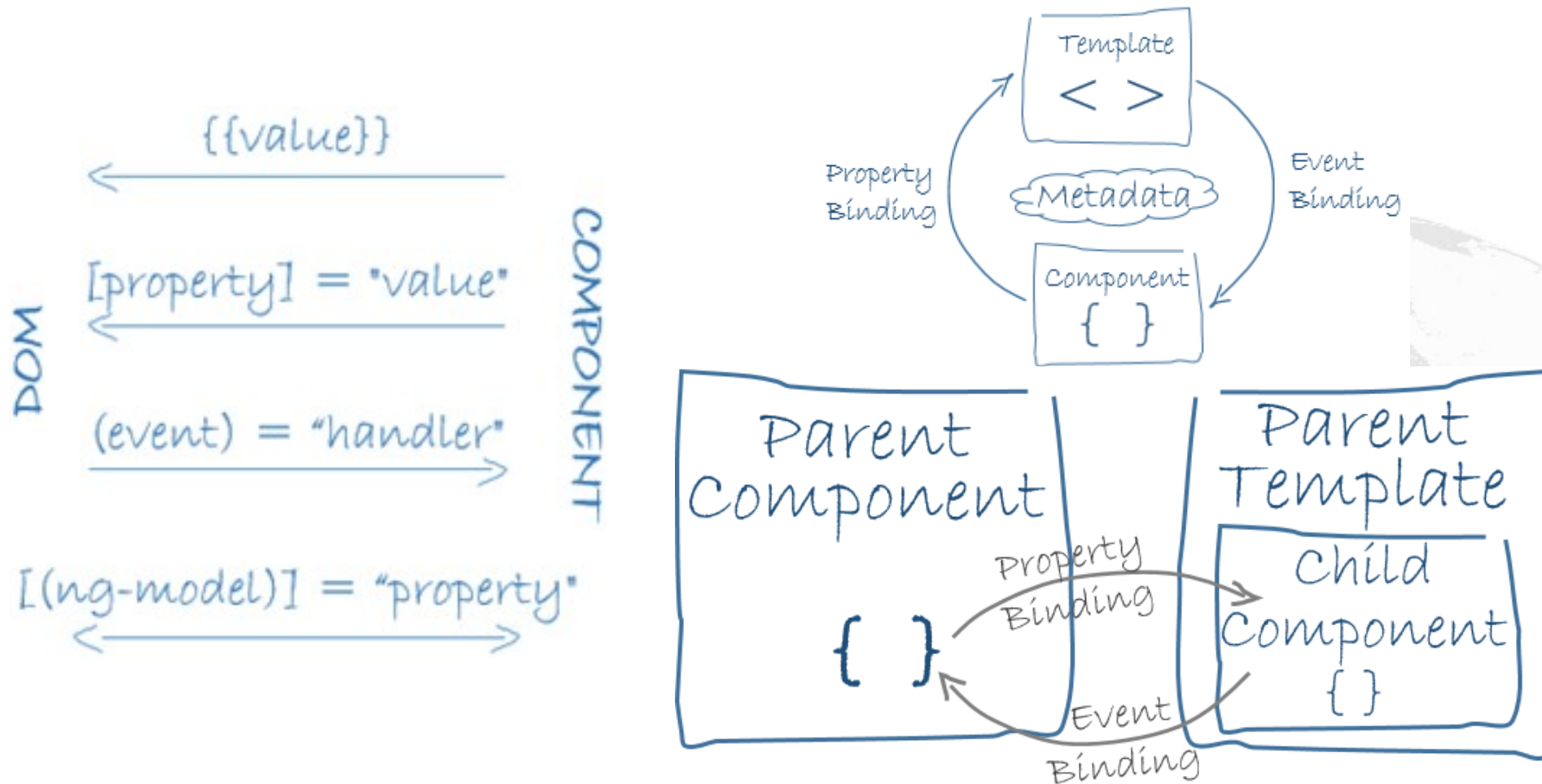
- 12. Understanding Angular 2 Dependency Injection (DI)
- 13. Configuring the injector
- 14. Registering providers in modules and components
- 15. Declarative and programmatic dependency injection
- 16. Injecting service dependencies using @Injectable() decorator
- 17. Registering custom providers using provide function, dependency injection tokens
- 18. Using hierarchical injectors

