Dynamic Component Loader

Component templates are not always fixed. An application may need to load new components at runtime.

This cookbook shows you how to use `ComponentFactoryResolver` to add components dynamically.

See the live example / download example of the code in this cookbook.

Dynamic component loading

The following example shows how to build a dynamic ad banner.

The hero agency is planning an ad campaign with several different ads cycling through the banner. New ad components are added frequently by several different teams. This makes it impractical to use a template with a static component structure.

Instead, you need a way to load a new component without a fixed reference to the component in the ad banner's template.

Angular comes with its own API for loading components dynamically.

The anchor directive

Before you can add components you have to define an anchor point to tell Angular where to insert components.

The ad banner uses a helper directive called `AdDirective` to mark valid insertion points in the template.

src/app/ad.directive.ts

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

@Directive({
  selector: '[ad-host]',
})
export class AdDirective {
  constructor(public viewContainerRef: ViewContainerRef) { }
}
```

`AdDirective` injects `ViewContainerRef` to gain access to the view container of the element that will host the dynamically added component.

In the `@Directive` decorator, notice the selector name, `ad-host`; that's what you use to apply the directive to the element. The next section shows you how.

Loading components

Most of the ad banner implementation is in `ad-banner.component.ts`. To keep things simple in this example, the HTML is in the `@Component` decorator's `template` property as a template string.

The `<ng-template>` element is where you apply the directive you just made. To apply the `AdDirective`, recall the selector from `ad.directive.ts`, `ad-host`. Apply that to `<ng-template>` without the square brackets. Now Angular knows where to dynamically load components.

src/app/ad-banner.component.ts (template)

```
template: `
            <div class="ad-banner-example">
              <h3>Advertisements</h3>
              <ng-template ad-host></ng-template>
            </div>
          `
```

The `<ng-template>` element is a good choice for dynamic components because it doesn't render any additional output.

Resolving components

Take a closer look at the methods in `ad-banner.component.ts`.

`AdBannerComponent` takes an array of `AdItem` objects as input, which ultimately comes from `AdService`. `AdItem` objects specify the type of component to load and any data to bind to the component.`AdService` returns the actual ads making up the ad campaign.

Passing an array of components to `AdBannerComponent` allows for a dynamic list of ads without static elements in the template.

With its `getAds()` method, `AdBannerComponent` cycles through the array of `AdItems` and loads a new component every 3 seconds by calling `loadComponent()`.

src/app/ad-banner.component.ts (excerpt)

```
export class AdBannerComponent implements OnInit, OnDestroy {
  @Input() ads: AdItem[];
  currentAdIndex = -1;
  @ViewChild(AdDirective, {static: true}) adHost: AdDirective;
  interval: any;

  constructor(private componentFactoryResolver: ComponentFactoryResolver) { }

  ngOnInit() {
    this.loadComponent();
    this.getAds();
  }

  ngOnDestroy() {
    clearInterval(this.interval);
  }

  loadComponent() {
    this.currentAdIndex = (this.currentAdIndex + 1) % this.ads.length;
    const adItem = this.ads[this.currentAdIndex];

    const componentFactory =
this.componentFactoryResolver.resolveComponentFactory(adItem.component);

    const viewContainerRef = this.adHost.viewContainerRef;
    viewContainerRef.clear();

    const componentRef = viewContainerRef.createComponent(componentFactory);
    (<AdComponent>componentRef.instance).data = adItem.data;
  }

  getAds() {
    this.interval = setInterval(() => {
      this.loadComponent();
    }, 3000);
  }
}
```

The `loadComponent()` method is doing a lot of the heavy lifting here. Take it step by step. First, it picks an ad.

> **How *loadComponent()* chooses an ad**
>
> The `loadComponent()` method chooses an ad using some math.
>
> First, it sets the `currentAdIndex` by taking whatever it currently is plus one, dividing that by the length of the `AdItem` array, and using the *remainder* as the new `currentAdIndex` value. Then, it uses that value to select an `adItem` from the array.

After `loadComponent()` selects an ad, it uses `ComponentFactoryResolver` to resolve a `ComponentFactory` for each specific component. The `ComponentFactory` then creates an instance of each component.

Next, you're targeting the `viewContainerRef` that exists on this specific instance of the component. How do you know it's this specific instance? Because it's referring to `adHost` and `adHost` is the directive you set up earlier to tell Angular where to insert dynamic components.

As you may recall, `AdDirective` injects `ViewContainerRef` into its constructor. This is how the directive accesses the element that you want to use to host the dynamic component.

To add the component to the template, you call `createComponent()` on `ViewContainerRef`.

The `createComponent()` method returns a reference to the loaded component. Use that reference to interact with the component by assigning to its properties or calling its methods.

Selector references

Generally, the Angular compiler generates a `ComponentFactory` for any component referenced in a template. However, there are no selector references in the templates for dynamically loaded components since they load at runtime.

To ensure that the compiler still generates a factory, add dynamically loaded components to the `NgModule`'s `entryComponents` array:

src/app/app.module.ts (entry components)

```
entryComponents: [ HeroJobAdComponent, HeroProfileComponent ],
```

The *AdComponent* interface

In the ad banner, all components implement a common `AdComponent` interface to standardize the API for passing data to the components.

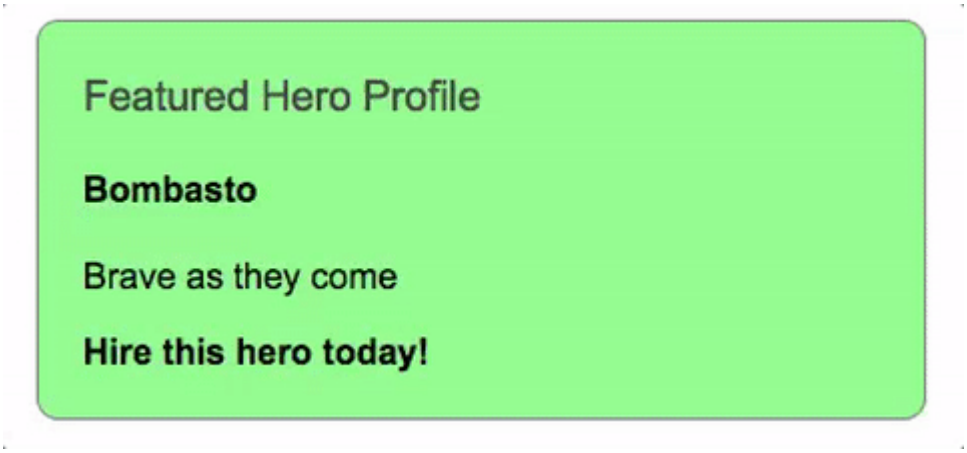
Here are two sample components and the `AdComponent` interface for reference:

hero-job-ad.component.ts *hero-profile.component.ts* *ad.component.ts*

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

import { AdComponent }      from './ad.component';

@Component({
  template: `
    <div class="job-ad">
      <h4>{{data.headline}}</h4>

      {{data.body}}
    </div>
  `
})
export class HeroJobAdComponent implements AdComponent {
  @Input() data: any;

}
```

Final ad banner

The final ad banner looks like this:



See the live example / download example.