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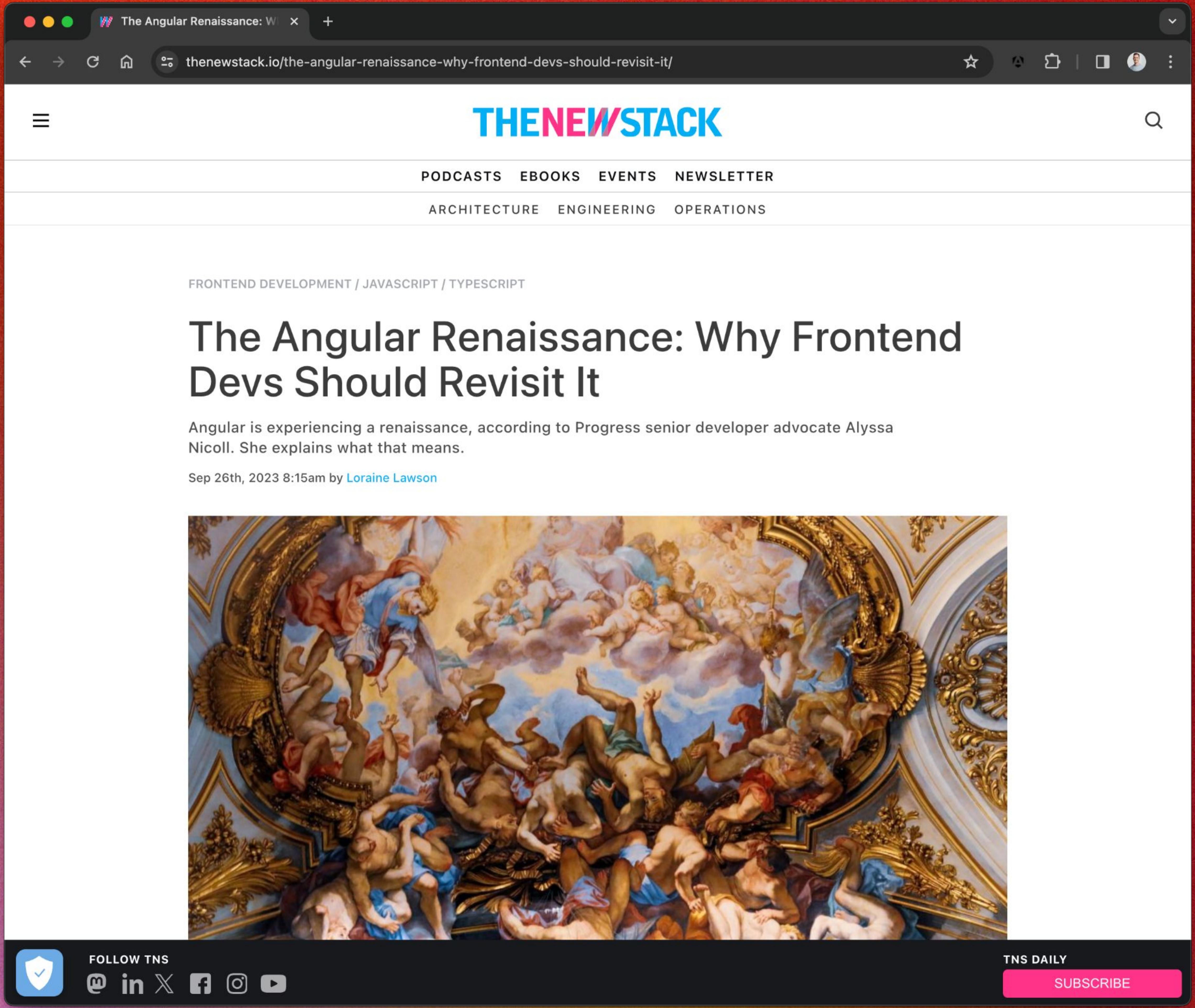
Next ’24

Generative AI web development with Angular

Proprietary

Emma Twersky

Developer Relations Engineer,
Google Cloud



The Angular Renaissance: W
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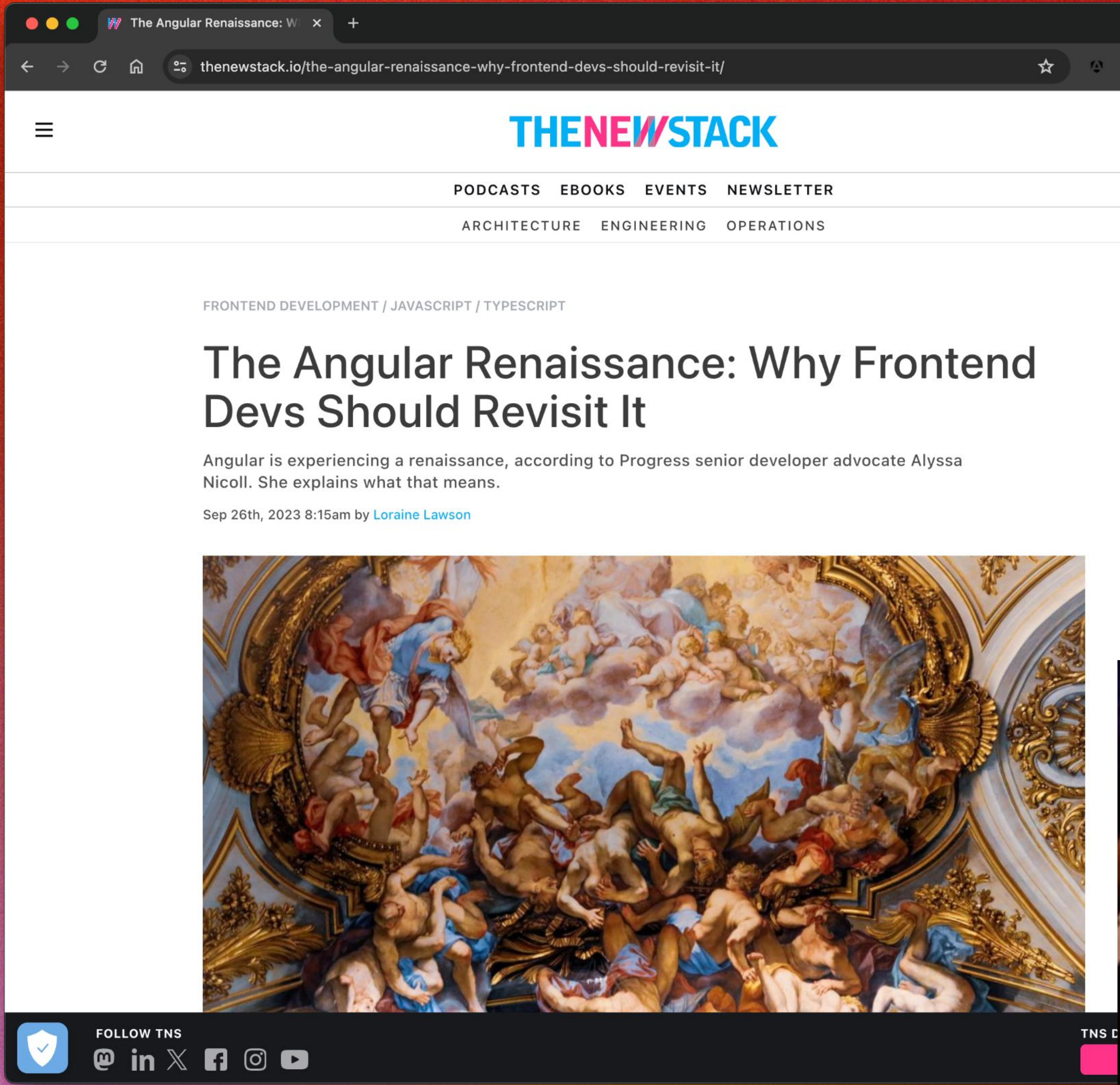
The Angular Renaissance: Why Frontend Devs Should Revisit It

Angular is experiencing a renaissance, according to Progress senior developer advocate Alyssa Nicoll. She explains what that means.

Sep 26th, 2023 8:15am by Loraine Lawson



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FRONTEND DEVELOPMENT / JAVASCRIPT / TYPESCRIPT

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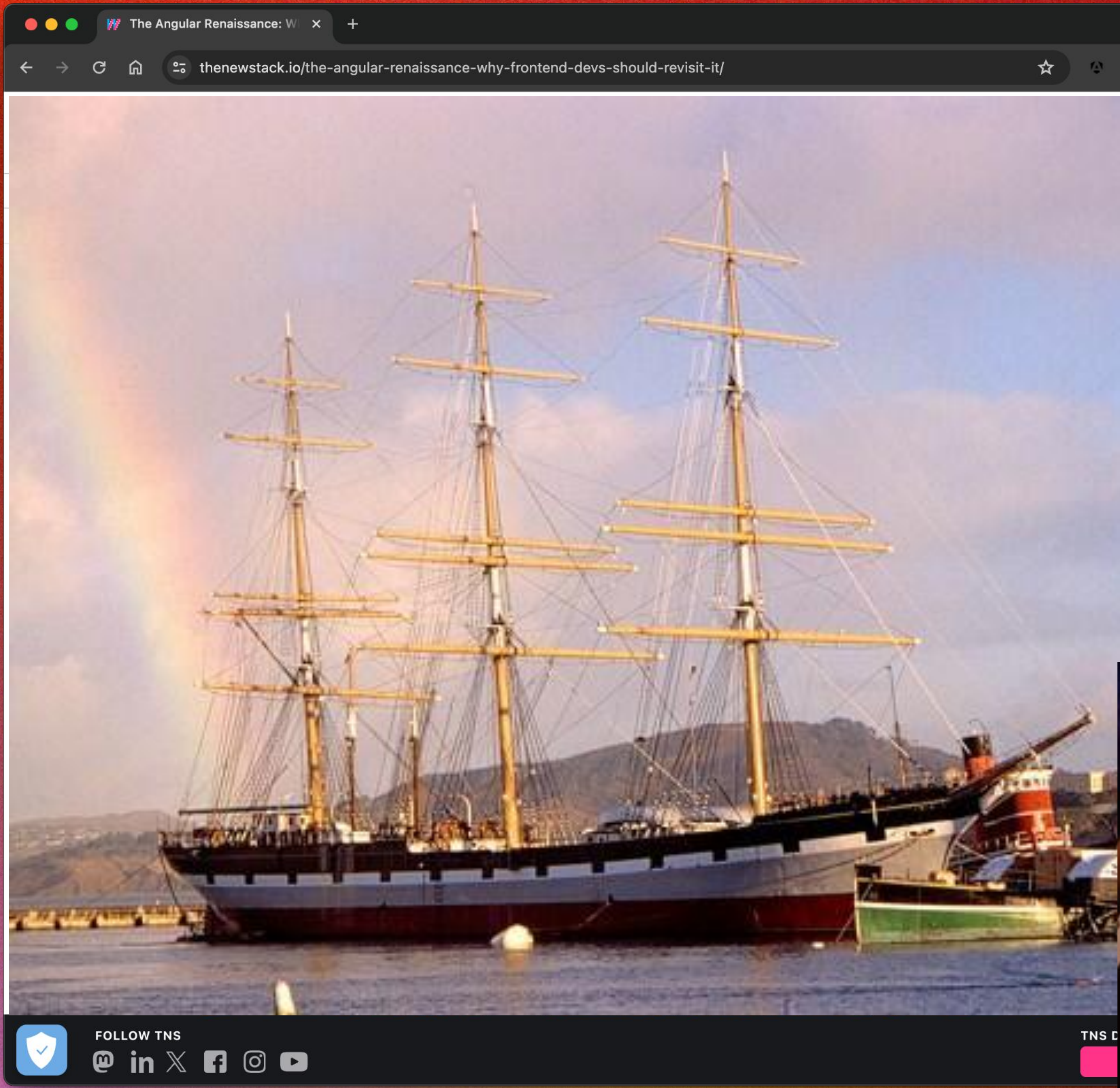

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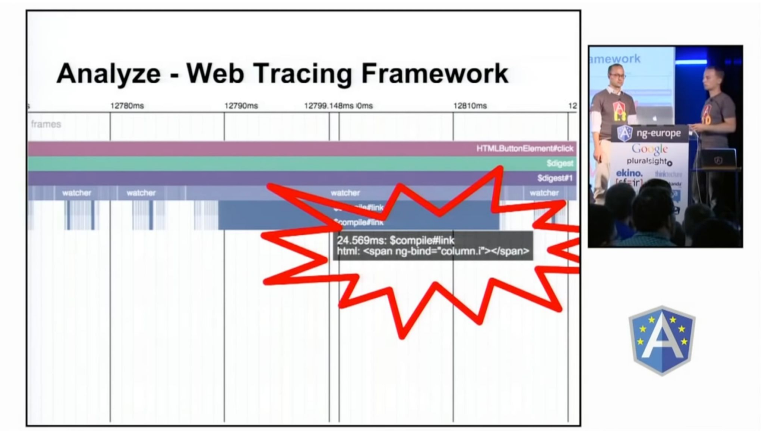
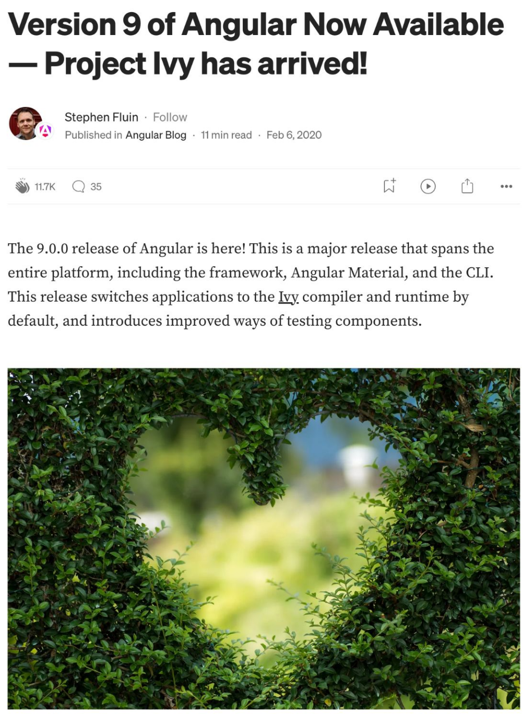
Quick time travel back to 2011

SIR, YOU'VE BEEN IN A COMA FOR 10 MINUTES.
OH BOY, I CAN'T WAIT TO TEST ALL THE NEW JS FRAMEWORKS.