# Where is The Code?

**Angular Application Programming**  
code is available @GitHub:

<https://github.com/iproduct/Course-Multimedia-FMI>

# Angular 2 Data and Event Bindings



# Displaying Data: ViewModel → View

- Using **template interpolation**:

```
<span class="badge">{{product.id}}</span> {{product.name}}  
- {{product.price | currency:'USD':true:'1.2-2'}}}
```

- Using built-in **directives**:

- **NgModel**: `<input [(ngModel)]= "product.name">`

- **NgFor**: `<li *ngFor="let product of products"></li>`

- **NgIf**: `<prod-detail *ngIf="selectedProd"></prod-detail>`

- **NgSwitch** + **\*ngSwitchCase** + **\*ngSwitchDefault**

- **Style binding** or **NgStyle**

- **Class binding** or **NgClass**

# NgSwitch + \*ngSwitchCase + \*ngSwitchDefault

```
<span class="user-icon" [ngSwitch]="user.role + user.gender">
  <span *ngSwitchCase="CUSTOMER_MALE">
    <img [src]="customerMaleImage"></span>
  <span *ngSwitchCase="CUSTOMER_FEMALE">
    <img [src]="customerFemaleImage"></span>
  <span *ngSwitchCase="OPERATOR_MALE">
    <img [src]="operatorMaleImage"></span>
  <span *ngSwitchCase="OPERATOR_FEMALE">
    <img [src]="operatorFemaleImage"></span>
  <span *ngSwitchCase="ADMIN_MALE">
    <img [src]="adminMaleImage"></span>
  <span *ngSwitchCase="ADMIN_FEMALE">
    <img [src]="adminFemaleImage"></span>
  <span *ngSwitchDefault>Other</span>
</span>
```



# NgSwitch + \*ngSwitchCase + \*ngSwitchDefault

## User List

*Pick a user from the list*

|   |                                    |   |
|---|------------------------------------|---|
| 1 | John Smith in role: CUSTOMER       |    |
| 2 | Sara Smith in role: CUSTOMER       |    |
| 3 | Veronica Simpson in role: OPERATOR |    |
| 4 | Simon Stars in role: OPERATOR      |    |
| 5 | Brian Harisson in role: ADMIN      |  |
| 6 | Svetlana Borisova in role: ADMIN   |  |

# Style Binding or NgStyle

- Style property binding:

```
<div [style.display]="isVisible ? 'block' : 'none'">  
  Show me with style </div>
```

- Using NgStyle directive:

```
<input type="text" name="name" [ngStyle]="getStyles()"   
[(ngModel)]="product.name" />
```

```
getStyles() {  
  return {  
    'color': this.isValid ? 'black' : 'red',  
    'font-weight': this.isChanged ? 'bold' : 'normal'  
  };  
}
```

# Class Binding or NgClass

- Class property binding:

```
<div [class.custom]="isCustom">Show me with class</div>
```

- Using NgClass directive:

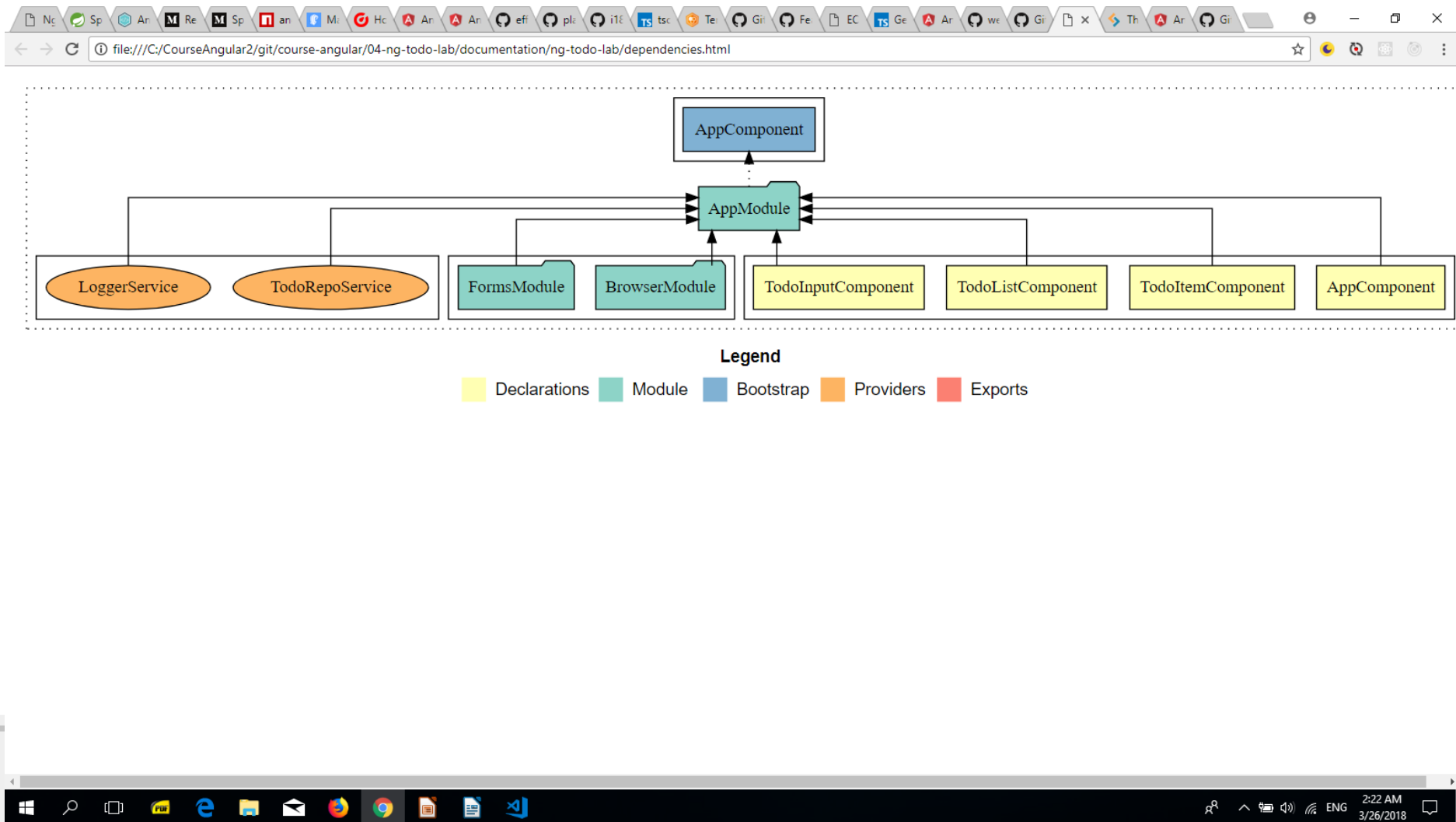
```
<input type="text" name="name" [ngClass]="getClasses()"
      [(ngModel)]="product.name" />
```

```
getClasses() {
  return {
    modifiable: this.canModify,
    changed: this.isChanged,
    invalid: !this.isValid
  };
}
```

# Angular Features & Services

- **Animations** – animate component behavior
- **Change detection** – zones to intercept asynchronous activity
- **Events** – publishing and subscribing to events (EventEmitter)
- **Forms** – complex data entry with validation and dirty checking
- **HttpClient** – communicate with a server to get/update data
- **Lifecycle hooks** – tap into key lifetime events of a component,
- **Pipes** – transforming display data: **price | currency:'USD':true**
- **Router** – single-page application navigation
- **Testing** – running unit tests on Ng2 application components

# Angular TODO Application Demo



# Handling User Input

[<https://angular.io/guide/user-input>]

- Binding event handlers:

```
<button (click)=calcTax(amount.value)>CalculateTax</button>
```

- Getting data from the **\$event** object:

```
<input (keyup)="onKey($event)">
```

```
onKey(event:any) { this.value += event.target.value; }
```

- Using **template reference variables**:

```
<input #amount (change)="0">
```

```
<div>{{amount.value}}</div>
```

