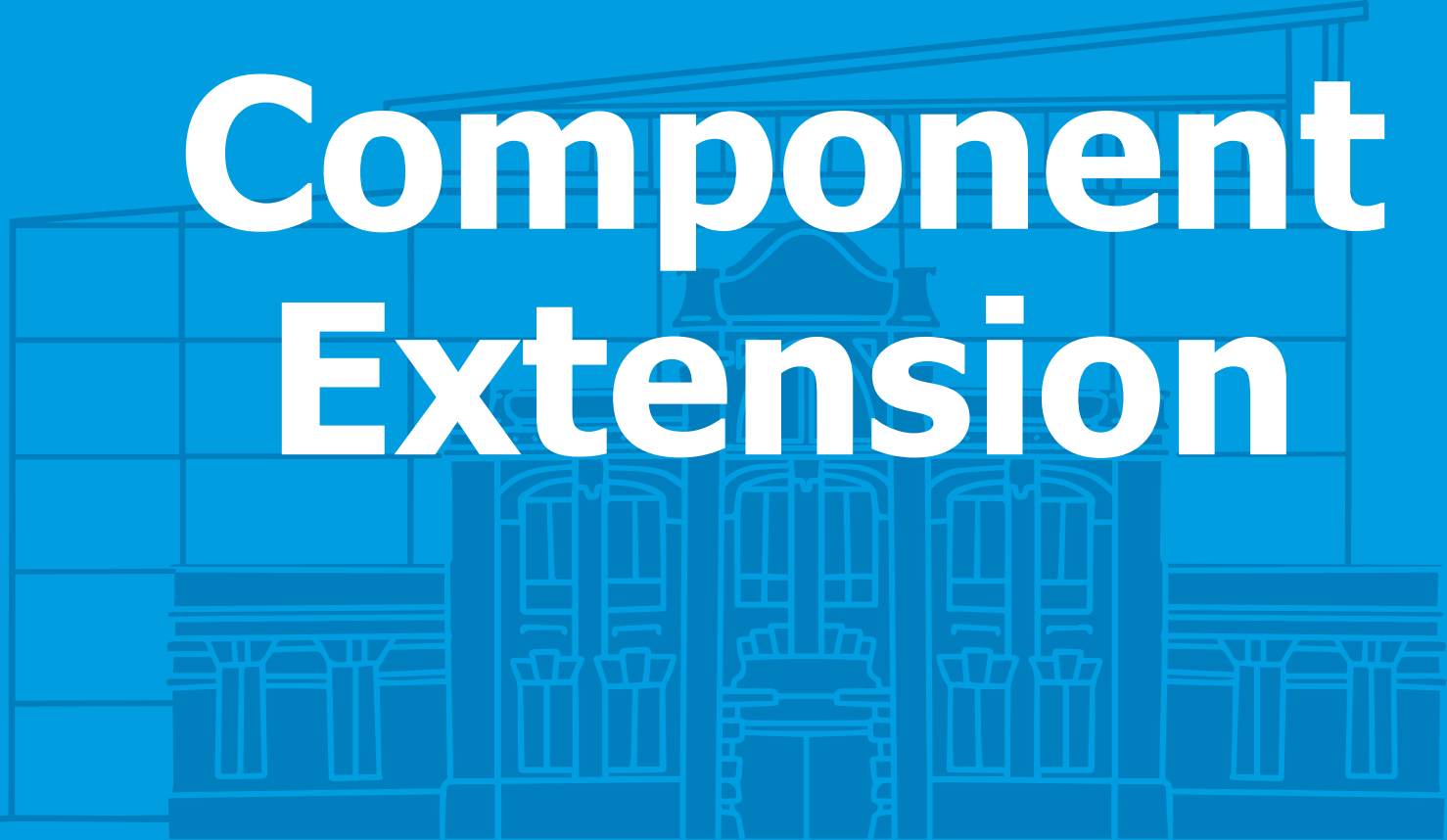


**Angular 14 - 09**

# Component Extension



# Component Extension

- We are going to continue exploring the components, and we will see how to extend their basic functionality to perform other tasks.
- To do this, we will take advantage of certain TypeScript features, such as **strong typing**.
- Interfaces allow you to define contracts that those who implement them have to comply with, guaranteeing features that can be used by rendering engines and also by editors.