Gaining momentum





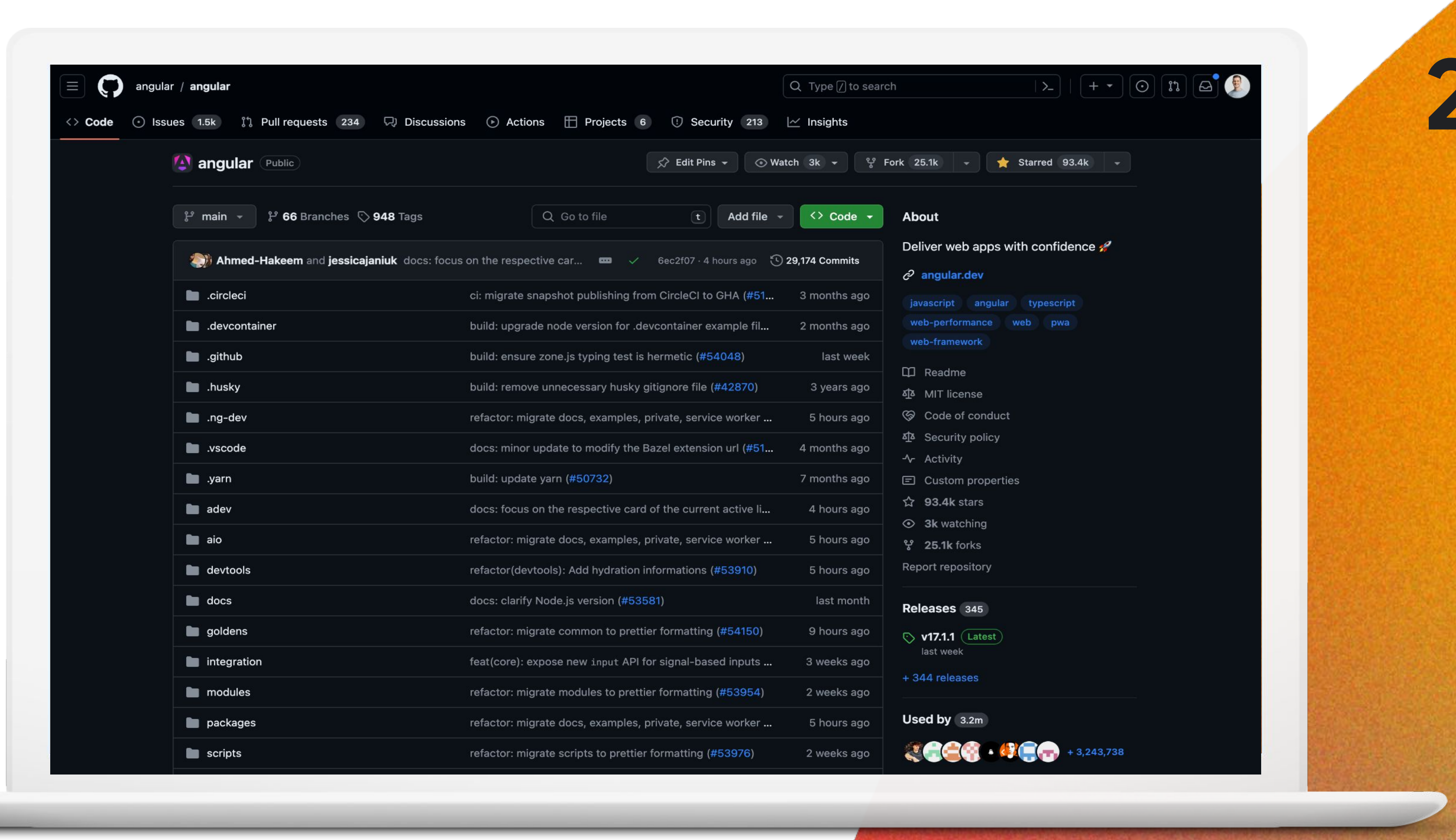
Version 9 of Angular Now Available — Project Ivy has arrived!

Stephen Fluin · Follow
Published in Angular Blog · 11 min read · Feb 6, 2020

11.7K 35

The 9.0.0 release of Angular is here! This is a major release that spans the entire platform, including the framework, Angular Material, and the CLI. This release switches applications to the Ivy compiler and runtime by default, and introduces improved ways of testing components.

2011 2014 2016 2020 2022 →



angular Public

66 Branches 948 Tags

Ahmed-Hakeem and jessicajaniuk docs: focus on the respective car... 6ec2f07 · 4 hours ago 29,174 Commits

.circleci	ci: migrate snapshot publishing from CircleCI to GHA (#51...	3 months ago
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scripts	refactor: migrate scripts to prettier formatting (#53976)	2 weeks ago

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v17.1.1 Latest
last week

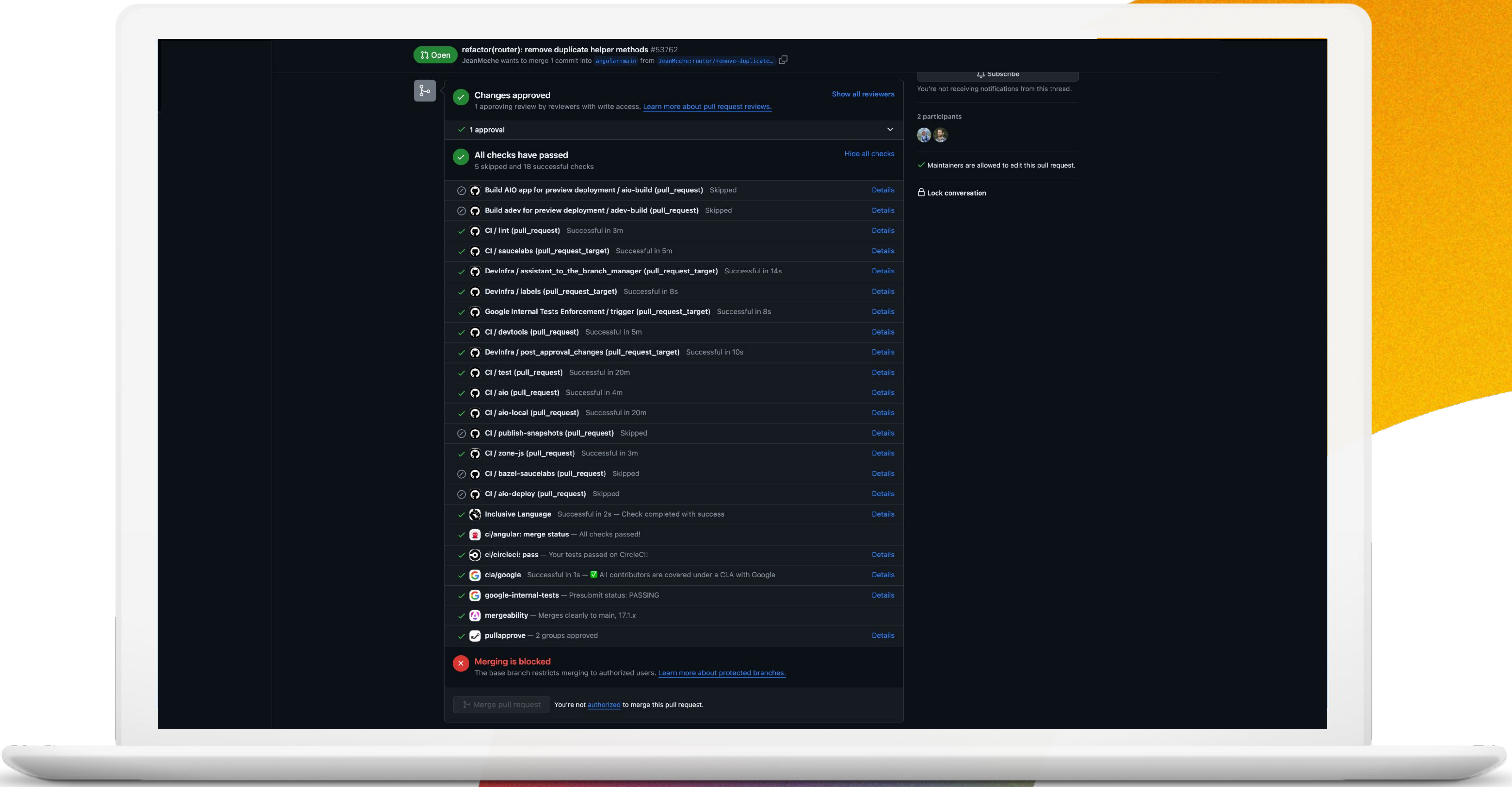
+ 344 releases

Used by 3.2m

+ 3,243,738

26,000 Pull Requests

2,400 Contributors
(CLI, framework)



Open refactor(router): remove duplicate helper methods #53762

JeanMeche wants to merge 1 commit into `angular:main` from `JeanMeche:router/remove-duplicate…`

Changes approved

1 approving review by reviewers with write access. Learn more about pull request reviews.

Show all reviewers

✓ 1 approval

All checks have passed

5 skipped and 18 successful checks

Hide all checks

- Build AIO app for preview deployment / aio-build (pull_request) Skipped — Details
- Build adev for preview deployment / adev-build (pull_request) Skipped — Details
- ✓ CI / lint (pull_request) Successful in 3m — Details
- ✓ CI / saucelabs (pull_request_target) Successful in 5m — Details
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- ✓ CI / aio-local (pull_request) Successful in 20m — Details
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- ✓ CI / zone-js (pull_request) Successful in 3m — Details
- CI / bazel-saucelabs (pull_request) Skipped — Details
- CI / aio-deploy (pull_request) Skipped — Details
- ✓ Inclusive Language Successful in 2s — Check completed with success — Details
- ✓ ci/angular: merge status — All checks passed!
- ✓ ci/circleci: pass — Your tests passed on CircleCI! — Details
- ✓ cla/google Successful in 1s — ✅ All contributors are covered under a CLA with Google — Details
- ✓ google-internal-tests — Presubmit status: PASSING — Details
- ✓ mergeability — Merges cleanly to main, 17.1.x
- ✓ pullapprove — 2 groups approved — Details

Merging is blocked

The base branch restricts merging to authorized users. Learn more about protected branches.

Merge pull request — You're not authorized to merge this pull request.

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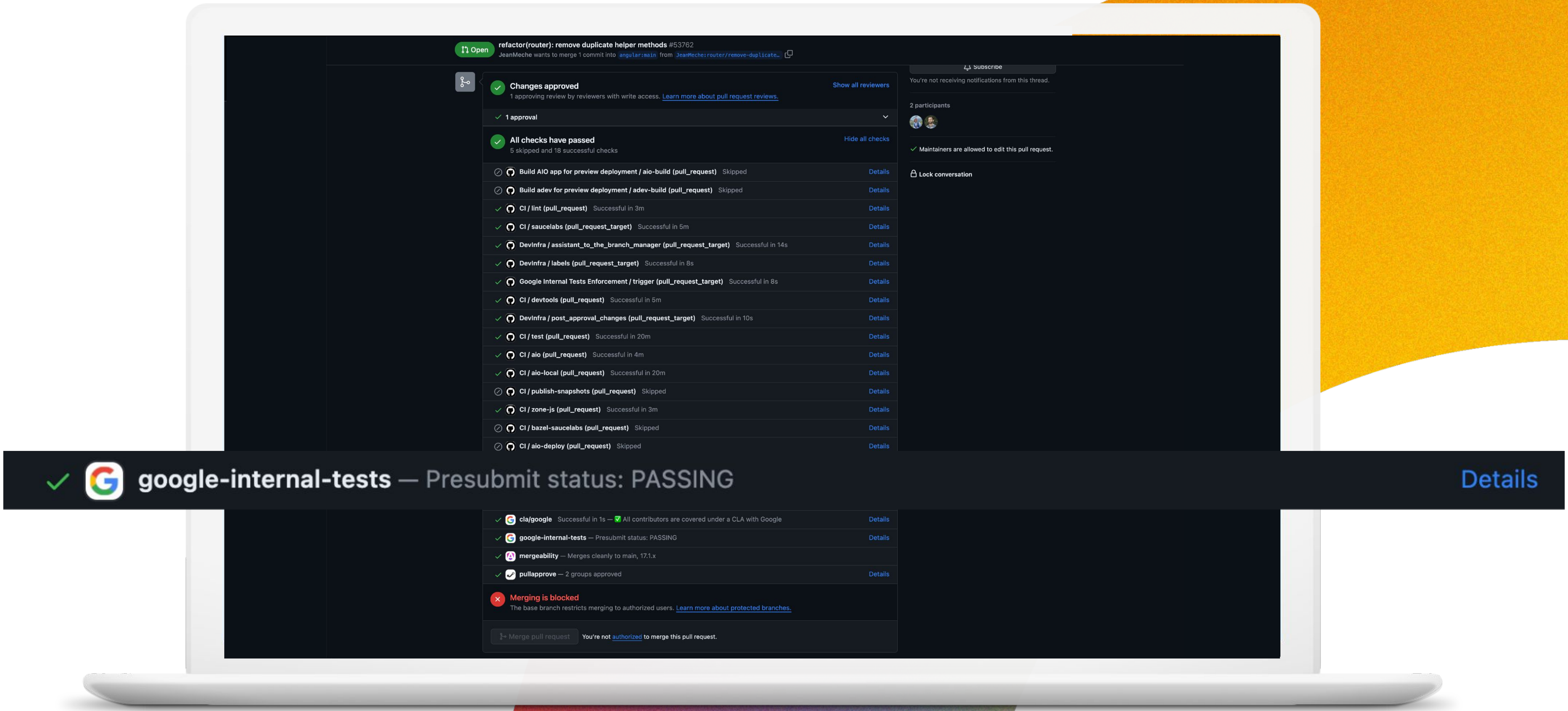
2 participants

✓ Maintainers are allowed to edit this pull request.