- Event filtering:

```
<input #amount (keyup.enter)="calcTax(amount.value)">
```

- Handling multiple events: 

```
<input #amount (keyup.enter)=  
"calcTax(amount.value)" (blur)="calcTax(amount.value)">
```

# Component Lifecycle and Lifecycle Hooks

[<https://angular.io/docs/ts/latest/guide/lifecycle-hooks.html>]

1. *ngOnChanges* – on input props change
2. *ngOnInit* - after the first *ngOnChanges*
3. *ngDoCheck* -every change detection run
4. *ngAfterContentInit* - after first content proj.
5. *ngAfterContentChecked* - each projection
6. *ngAfterViewInit* - after first component's views and child views initialization/check
7. *ngAfterViewChecked* - each views check
8. *ngOnDestroy* - before destroying directive/component – should unsubscribe observables and detach event handlers

constructor

ngOnChanges

ngOnInit

ngDoCheck

ngAfterContentInit

ngAfterContentChecked

ngAfterViewInit

ngAfterViewChecked

ngOnDestroy

# Building Template-Driven Forms using ngModel

- Two-way data binding with **ngModel**:

```
<input [(ngModel)]="product.name" id="name" name="name">
```

Diagnostic data: {{product.name}}

```
<input type="text" id="name" name="name" required  
  [(ngModel)]="product.name"  
  (ngModelChange)="product.name = $event">
```

- Change tracking, validation, and error handling with **ngModel**:

```
<input [(ngModel)]="user.email" id="email" name="email"  
required pattern="^[A-Za-z0-9._%+-]+@[A-Za-z0-9.-]+\.[A-  
Za-z]{2,}$" #email>
```

```
<p>{{email.className}}</p>
```

Svetlana Borisova Details

|             |   |
|-------------|---|
| ID:         | <input type="text" value="6"/>  |
| First Name: | <input type="text" value="Svetlana"/>   |
| Last Name:  | <input type="text" value="Borisova"/>   |
| Email:      | <input type="text" value="sveta@"/><br><small>col-xs-12 col-sm-9 ng-dirty ng-touched ng-invalid</small> |



# Angular Forms

- Providing custom styles for different control states

| <i>Control/Form State</i> | <i>Class if <b>True</b></i> | <i>Class if <b>False</b></i> |
|---------------------------|-----------------------------|------------------------------|
| Control has been visited  | <b>ng-touched</b>           | <b>ng-untouched</b>          |
| Control's value changed   | <b>ng-dirty</b>             | <b>ng-pristine</b>           |
| Control's value valid     | <b>ng-valid</b>             | <b>ng-invalid</b>            |

- Using **NgForm** / **NgModelGroup** directives
- Resetting and submitting forms
- Add/ Edit/ Display forms
- Reactive forms using **ReactiveFormsModule** directives:  
FormArrayName, FormControlDirective, FormGroupDirective,  
FormBuilder, RequiredValidator, PatternValidator, etc.

# Building Forms – Example:

template: `

```
<form #f="ngForm" (ngSubmit)="onSubmit(f)">
  <p *ngIf="nameCtrl.invalid">Name is invalid.</p>
  <div ngModelGroup="name" #nameCtrl="ngModelGroup">
    <input name="first" [ngModel]="name.first" minlength="2">
    <input name="last" [ngModel]="name.last" required>
  </div>
  <input name="email" ngModel> <button>Submit</button>
</form> <button (click)="setValue()">Set value</button>
```

```
export class SimpleFormComponent {
  public name = {first: 'John', last: 'Smith'};
  public onSubmit(f:NgForm){console.log(f.value); console.log(f.valid);}
  public setValue() { this.name = {first: 'Brian', last: 'Adams'}; }
}
```

# Angular Standard Validators

- To validate user input, add **HTML validation attributes** to the elements → Angular adds validator functions to control model:

| <i>Attribute</i> | <i>Input types supported</i>   | <i>Constraint description</i>                            |
|------------------|--|--|
| <b>required</b>  | text, search, url, email, tel, date, time, password, checkbox, number, radio, file, <select>, <textarea> | There must be a value                                    |
| <b>minlength</b> | text, search, url, password, tel, email, <textarea>  | The number of characters must not be less than the value |
| <b>maxlength</b> | text, search, url, password, tel, email, <textarea>  | The number of characters must not exceed the value       |
| <b>email</b>     | email  | Value must be a valid email                              |
| <b>pattern</b>   | text, search, url, tel, email, password  | The value must match the pattern                         |