# Benefits of "strong typing"

- Our array of products has no type defined, so the editor cannot check for errors while typing.
- One way to avoid this is to define an **interface** with all the properties that the array should have, and declare the array to be of that interface type.
- Another alternative is defining a **class**, specially if you want to add it business logic.

 Create a separate file "iproduct.ts" in the "models" directory

```
ng g i models/IProduct
```

```
export interface IProduct {  
  name:string;  
  code:string;  
  image:string;  
  date:Date;  
  price:number;  
  stars:number;  
}
```

 Create a separate file "product.ts" in the "models" directory

```
ng g cl models/Product
```

```
export class Product {  
  private _name: string;  
  private _code: string;  
  private _image: string;  
  private _date: Date;  
  private _price: number;  
  private _stars: number;  
  
  constructor(...) {...}  
  // getters and setters  
  // other methods  
}
```

# Benefits of "strong typing"

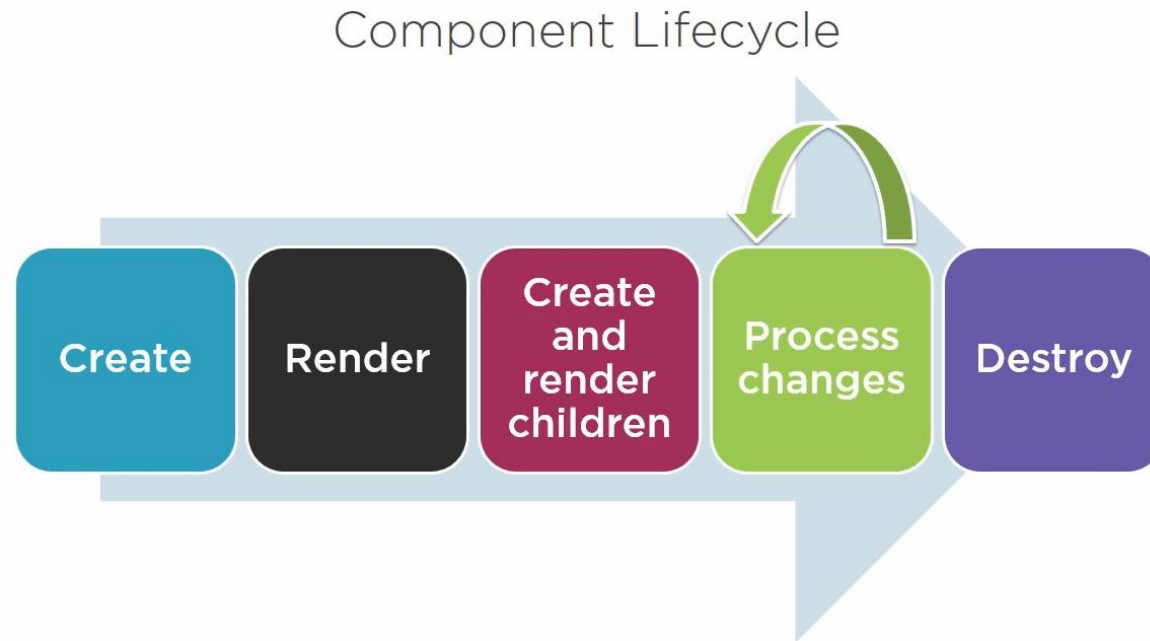
- Next, in the component, we need to perform the import of the interface, and redefine the data to be cast according to the interface:

```
import { IProduct } from 'src/app/models/iproduct';
...
products: IProduct[] = [
  {
    name: 'Leaf Rake',
    code: 'GUN-0611',
    image: 'LeafRake.png',
    date: new Date(2016,3,19),
    price: 19.95,
    stars: 3,
  },
  {
    name: 'Garden Cart',
    code: 'GUN-0023',
    image: 'GardenCart.png',
    date: new Date(2016,5,21),
    price: 32.99,
    stars: 4,
  },
];
```

```
import { IProduct } from 'src/app/models/iproduct';
...
productObjs: Product[] = [
  new Product('Leaf Rake',
    'GUN-0611',
    'LeafRake.png',
    new Date(2016,3,19),
    19.95,
    3),
  new Product('Garden Cart',
    'GUN-0023',
    'GardenCart.png',
    new Date(2016,5,21),
    32.99,
    4)
];
```