Lock conversation



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✓ 1 approval

✓ **All checks have passed** Hide all checks

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Angular + google3

Angular + google3

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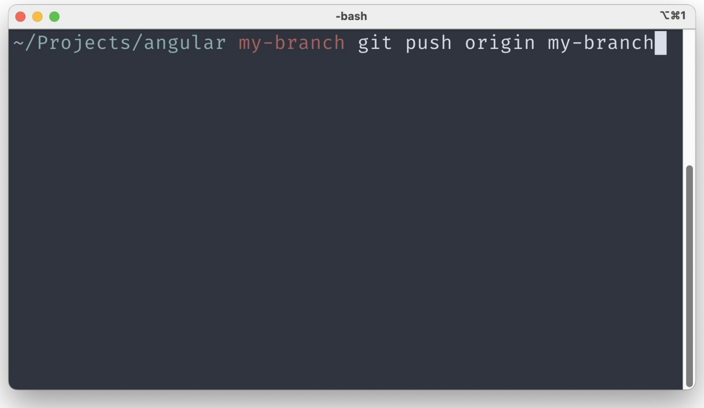

```
~/Projects/angular my-branch git push origin my-branch
```

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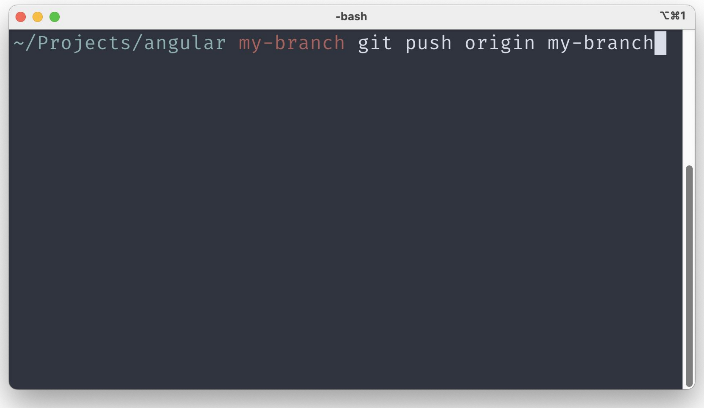
1



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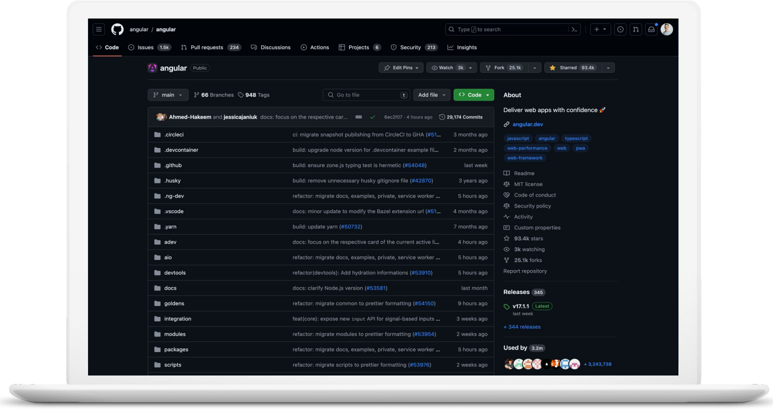
2



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+ 344 releases

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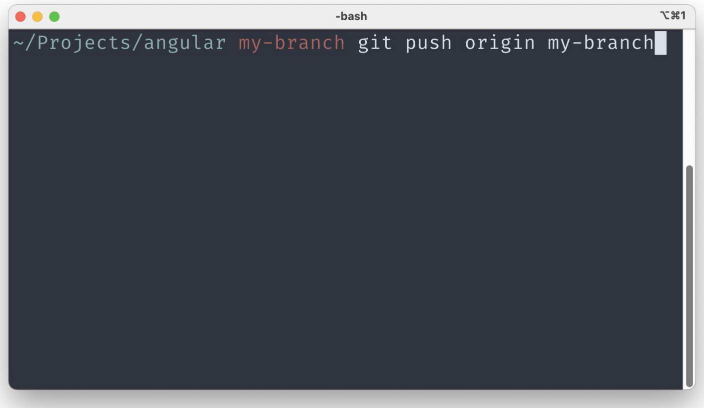

```
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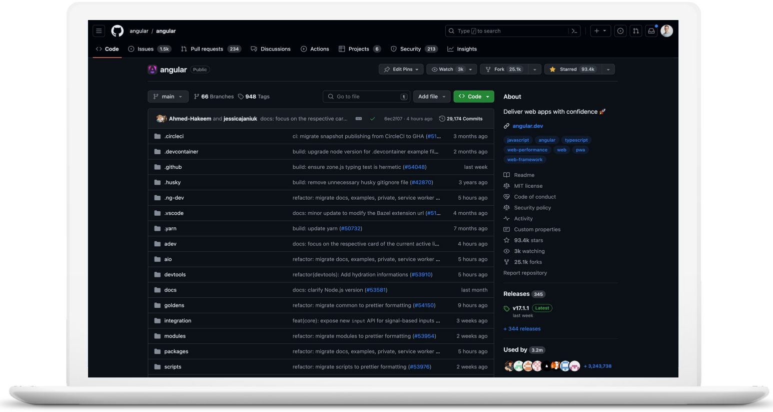
```

2



3

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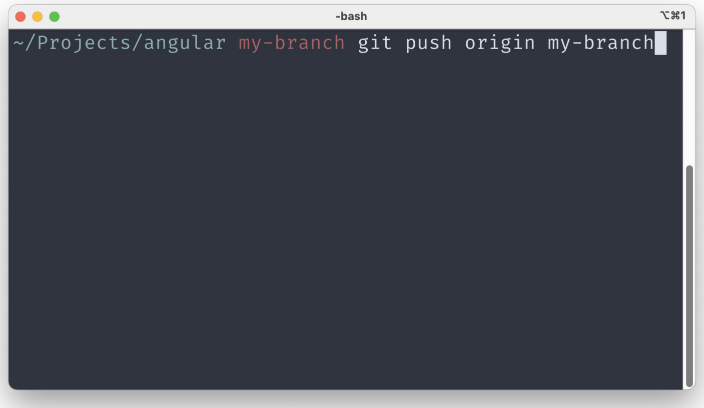
1



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```

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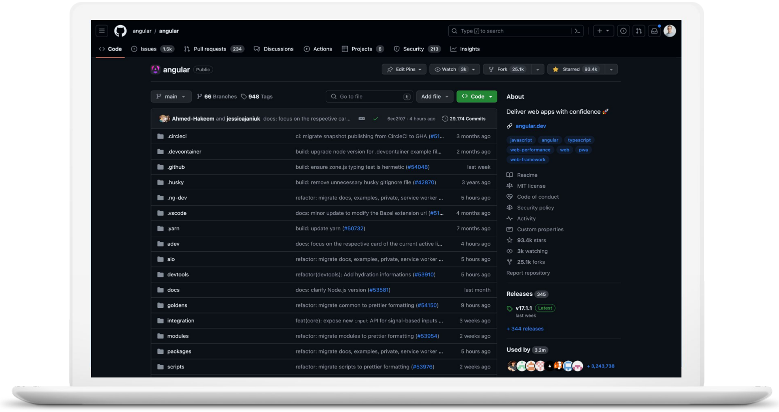

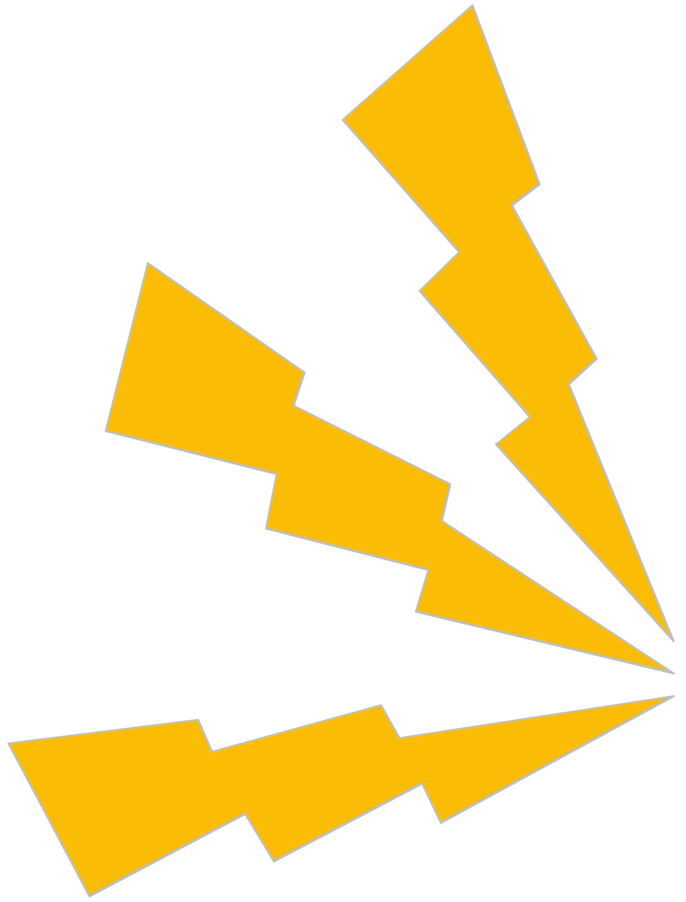

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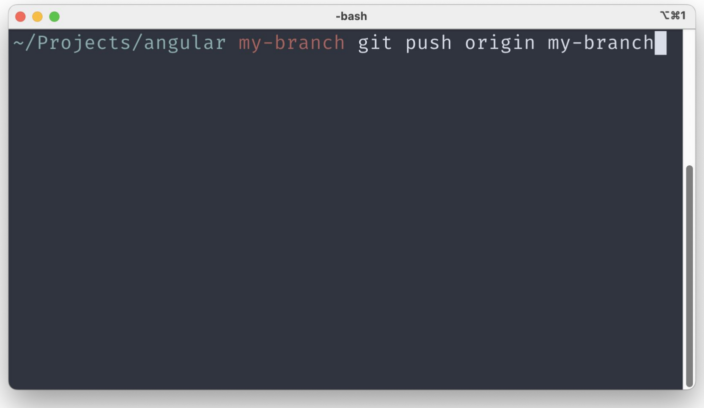

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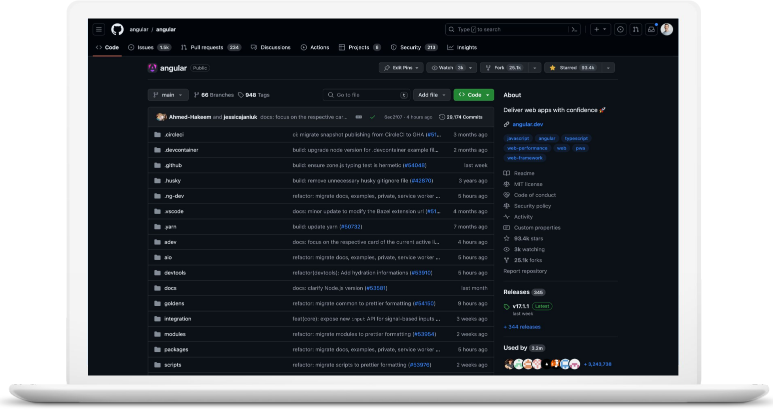

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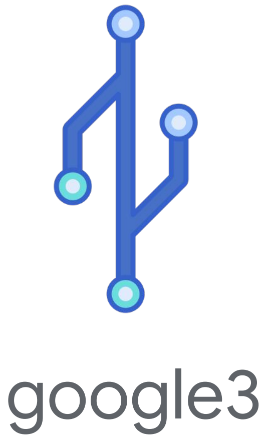
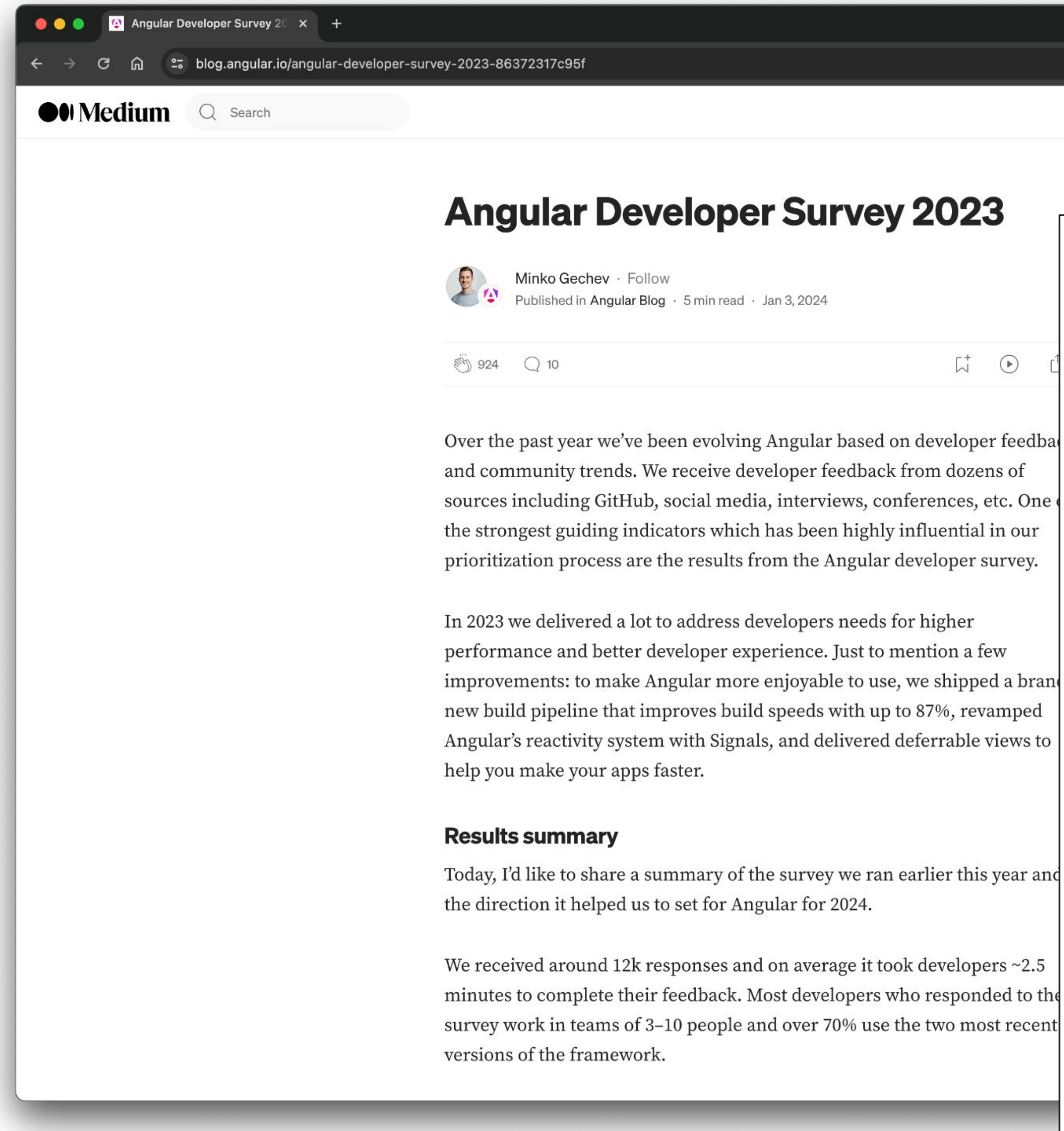