# Custom Validators

[<https://angular.io/docs/ts/latest/cookbook/form-validation.html#custom-validation>]

```
import { Control, ValidatorFn, AsyncValidatorFn } from
"@angular/forms";
interface ValidationErrors{
  [key: string]: any;
}
export function forbiddenNameValidator(nameRe: RegExp):
ValidatorFn {
  return (control: AbstractControl): ValidationErrors => {
    const name = control.value;
    const no = nameRe.test(name);
    return no ? {forbiddenName: {name}} : null;
  };
}
```

# Custom Validators Async (Promise)

[<https://github.com/daviddt/angular2-form-validation-example/>]

```
export function usernameTakenValidator(): AsyncValidatorFn {
  return (control: AbstractControl): Promise<ValidationErrors> => {
    return new Promise((resolve, reject) => {
      setTimeout(() => {
        if (control.value === "John") {
          resolve({ "usernameTaken": true });
        } else {
          resolve(null);
        }
      }, 1000);
    });
  };
}
```

# Custom Validation Directive - I

[<https://angular.io/docs/ts/latest/cookbook/form-validation.html#custom-validation>]

```
@Directive({
  selector: '[forbiddenName]',
  providers: [{provide: NG_VALIDATORS,
    useExisting: ForbiddenValidatorDirective, multi: true}]
})
export class ForbiddenValidatorDirective implements Validator,
OnChanges {
  @Input() private forbiddenName: string;
  private valFn = Validators.nullValidator;

  public validate(control: AbstractControl): ValidationErrors {
    return this.valFn(control);
  }
  ...
}
```

# Custom Validation Directive - II

[<https://angular.io/docs/ts/latest/cookbook/form-validation.html#custom-validation>]

```
...  
public ngOnChanges(changes: SimpleChanges): void {  
  const change = changes['forbiddenName'];  
  if (change) {  
    const val: string | RegExp = change.currentValue;  
    const re = val instanceof RegExp ? val  
      : new RegExp(val, 'i');  
    this.valFn = forbiddenNameValidator(re);  
  } else {  
    this.valFn = Validators.nullValidator;  
  }  
}
```

# Validation Directive (Template Driven Form)

[<https://angular.io/docs/ts/latest/cookbook/form-validation.html#custom-validation>]

```
<form #heroForm="ngForm" (ngSubmit)="onSubmit()">
  <div class="form-group">
    <label for="name">Name</label>

    <input type="text" id="name" class="form-control"
      required minlength="4" maxlength="24" forbiddenName="sam"
      name="name" [(ngModel)]="hero.name" >

    <div *ngIf="formErrors.name" class="alert alert-danger">
      {{ formErrors.name }}
    </div>
  </div>
  ...
</form>
```



# Using Custom Validators (Reactive Form)

```
constructor(private builder: FormBuilder) {  
    this.username = new FormControl(  
        "",  
        [ Validators.required,    //Sync validators  
          Validators.minLength(3),  
          Validators.maxLength(25),  
          forbiddenNameValidator(/sam/i)],  
          usernameTakenValidator() //Async validator  
    );  
  
    this.form = builder.group({  
        username: this.username  
    });  
}
```