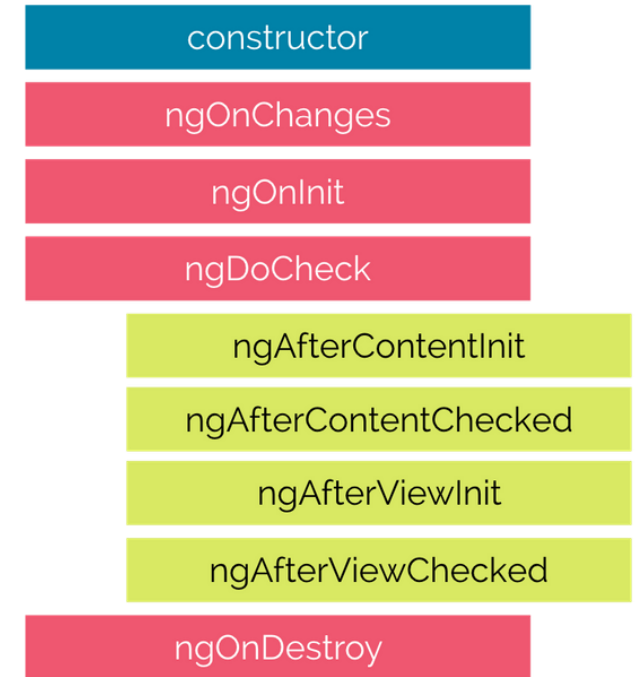
# Components lifecycle

- Components have a **lifecycle** which is the steps Angular takes to create and maintain it, until it is removed from the DOM



# Components lifecycle

- We can intervene between these phases, and include "**lifecycle hooks**" to modify the default behavior.
  - <https://angular.io/guide/lifecycle-hooks>
- The 3 most used are:
  - **onInit**: for component initialization. It is the perfect step to read data from a "backend" server.
  - **onChanges**: to execute code after a change occurs in an input element.
  - **onDestroy**: Allows to perform memory cleanup tasks before destroying the component.
- We will need to **implement hook interfaces** that are already defined in Angular.
  - This requires the reference corresponding to the hook that we are going to use.
  - And the implementation of the method (similar to that of an event handler).



# Components lifecycle

HOOK METHOD	PURPOSE
<b>ngOnChanges()</b>	Respond when Angular sets or resets data-bound input properties. The method receives a SimpleChanges object of current and previous property values. This happens frequently, so any operation you perform here impacts performance significantly.
<b>ngOnInit()</b>	Initialize the directive or component after Angular first displays the data-bound properties and sets the directive or component's input properties.
<b>ngDoCheck()</b>	Detect and act upon changes that Angular can't or won't detect on its own.
<b>ngAfterContentInit()</b>	Respond after Angular projects external content into the component's view, or into the view that a directive is in.
<b>ngAfterContentChecked()</b>	Respond after Angular checks the content projected into the directive or component.
<b>ngAfterViewInit()</b>	Respond after Angular initializes the component's views and child views, or the view that contains the directive.
<b>ngAfterViewChecked()</b>	Respond after Angular checks the component's views and child views, or the view that contains the directive.
<b>ngOnDestroy()</b>	Cleanup just before Angular destroys the directive or component. Unsubscribe Observables and detach event handlers to avoid memory leaks.