Angular Developer Survey 2023



Angular Developer Survey 20
blog.angular.io/angular-developer-survey-2023-86372317c95f
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Angular Developer Survey 2023

Minko Gechev · Follow
Published in Angular Blog · 5 min read · Jan 3, 2024

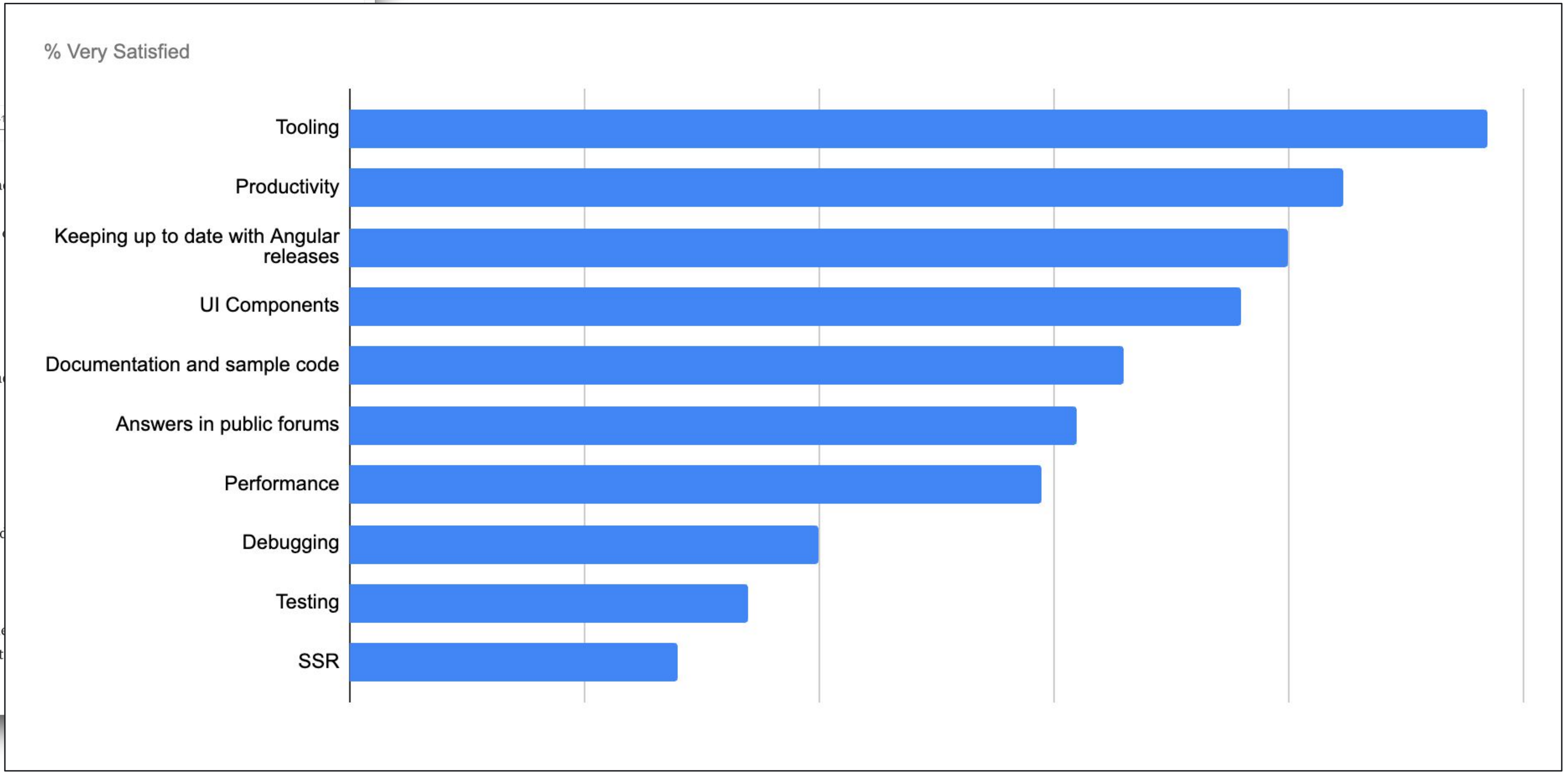
Over the past year we've been evolving Angular based on developer feedba and community trends. We receive developer feedback from dozens of sources including GitHub, social media, interviews, conferences, etc. One the strongest guiding indicators which has been highly influential in our prioritization process are the results from the Angular developer survey.

In 2023 we delivered a lot to address developers needs for higher performance and better developer experience. Just to mention a few improvements: to make Angular more enjoyable to use, we shipped a bran new build pipeline that improves build speeds with up to 87%, revamped Angular's reactivity system with Signals, and delivered deferrable views to help you make your apps faster.

Results summary

Today, I'd like to share a summary of the survey we ran earlier this year and the direction it helped us to set for Angular for 2024.

We received around 12k responses and on average it took developers ~2.5 minutes to complete their feedback. Most developers who responded to the survey work in teams of 3–10 people and over 70% use the two most recent versions of the framework.



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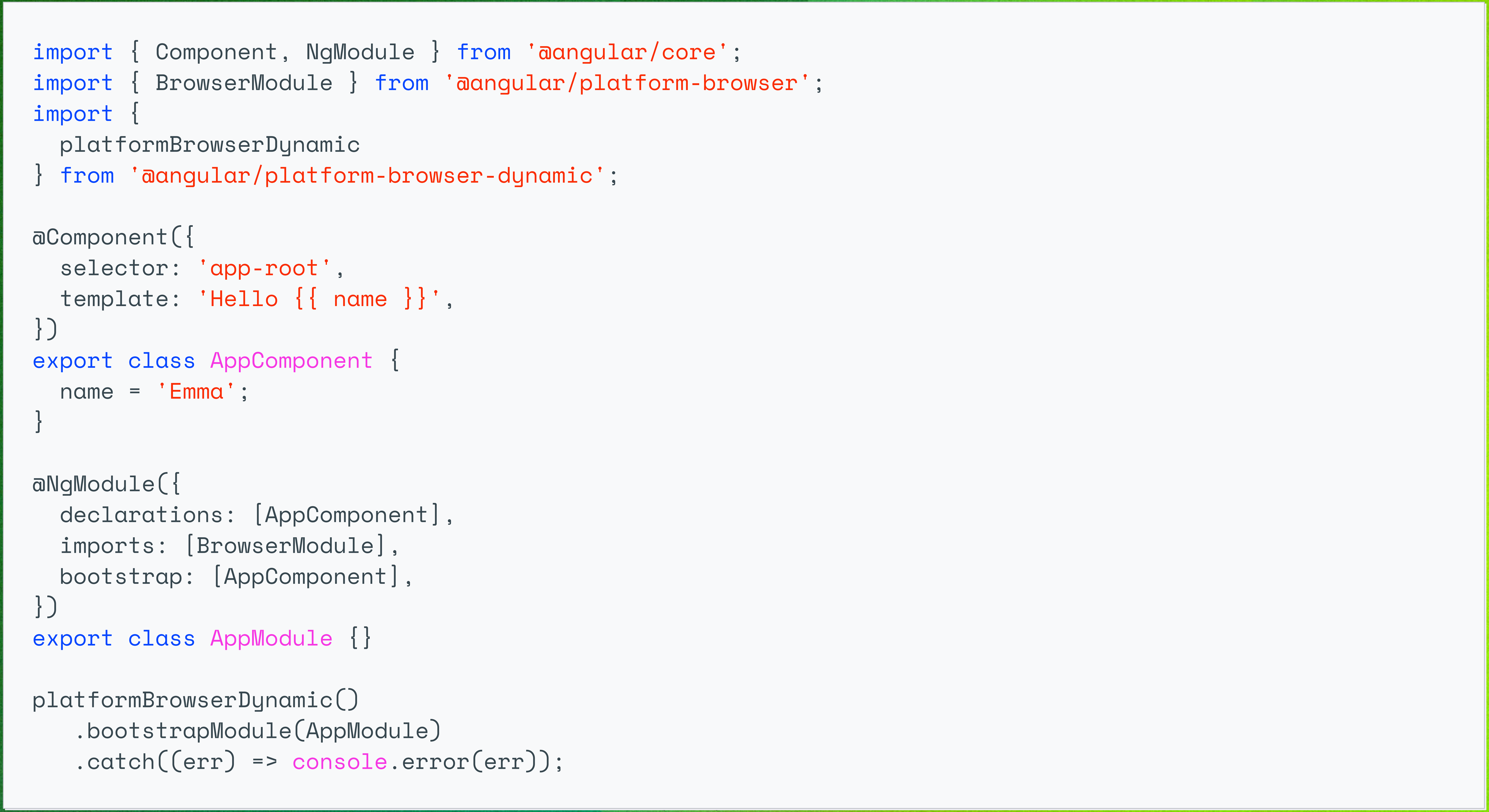
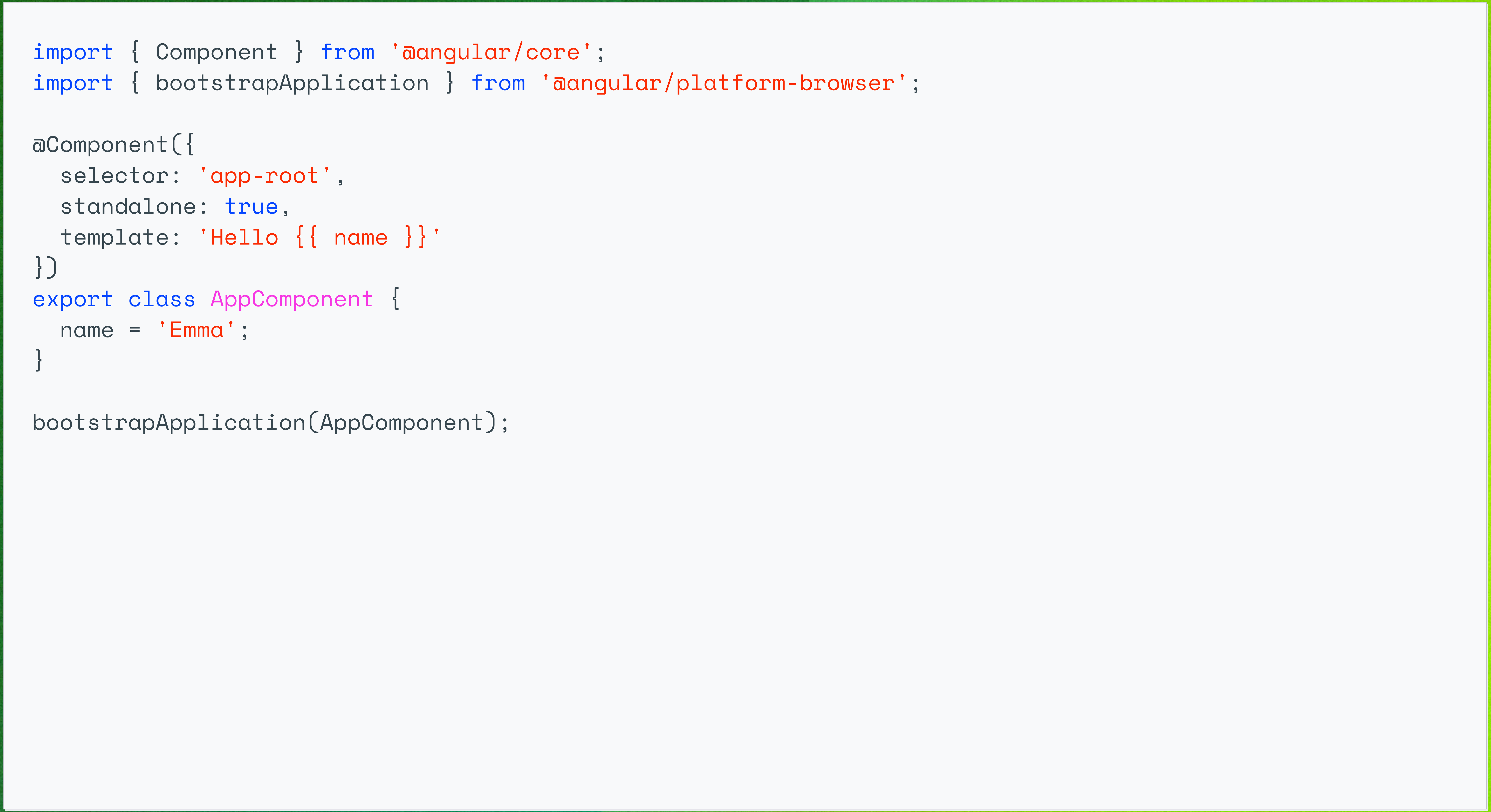
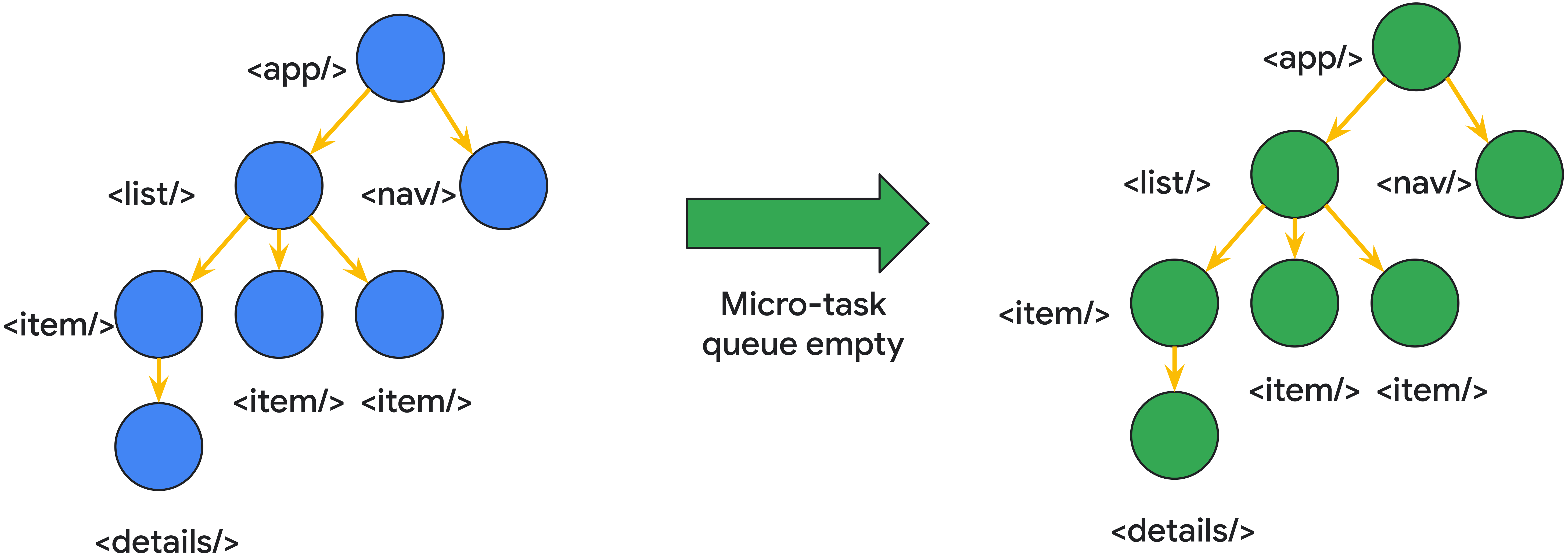


```typescript
import { Component, NgModule } from '@angular/core';
import { BrowserModule } from '@angular/platform-browser';
import {
  platformBrowserDynamic
} from '@angular/platform-browser-dynamic';

@Component({
  selector: 'app-root',
  template: 'Hello {{ name }}',
})
export class AppComponent {
  name = 'Emma';
}

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

platformBrowserDynamic()
   .bootstrapModule(AppModule)
   .catch((err) => console.error(err));
```