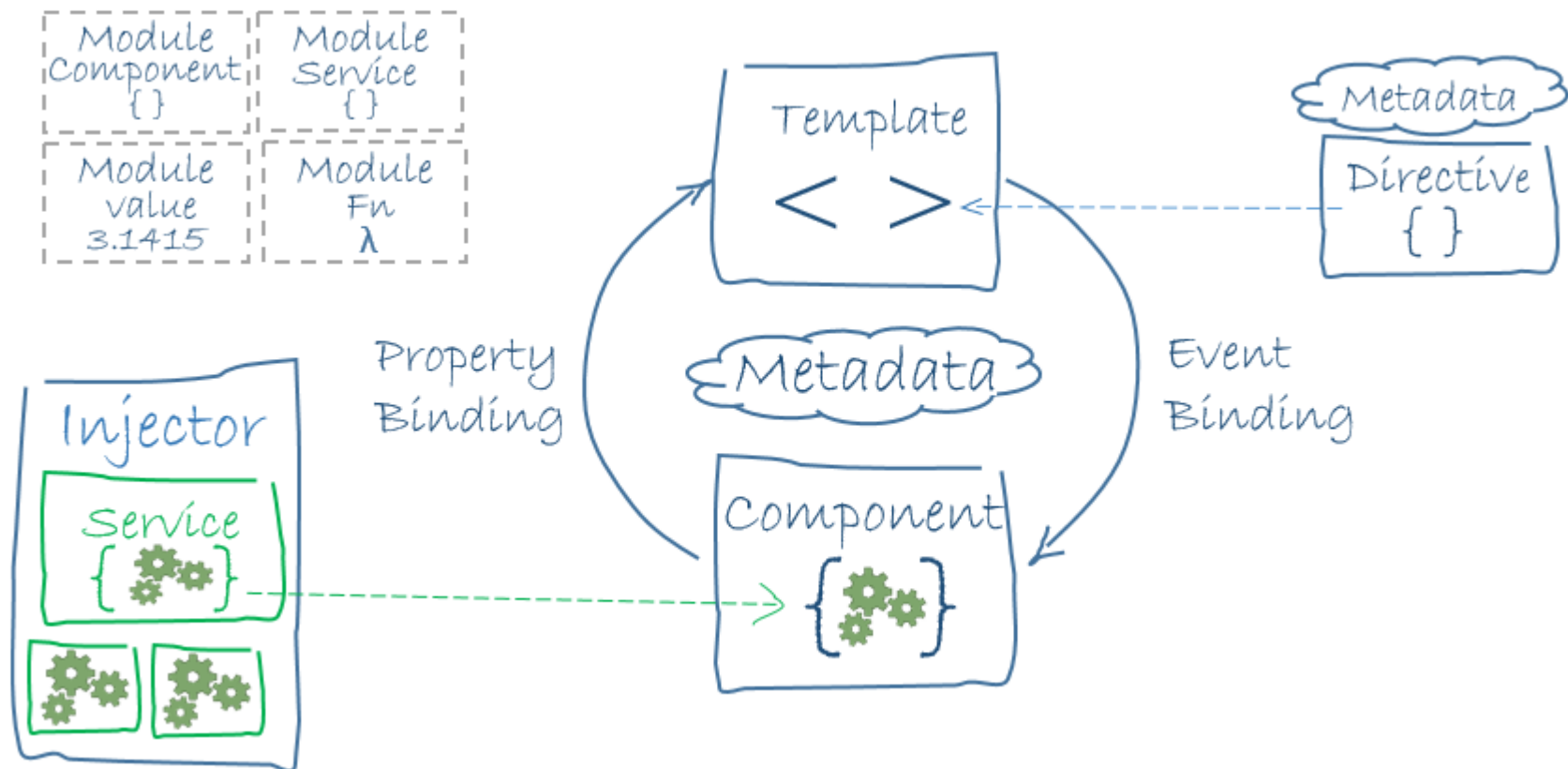
# Dynamic Forms - I

- Official angular dynamic forms tutorial:  
<https://angular.io/guide/dynamic-form>
- Create a dynamic form with configurable fields and validations using Angular:  
<https://medium.com/@mail.bahurudeen/create-a-dynamic-form-with-configurable-fields-and-validations-using-angular-6-994db56834da>
- Configurable Reactive Forms in Angular with dynamic components:  
<https://ultimatecourses.com/blog/angular-dynamic-components-forms>