# Component Lifecycle Resource Usage

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

@Component()
export class ProductsListComponent implements OnInit, OnChanges, OnDestroy {

  ...
  ngOnInit() {
    console.log(`Spy #${this.products} onInit`);
  }

  ngOnChanges() {
    console.log(`Spy #${this.products} onInit`);
  }

  ngOnDestroy() {
    console.log(`Spy #${this.products} onDestroy`);
  }
  ...
}
```

- Implementing interfaces is not required (they don't exist in JavaScript yet), but it is good practice.



# Custom pipes

- A Pipe is just another component, therefore it is a decorated class. The decorator in this case is **@Pipe** .

 To create a pipe we will use the command:

```
ng g p [pipe_name]
ng g p pipes/FilterProducts
```

- We will use pipes through its **name** property (filterProducts ).
- As any other component it is added to the module.

```
import { Pipe, PipeTransform } from '@angular/core';

@Pipe({
  name: 'filterProducts'
})
export class FilterProductsPipe implements PipeTransform {

  transform(value: unknown, ...args: unknown[]): unknown {
    return null;
  }

}
```

# Using custom pipes

- We can add business logic to **transform** function:

```
@Pipe({
  name: 'filterProducts'
})
export class FilterProductsPipe implements PipeTransform {


  transform(value: Product[], text: string): Product[] {
    console.log('filtering:', value, text);
    if(text){
      return value.filter(aP=>aP.name.toLocaleLowerCase().indexOf(text.toLocaleLowerCase())>=0);
    }else return value;
  }
}
```

- In the UI, we just use it like any other pipe.

```
<input [(ngModel)]="filter_text" placeholder="input a text to filter"/>
...
<tr *ngFor="let product of productObjs | filterProducts:filter_text">...</tr>
```

# Custom directives: attribute

- Directives are classes that add additional behavior to elements .A directive is just another component a decorated class with **@Directive**.
  - <https://angular.io/guide/attribute-directives>

 To create a pipe we will use the command:

```
ng g d [directive_name]
ng g d directives/highlight
```

- We will invoke directives using its **selector** property (highlight).
- As any other component it is added to the module.

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

@Directive({
  selector: '[highlight]'
})
export class HighlightDirective {

  constructor() { }

}
```

# Custom directives : attribute

- To modify the element we will need the **ElementRef**. It grants direct access to the host DOM element through its nativeElement property:
- Then we must add ElementRef in the directive's **constructor()** to inject a reference to the host DOM element, the element to which apply Highlight.
- In the constructor we can add the necessary logic that implements the directive functionality.

```
import { Directive, ElementRef } from '@angular/core';

@Directive()
export class HighlightDirective {

  constructor(private el: ElementRef) {
    this.el.nativeElement.style.backgroundColor = 'yellow';
  }

}
```

- In the UI, we just use it in the desired tag.

```
<td highlight>{{product.name}}</td>
```

# Custom directives : structural

- Structural directives work in a different way as they are capable of completely changing the element on which they are applied.
  - Examples of structural directives are \*ngFor and \*ngIf.
  - <https://angular.io/guide/structural-directives>
- For doing this, it uses **TemplateRef** (reference to content enclosed within the container) and **ViewContainerRef** (Refers to the Container to which directive is applied).
- We can get input parameters using **@Input**.

```
import { Directive, Input, TemplateRef, ViewContainerRef } from '@angular/core';

@Directive({
  selector: '[replicate]',
})
export class ReplicateDirective {
  constructor(private templateRef: TemplateRef<any>, private viewContainer: ViewContainerRef) {}

  @Input() set replicate(nTimes: number) {
    for (var i = 0; i < nTimes; i++)
      this.viewContainer.createEmbeddedView(this.templateRef);
  }
}
```

# Custom directives : structural

- Structural directives are called using **\*[name]**, in this case `*replicate="[number]"`.
- When we apply the directive to a selector, it modifies the container, in this case, to replicate the element.

```
<h2 *replicate="4">Title to be repeated</h2>
```

Title to be repeated  
Title to be repeated  
Title to be repeated  
Title to be repeated

## Let's put it into practice: Tasks/Projects App

1. Add models for project and task.
2. Create a pipe that allows you to filter the list of tasks based on two parameters: a field and its value
3. Then, make it generic for applying to projects.
4. Create an attribute directive for converting any string to uppercase and enclose in a red border, with 2px span.
5. Create a structural directive that applies a delay of n seconds for showing the element
  - Tip: use timeout function.





# Next steps





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