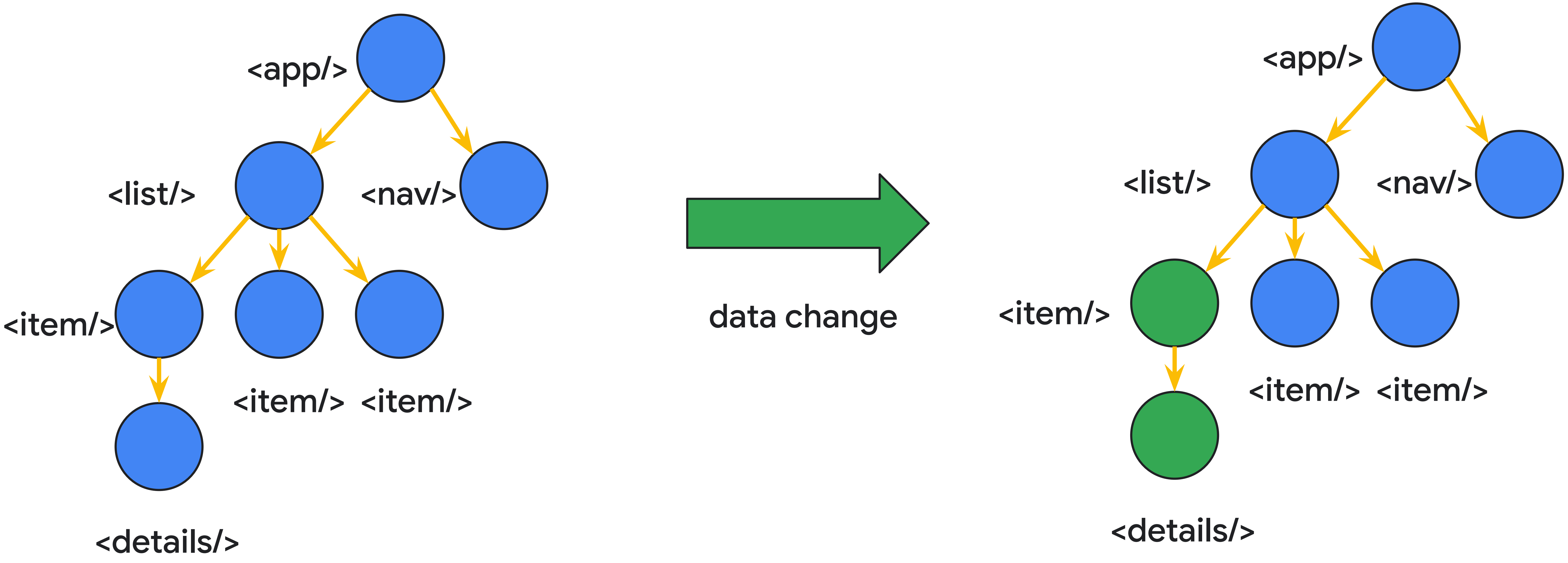


```
import { Component } from '@angular/core';
import { bootstrapApplication } from '@angular/platform-browser';

@Component({
  selector: 'app-root',
  standalone: true,
  template: 'Hello {{ name }}'
})
export class AppComponent {
  name = 'Emma';
}

bootstrapApplication(AppComponent);
```

change detection



Improving change detection



```
@Component({
  selector: 'app',
  template: `
    <h1>Hello, {{ title() }}</h1>
  `,
})
class App {
  title = signal('world');

  change() {
    this.title.set('Rhubarb');
  }
}
```

```
@Component({
  selector: 'app',
  template: `
    <h1>Hello, {{ title() }}</h1>
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  `,
})
class App {
  title = signal('world');

  change() {
    this.title.set('Rhubarb');
  }
}
```
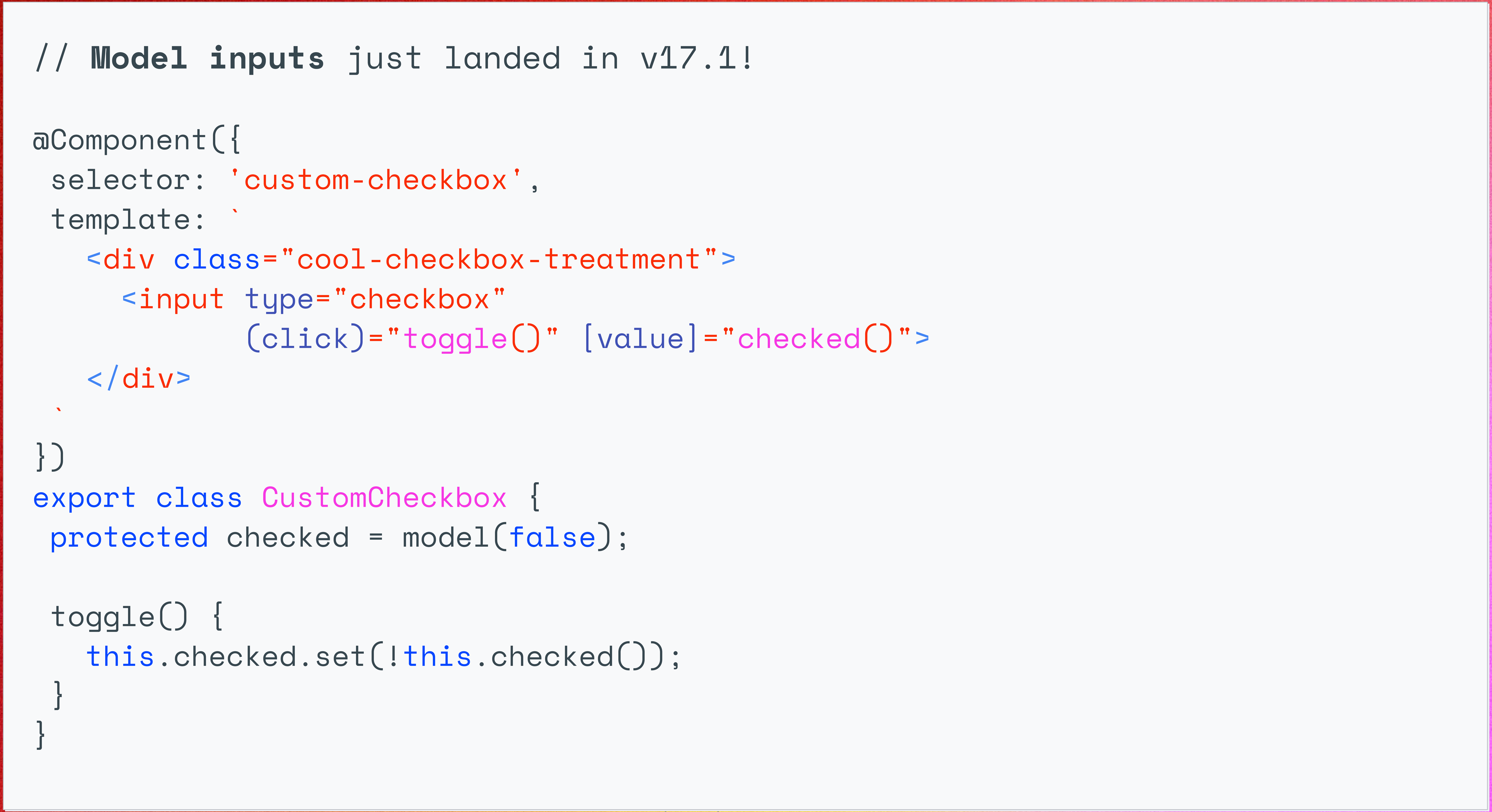
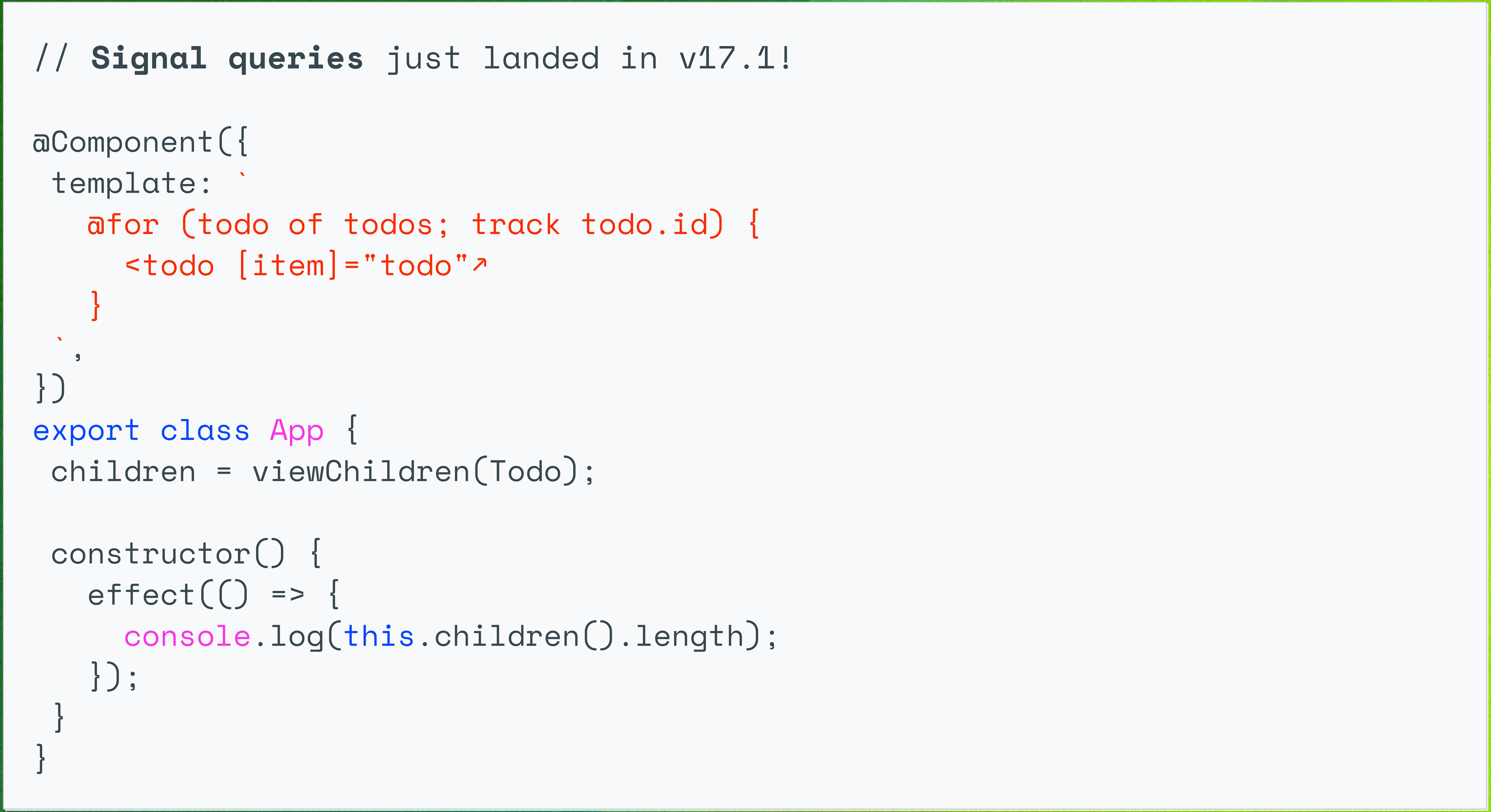
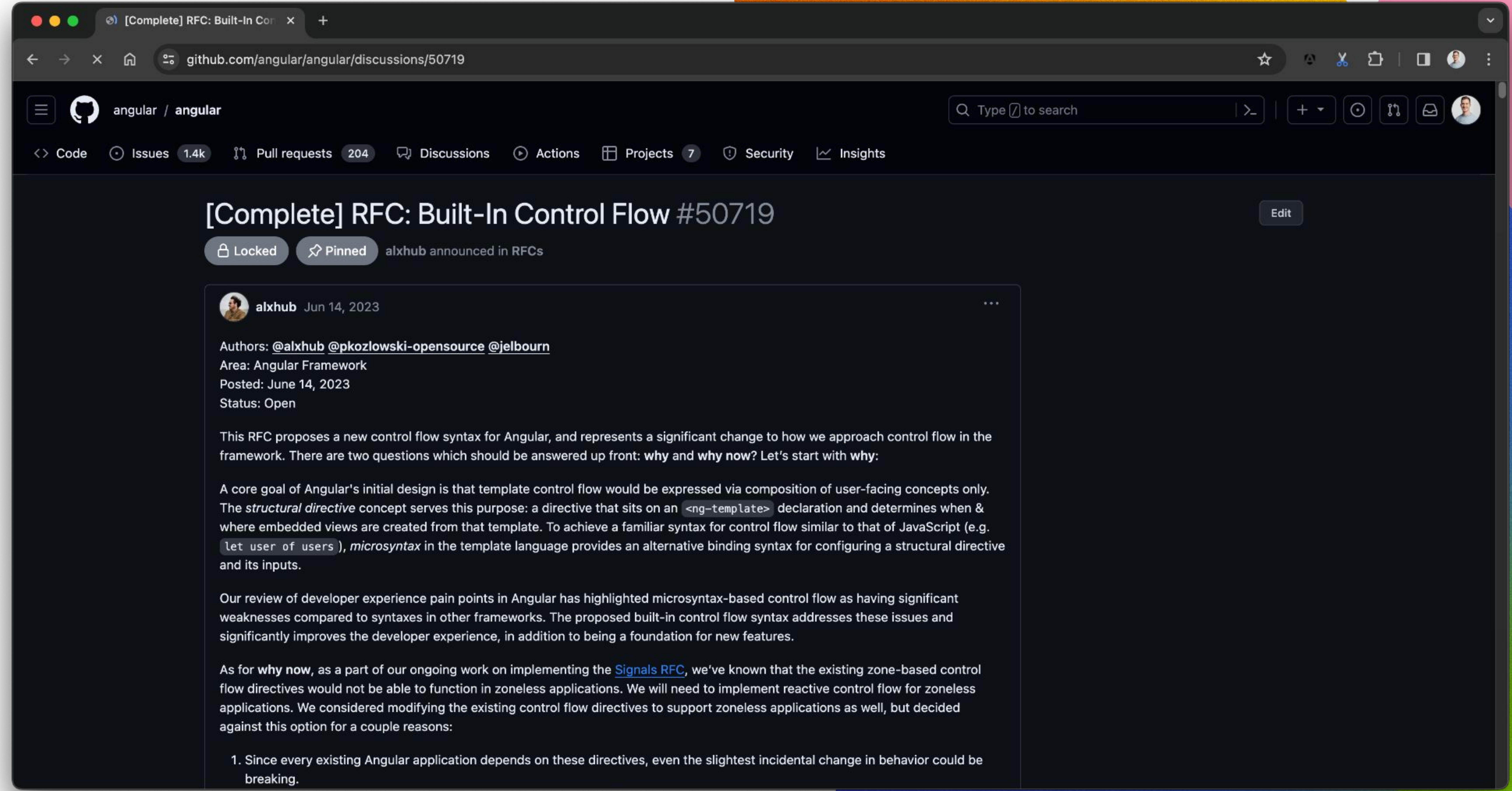

```
// Signal inputs just landed in v17.1!

@Component({...})
class App {
  title = input<string>();
  totalUsers = input.required<number>(0);
}
```



```
// Model inputs just landed in v17.1!

@Component({
 selector: 'custom-checkbox',
 template: `
   <div class="cool-checkbox-treatment">
     <input type="checkbox"
            (click)="toggle()" [value]="checked()">
   </div>
 `
})
export class CustomCheckbox {
 protected checked = model(false);

 toggle() {
   this.checked.set(!this.checked());
 }
}
```



```
// Signal queries just landed in v17.1!

@Component({
 template: `
   @for (todo of todos; track todo.id) {
     <todo [item]="todo"↗
   }
 `,
})
export class App {
 children = viewChildren(Todo);

 constructor() {
   effect(() => {
     console.log(this.children().length);
   });
 }
}
```