## Dynamic Forms - II

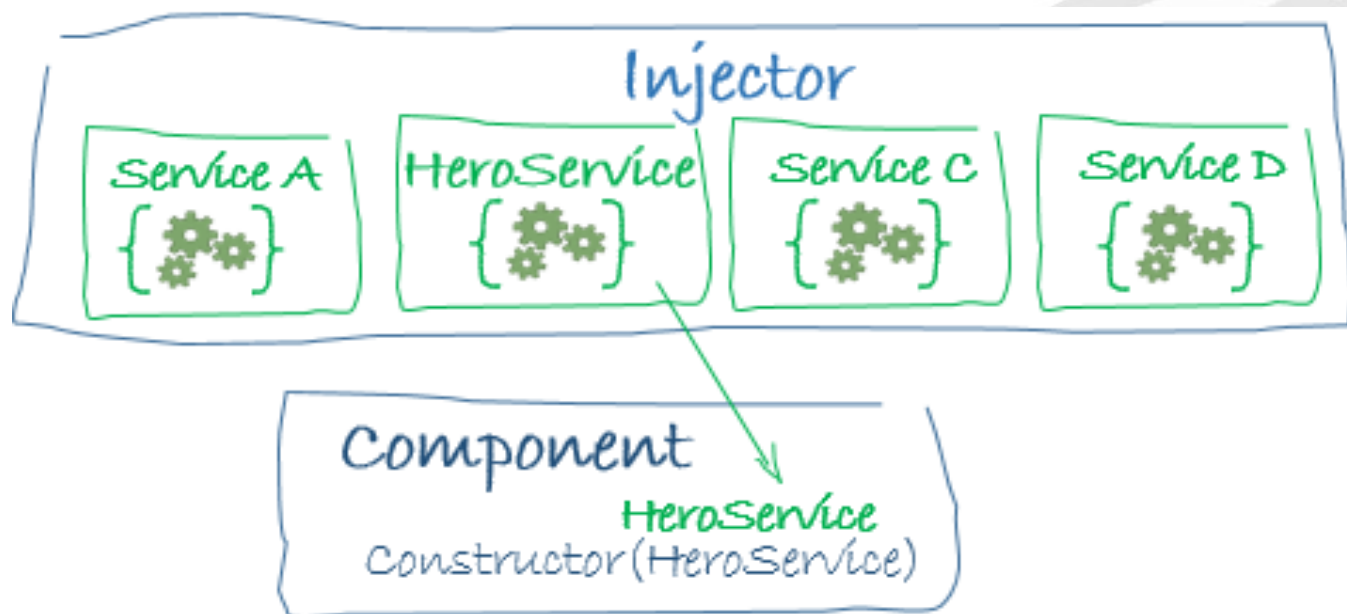
- Reactive Forms in Angular: Dynamically Creating Form Fields With FormArray:  
<https://alligator.io/angular/reactive-forms-formarray-dynamic-fields/>
- Template-based component selection  
<https://stackblitz.com/edit/angular-dynamic-form-builder?file=app%2Fdynamic-form-builder%2Ffield-builder%2Ffield-builder.component.ts>
- NG Dynamic Forms:  
<https://github.com/udos86/ng-dynamic-forms>
- Dynamic JSON Powered forms for Angular Material:  
<https://github.com/formio/angular-material-formio>

# Angular 2 Services



# Angular 2 Dependency Injection (DI)

- Dependency Injection (DI) using constructors
- Hierarchical dependency injectors – module or component provided services



# Simple Service Example – logger.service.ts

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

@Injectable()
export class Logger {
  public log(msg: any) { console.log(msg); }
  public error(msg: any) { console.error(msg); }
  public warn(msg: any) { console.warn(msg); }
}
```


# Backend Service Example – backend.service.ts

```
import { Injectable, Type } from '@angular/core';
import { Logger } from '../logger.service';
import { Product } from '../product.model';
const PRODUCTS = [new Product('Logitech Mouse', 12.99, 'Super mouse'),
  new Product('Whiteboard Marker', 0.32, 'Drawing is fun!')];
@Injectable()
export class BackendService {
  constructor(private logger: Logger){} ← Dependency Injection (DI)
  public getAll(type: Type<any>): Promise<any> {
    if (type === Product) {
      return Promise.resolve(PRODUCTS); // TODO get from the database
    }
    let err = new Error(`Cannot get object of this type : ${type}`);
    return Promise.reject(err);
  }
}
```

# Product Service Example – product.service.ts