[Complete] RFC: Built-In Control Flow #50719

Locked Pinned alxhub announced in RFCs

alxhub Jun 14, 2023

Authors: @alxhub @pkozlowski-opensource @jelbourn
Area: Angular Framework
Posted: June 14, 2023
Status: Open

This RFC proposes a new control flow syntax for Angular, and represents a significant change to how we approach control flow in the framework. There are two questions which should be answered up front: **why** and **why now**? Let's start with **why**:

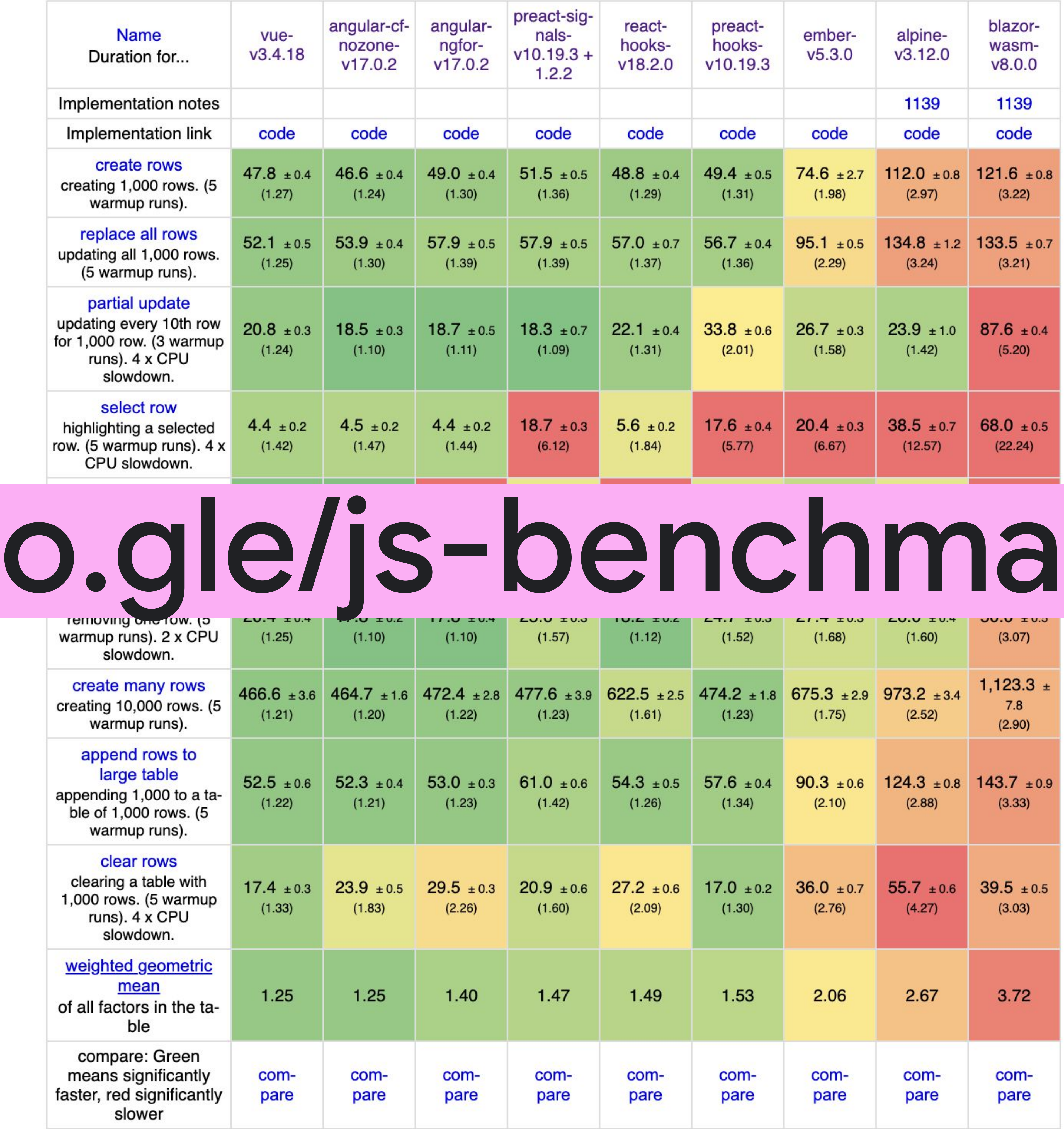
A core goal of Angular's initial design is that template control flow would be expressed via composition of user-facing concepts only. The *structural directive* concept serves this purpose: a directive that sits on an `<ng-template>` declaration and determines when & where embedded views are created from that template. To achieve a familiar syntax for control flow similar to that of JavaScript (e.g. `let user of users`), *microsyntax* in the template language provides an alternative binding syntax for configuring a structural directive and its inputs.

Our review of developer experience pain points in Angular has highlighted microsyntax-based control flow as having significant weaknesses compared to syntaxes in other frameworks. The proposed built-in control flow syntax addresses these issues and significantly improves the developer experience, in addition to being a foundation for new features.

As for **why now**, as a part of our ongoing work on implementing the Signals RFC, we've known that the existing zone-based control flow directives would not be able to function in zoneless applications. We will need to implement reactive control flow for zoneless applications. We considered modifying the existing control flow directives to support zoneless applications as well, but decided against this option for a couple reasons:

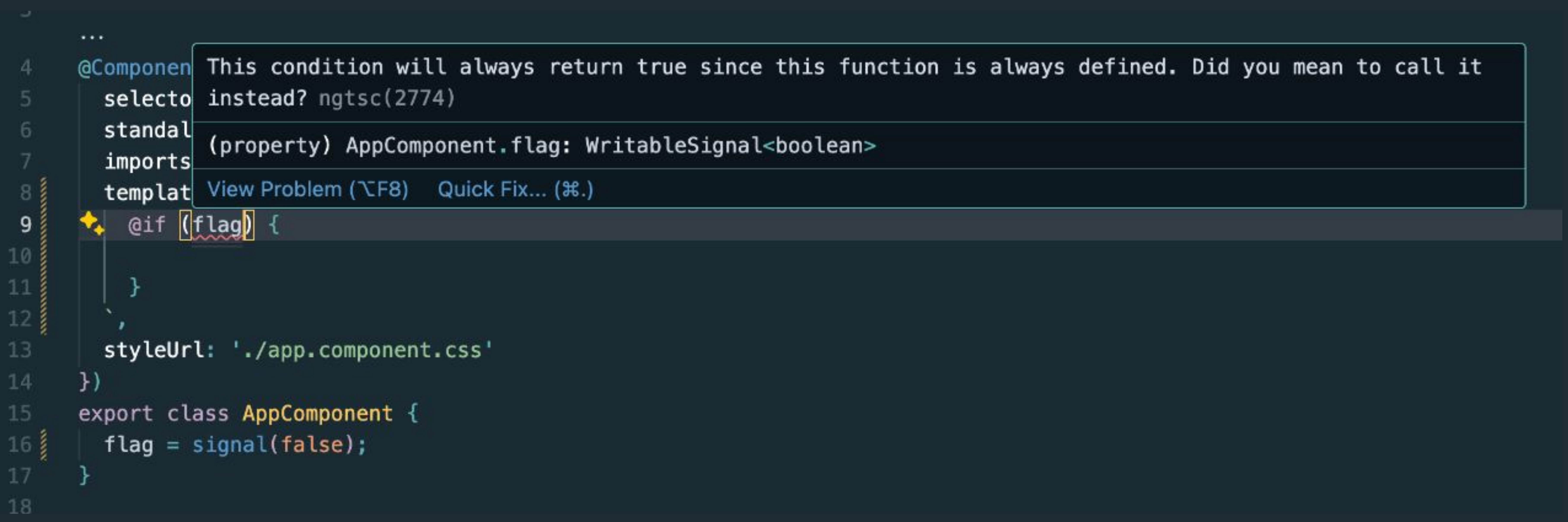
1. Since every existing Angular application depends on these directives, even the slightest incidental change in behavior could be breaking.

```
// Control flow in v17

@if (user.isHuman) {
  <human-profile [data]="user" />
} @else if (user.isRobot) {
  <!-- robot users are rare, so load their profiles lazily -->
  @defer {
    <robot-profile [data]="user" />
  }
} @else {
  <p>The profile is unknown!
}
```