```
import { Injectable } from '@angular/core';
import { Product } from '../product.model';
import { BackendService } from '../backend.service';
import { Logger } from '../logger.service';
@Injectable()
export class ProductService {
  private products: Product[] = [];
  constructor(private backend: BackendService, private logger: Logger){}
  public getProducts() {
    this.backend.getAll(Product).then( (products: Product[]) => {
      this.logger.log(`Fetched ${products.length} products.`);
      this.products.push(...products); // fill cache
    }).catch(
      err => this.logger.error(`ProductService Error: ` + err)
    );
    return this.products;
  }
}
```

**Dependency Injection (DI)**





# Injecting Service into Component

```
import { Component, OnInit } from '@angular/core';
import { Product } from './product.model';
import { ProductService } from './product.service';
```

```
@Component({
  selector: 'product-list',
  templateUrl: './product-list.component.html',
  providers: [ProductService] ← Registering DI Providers
})
```

```
export class ProductListComponent implements OnInit {
  public products: Product[];
  public selectedProd: Product;
  constructor(private service: ProductService) { }
  public ngOnInit() {
    this.products = this.service.getProducts();
  }
  public selectProduct(product: Product){this.selectedProd = product;}
}
```

**Dependency Injection (DI)**

# Components Testability and DI

```
let expectedProducts = [new Product('Test Product', 10.50, 'Test  
product description')]
```

```
let mockService = <ProductService> {  
  getProducts: () => expectedProducts  
}
```

```
it('should have products when ProductListComponent created', () => {  
  let plc = new ProductListComponent(mockService);  
  expect(plc.products.length).toEqual(expectedProducts.length);  
});
```

# DI Providers

- Provider class and **provide** object literal:
  - `providers: [Logger]`
  - `[{ provide: Logger, useClass: Logger }]`
  - `[{ provide: Logger, useClass: SuperiorLogger }]`
  - `[ SuperiorLogger,`  
    `{ provide: Logger, useExisting: SuperiorLogger}]`
  - `[{ provide: Logger, useValue: { log: (message) => {`  
    `console.log(`Custom: ${message}`); } }]`
  - `[{ provide: ProductService, useFactory:`  
    `productServiceFactory, deps: [Logger, UserService]}]`

# Declarative and Programmatic DI

- Declarative dependency injection:

```
constructor(productService: ProductService) { ... }
```

- Programmatic dependency injection:

```
productService: productService = this.injector.get(ProductService);
```

- Programmatic DI example:

```
const injector: Injector = ReflectiveInjector.resolveAndCreate(  
    [{provide: 'token', useValue: 'Value'}]);  
expect(injector.get('token')).toEqual('Value');  
expect(() => injector.get('noSuchToken')).toThrowError();  
expect(injector.get('noSuchToken', 'Not Found')).toEqual('Not Found');
```

# DI Tokens

- Dependency injection tokens – *can not inject by interface types:*

```
export interface ProductServiceConfig {
  productServiceUrl: string;
}

export const PRODUCT_DI_CONFIG: ProductServiceConfig = {
  productServiceUrl: 'http://localhost:8080/api' };

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

export let PROD_CONFIG = new OpaqueToken('product.config');

providers: [{ provide: PROD_CONFIG, useValue: PRODUCT_DI_CONFIG }]

constructor(@Inject(PROD_CONFIG) config: ProductServiceConfig) {
  this.productServiceUrl = config.productServiceUrl;
}
```

# DI Tokens

- Dependency injection tokens – *can not inject by interface types:*

```
export interface ProductServiceConfig {
  productServiceUrl: string;
}
export const PRODUCT_DI_CONFIG: ProductServiceConfig = {
  productServiceUrl: 'http://localhost:8080/api' };
import { InjectionToken } from '@angular/core';
export let PROD_CONFIG =
  new InjectionToken<ProductServiceConfig>('product.config');
providers: [{ provide: PROD_CONFIG, useValue: PRODUCT_DI_CONFIG }]
constructor(@Inject(PROD_CONFIG) config: ProductServiceConfig) {
  this.productServiceUrl = config.productServiceUrl;
}
```

New in Angular (typescript)



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Thanks for Your Attention!

Questions?