Name Duration for...	vue-v3.4.18	angular-cf-nozone-v17.0.2	angular-ngfor-v17.0.2	preact-signals-v10.19.3 + 1.2.2	react-hooks-v18.2.0	preact-hooks-v10.19.3	ember-v5.3.0	alpine-v3.12.0	blazor-wasm-v8.0.0
Implementation notes								1139	1139
Implementation link	code	code	code	code	code	code	code	code	code
create rows creating 1,000 rows. (5 warmup runs).	47.8 ± 0.4 (1.27)	46.6 ± 0.4 (1.24)	49.0 ± 0.4 (1.30)	51.5 ± 0.5 (1.36)	48.8 ± 0.4 (1.29)	49.4 ± 0.5 (1.31)	74.6 ± 2.7 (1.98)	112.0 ± 0.8 (2.97)	121.6 ± 0.8 (3.22)
replace all rows updating all 1,000 rows. (5 warmup runs).	52.1 ± 0.5 (1.25)	53.9 ± 0.4 (1.30)	57.9 ± 0.5 (1.39)	57.9 ± 0.5 (1.39)	57.0 ± 0.7 (1.37)	56.7 ± 0.4 (1.36)	95.1 ± 0.5 (2.29)	134.8 ± 1.2 (3.24)	133.5 ± 0.7 (3.21)
partial update updating every 10th row for 1,000 row. (3 warmup runs). 4 x CPU slowdown.	20.8 ± 0.3 (1.24)	18.5 ± 0.3 (1.10)	18.7 ± 0.5 (1.11)	18.3 ± 0.7 (1.09)	22.1 ± 0.4 (1.31)	33.8 ± 0.6 (2.01)	26.7 ± 0.3 (1.58)	23.9 ± 1.0 (1.42)	87.6 ± 0.4 (5.20)
select row highlighting a selected row. (5 warmup runs). 4 x CPU slowdown.	4.4 ± 0.2 (1.42)	4.5 ± 0.2 (1.47)	4.4 ± 0.2 (1.44)	18.7 ± 0.3 (6.12)	5.6 ± 0.2 (1.84)	17.6 ± 0.4 (5.77)	20.4 ± 0.3 (6.67)	38.5 ± 0.7 (12.57)	68.0 ± 0.5 (22.24)
removing one row. (5 warmup runs). 2 x CPU slowdown.	20.4 ± 0.4 (1.25)	17.8 ± 0.2 (1.10)	17.8 ± 0.4 (1.10)	25.6 ± 0.3 (1.57)	18.2 ± 0.2 (1.12)	24.7 ± 0.3 (1.52)	27.4 ± 0.3 (1.68)	26.0 ± 0.4 (1.60)	50.0 ± 0.5 (3.07)
create many rows creating 10,000 rows. (5 warmup runs).	466.6 ± 3.6 (1.21)	464.7 ± 1.6 (1.20)	472.4 ± 2.8 (1.22)	477.6 ± 3.9 (1.23)	622.5 ± 2.5 (1.61)	474.2 ± 1.8 (1.23)	675.3 ± 2.9 (1.75)	973.2 ± 3.4 (2.52)	1,123.3 ± 7.8 (2.90)
append rows to large table appending 1,000 to a table of 1,000 rows. (5 warmup runs).	52.5 ± 0.6 (1.22)	52.3 ± 0.4 (1.21)	53.0 ± 0.3 (1.23)	61.0 ± 0.6 (1.42)	54.3 ± 0.5 (1.26)	57.6 ± 0.4 (1.34)	90.3 ± 0.6 (2.10)	124.3 ± 0.8 (2.88)	143.7 ± 0.9 (3.33)
clear rows clearing a table with 1,000 rows. (5 warmup runs). 4 x CPU slowdown.	17.4 ± 0.3 (1.33)	23.9 ± 0.5 (1.83)	29.5 ± 0.3 (2.26)	20.9 ± 0.6 (1.60)	27.2 ± 0.6 (2.09)	17.0 ± 0.2 (1.30)	36.0 ± 0.7 (2.76)	55.7 ± 0.6 (4.27)	39.5 ± 0.5 (3.03)
weighted geometric mean of all factors in the table	1.25	1.25	1.40	1.47	1.49	1.53	2.06	2.67	3.72
compare: Green means significantly faster, red significantly slower	compare	compare	compare	compare	compare	compare	compare	compare	compare

goo.gle/js-benchmarks

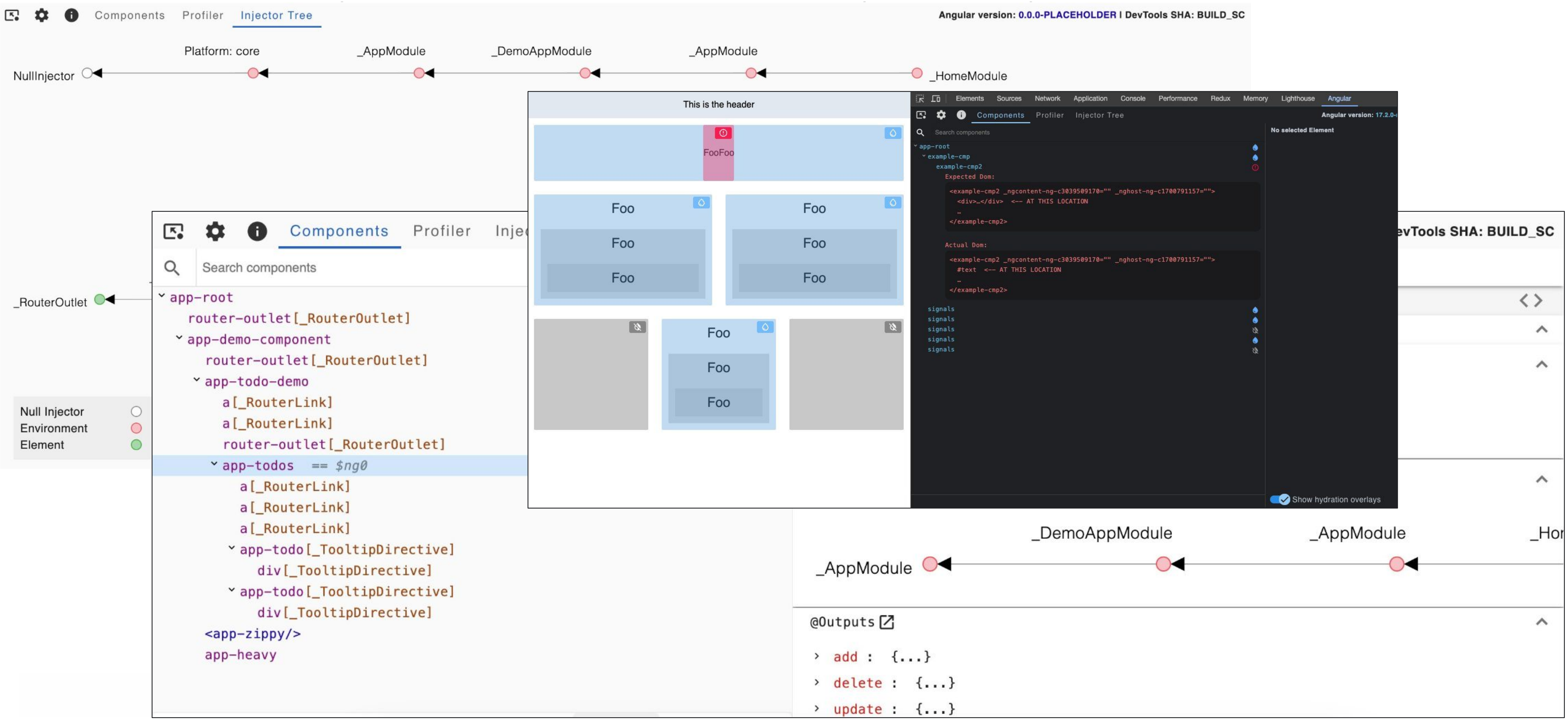


```
...
@Componen
  selecto
  standal
  imports
  templat
    @if (flag) {

    }
  `,
  styleUrl: './app.component.css'
})
export class AppComponent {
  flag = signal(false);
}
```

This condition will always return true since this function is always defined. Did you mean to call it instead? ngtsc(2774)

(property) AppComponent.flag: WritableSignal<boolean>

Dependency injection &



```
app-root
  example-cmp
    example-cmp2
      Expected Dom:
      <example-cmp2 _ngcontent-ng-c3039509170="" _nghost-ng-c1700791157="">
        <div>…</div>  <-- AT THIS LOCATION
        …
      </example-cmp2>

      Actual Dom:
      <example-cmp2 _ngcontent-ng-c3039509170="" _nghost-ng-c1700791157="">
        #text  <-- AT THIS LOCATION
        …
      </example-cmp2>
  signals
  signals
  signals
  signals
  signals
```

```
app-root
  router-outlet[_RouterOutlet]
  app-demo-component
    router-outlet[_RouterOutlet]
    app-todo-demo
      a[_RouterLink]
      a[_RouterLink]
      router-outlet[_RouterOutlet]
      app-todos  == $ng0
        a[_RouterLink]
        a[_RouterLink]
        a[_RouterLink]
        app-todo[_TooltipDirective]
          div[_TooltipDirective]
        app-todo[_TooltipDirective]
          div[_TooltipDirective]
    <app-zippy/>
    app-heavy
```

```
@Outputs
> add : {...}
> delete : {...}
> update : {...}
```

Deliver web apps with confidence 🚀

Developer Experience

Performance

Stability & Reliability

Angular Image Directive

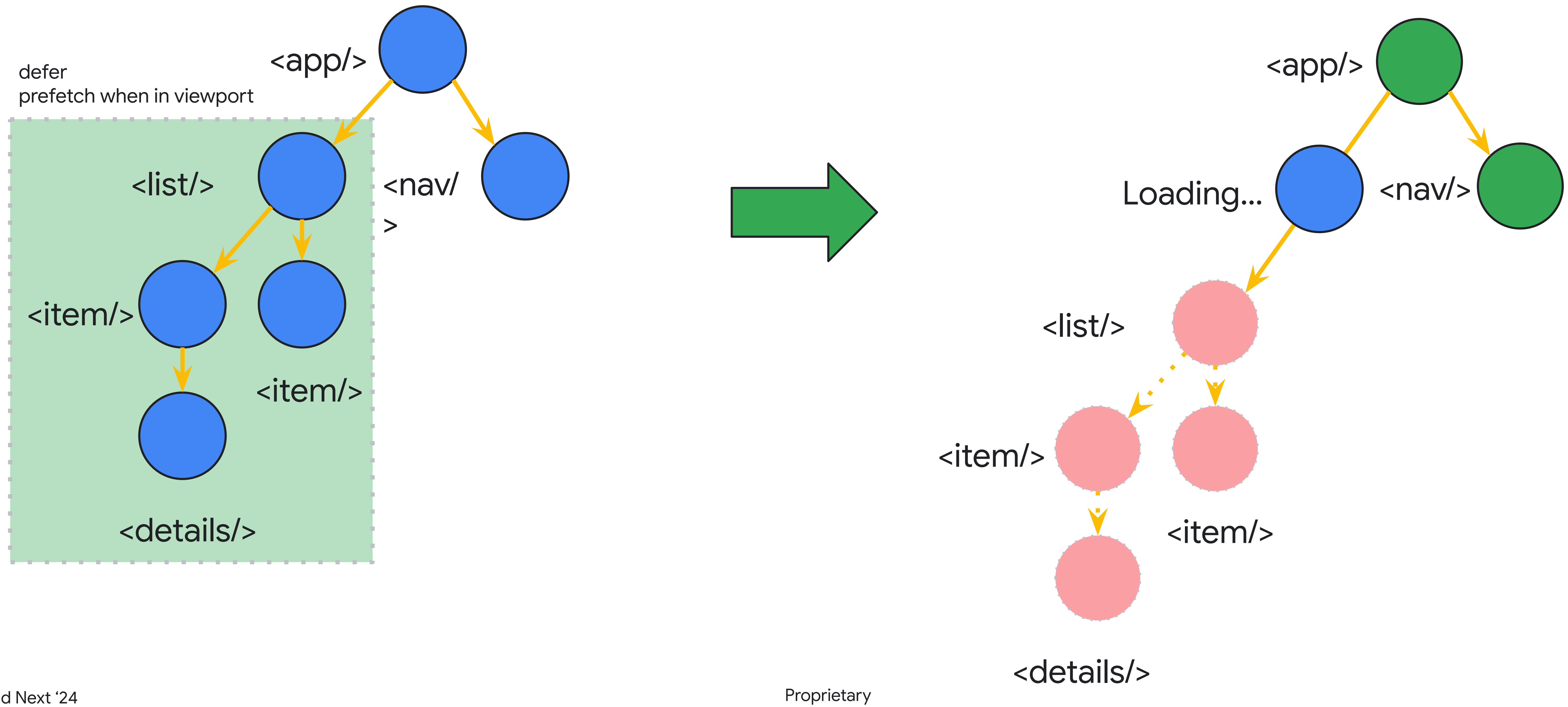
75%

Improvement in LCP

- Automatically setting **fetchpriority**
- Lazy loading other images by default
- Ensuring a **preconnect** link tag in <head>
- Generating a **preload** hint if using SSR

```
<img ngSrc="logo.png"
     width="200"
     height="150"
     priority>
```

Declarative lazy loading and prefetching



“

Reduced bundle size

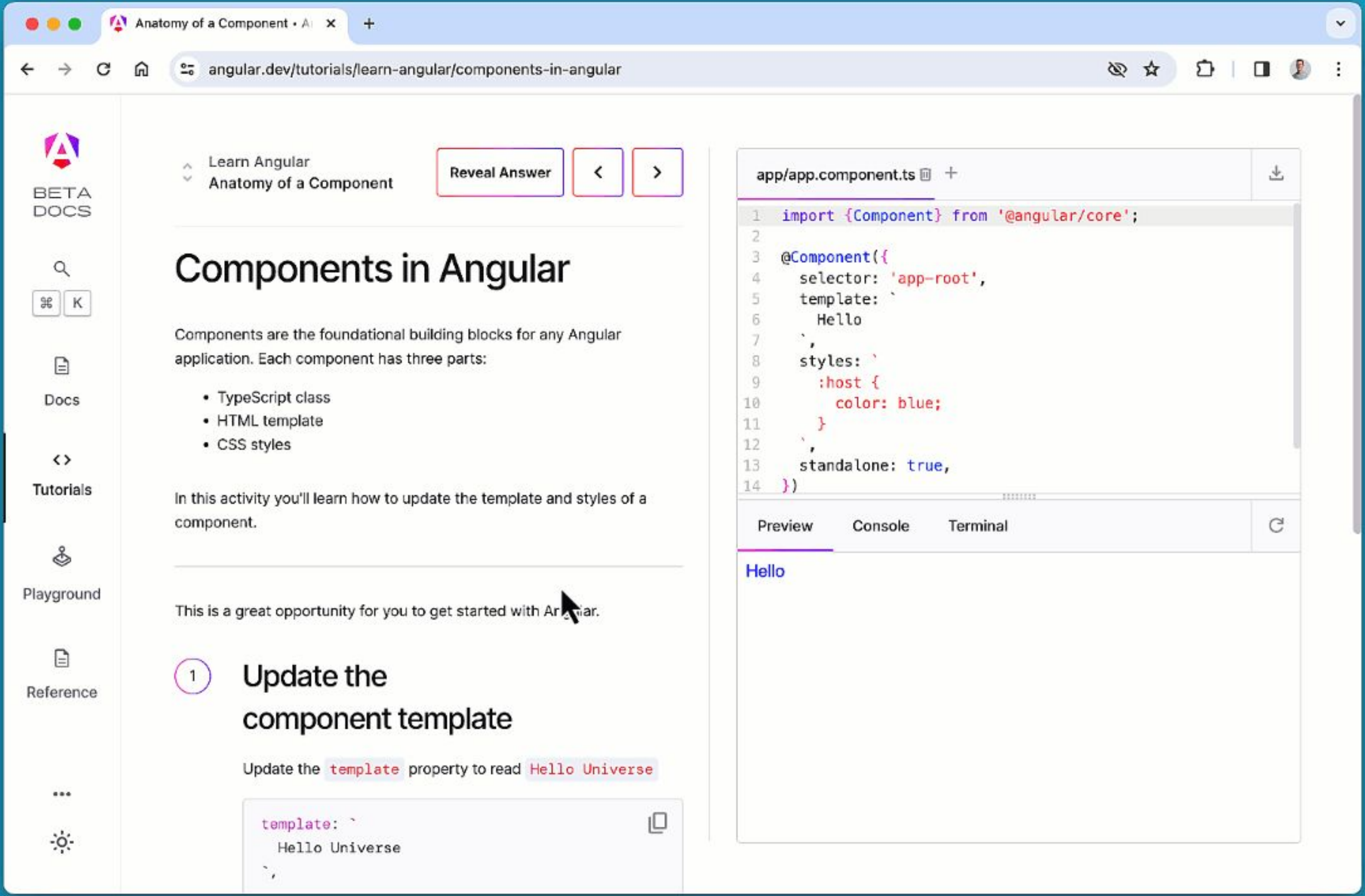
by 50%

using deferrable views

bill

A

V16
⌘K
Docs
Tutorials
Reference
Angular



Components in Angular

Components are the foundational building blocks for any Angular application. Each component has three parts:

- TypeScript class
- HTML template
- CSS styles

In this activity you'll learn how to update the template and styles of a component.

This is a great opportunity for you to get started with Angular.

1 Update the component template

Update the `template` property to read `Hello Universe`

```
template: `
  Hello Universe
`,
```

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

@Component({
  selector: 'app-root',
  template: `
    Hello
  `,
  styles: `
    :host {
      color: blue;
    }
  `,
  standalone: true,
})
```

```
Hello
```

What’s coming up next?

angular.dev/roadmap

What’s next?

Partial hydration

Fine-grained code loading of only logic that is immediately needed to handle user interactions.

Fine-grained reactivity

Enable detecting changes within a fraction of the component.

Improved authoring

With standalone components, signals, and other recent advancements we’re iterating on the authoring experience

Gemini

Gemini

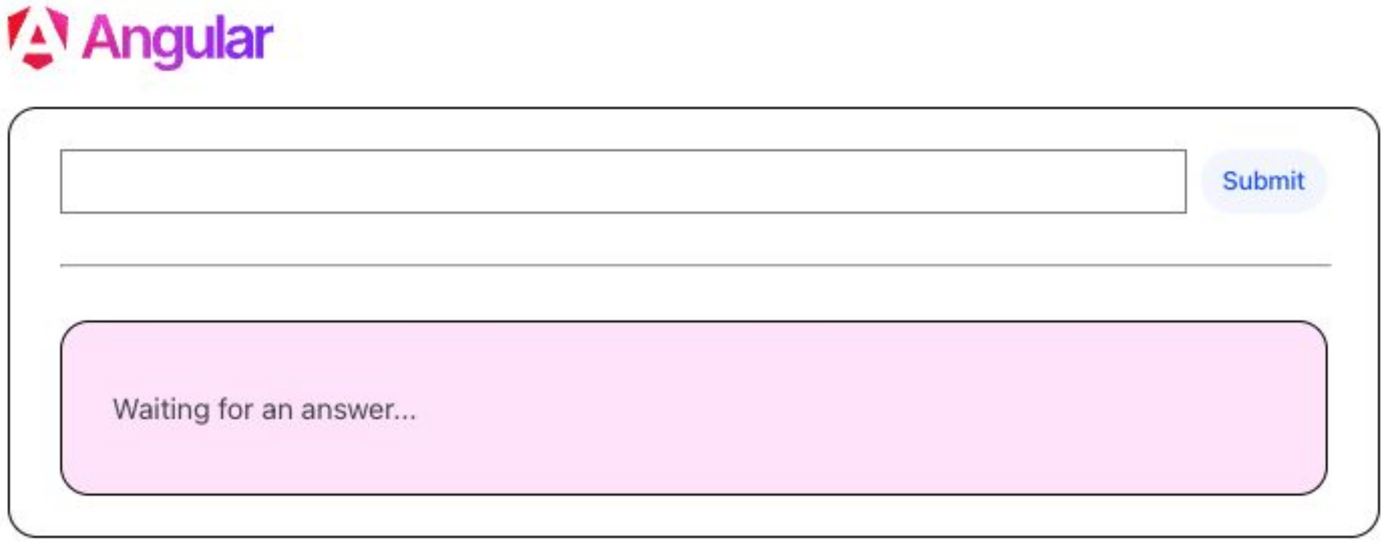
ai.google.dev/tutorials/node_quickstart

Install the package

```
> npm i @google/generative-ai

added 1 package, and audited 913 packages in 1s

117 packages are looking for funding
  run `npm fund` for details

found 0 vulnerabilities
```

Initialize the Generative Model

```
import { Component, model } from '@angular/core';
import { GenerativeModel, GoogleGenerativeAI } from
"@google/generative-ai";

@Component({...})
export class AppComponent {
  question = model('')
  answer: string = 'Waiting for an answer'

  genAI: GoogleGenerativeAI = new GoogleGenerativeAI('API_KEY');
  genModel: GenerativeModel =
    this.genAI.getGenerativeModel({ model: "gemini-pro"});
}
```

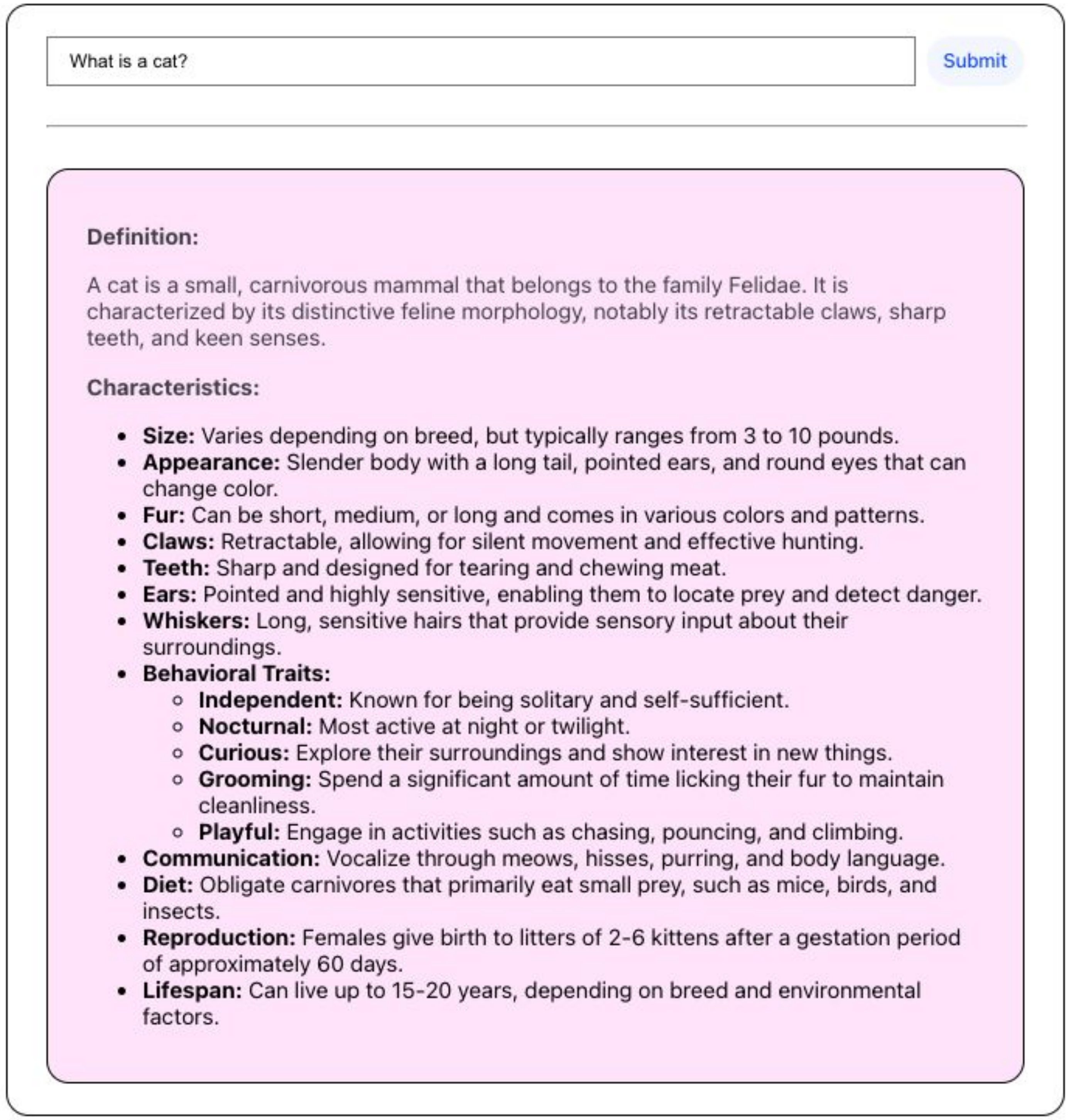


Waiting for an answer...

Generate text from text-only input

```
@Component({...})
export class AppComponent {
  question = model("What is a cat?")
  answer: string = 'Waiting for an answer...'
  ...

  async getAnswer() {
    const result =
      await this.genModel
           .generateContent(this.question());
    const response = await result.response;
    this.answer = response.text();
  }
}
```

Angular



Definition:

A cat is a small, carnivorous mammal that belongs to the family Felidae. It is characterized by its distinctive feline morphology, notably its retractable claws, sharp teeth, and keen senses.

Characteristics:

- **Size:** Varies depending on breed, but typically ranges from 3 to 10 pounds.
- **Appearance:** Slender body with a long tail, pointed ears, and round eyes that can change color.
- **Fur:** Can be short, medium, or long and comes in various colors and patterns.
- **Claws:** Retractable, allowing for silent movement and effective hunting.
- **Teeth:** Sharp and designed for tearing and chewing meat.
- **Ears:** Pointed and highly sensitive, enabling them to locate prey and detect danger.
- **Whiskers:** Long, sensitive hairs that provide sensory input about their surroundings.
- **Behavioral Traits:**
  - **Independent:** Known for being solitary and self-sufficient.
  - **Nocturnal:** Most active at night or twilight.
  - **Curious:** Explore their surroundings and show interest in new things.
  - **Grooming:** Spend a significant amount of time licking their fur to maintain cleanliness.
  - **Playful:** Engage in activities such as chasing, pouncing, and climbing.
- **Communication:** Vocalize through meows, hisses, purring, and body language.
- **Diet:** Obligate carnivores that primarily eat small prey, such as mice, birds, and insects.
- **Reproduction:** Females give birth to litters of 2-6 kittens after a gestation period of approximately 60 days.
- **Lifespan:** Can live up to 15-20 years, depending on breed and environmental factors.

“

Build something bigger!

What if you could ask the docs a question?

Where should we host this?

What else can we use?

Angular deferrable views

Firebase Cloud Functions

GenerativeLanguage API

Early preview of Angular support on Firebase Hosting

Semantic Retrieval API

Attributed Question-Answering

Angular Model inputs (developer preview)

Angular Signals

Control flow

Demo time!

Deliver web apps with confidence 🚀

Developer Experience

Intuitive APIs

Improved authoring

Optional NGModules

Performance

Angular Signals

Control flow

Deferrable views

Image directive

Zoneless

Stability & Reliability

Backwards compatibility

Migrations

Debugging

Tested against all of Google3

Ready to build what's next?

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Scan the code to receive personalized guidance from one of our experts.

Or visit **g.co/next/24offers**

Thank you