

WEB COMPONENTS THROUGH THE EYES OF A NEWCOMER

DESIGN 4 DRUPAL - DECEMBER 2, 2020

[HTTPS://BIT.LY/D4DWC](https://bit.ly/d4dwc)

BRIAN PERRY

- » Front End Architect at Bounteous
- » Rocking the Chicago 'burbs
- » Lover of all things components... and Nintendo

@bricomedy



bounteous



COMPONENTS HAVE TAKEN OVER THE WEB



**WE'RE HERE TO TALK
ABOUT
WEB
COMPONENTS**

LIKE REACT AND ANGULAR, RIGHT?

WEB COMPONENTS

A set of web platform APIs, not tied to a specific framework

» Custom elements

» Shadow DOM

» HTML Templates

I ♥ COMPONENTS.

SO I SHOULD ♥ WEB COMPONENTS.

**SO WHY AREN'T THEY PART OF MY
WORKFLOW? 🥲**



WARNING: NOT AN EXPERT

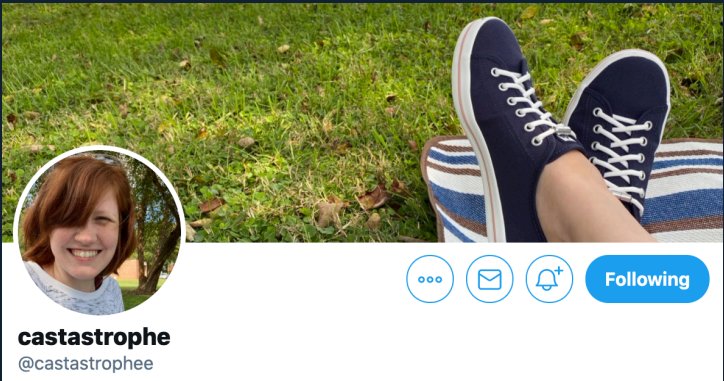
I LOOK TO:



@BTOPRO



@SALEM_COBALT

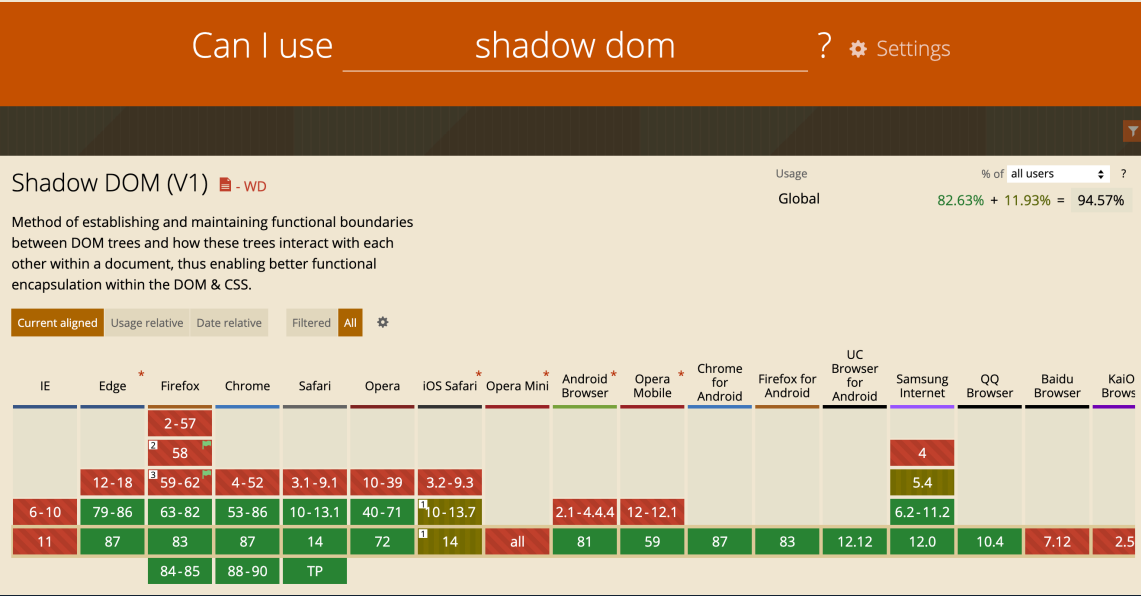
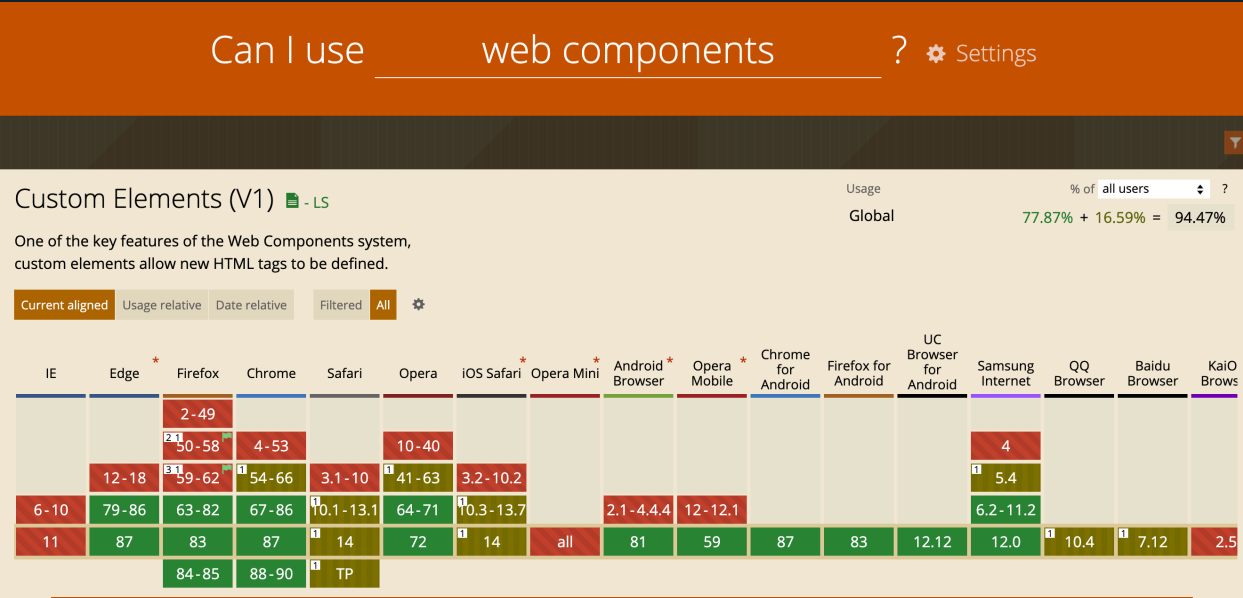


@CASTASTROPHEE



@ILLEPIC

CAN I USE WEB COMPONENTS?¹



¹ IE 11 can be supported using polyfills

CAN I USE WEB COMPONENTS?²

Current alignedUsage relativeDate relativeFilteredAll

IE	Edge*	Firefox	Chrome	Safari	Opera	iOS Safari*	Opera Mini*	Android Browser*	Opera Mobile*	Chrome for Android	Firefox for Android	UC Browser for Android	Samsung Internet	QQ Browser	Baidu Browser	KaiO Brows
				3.1-6												
				6.1												
	12		4-25	7	10-12.1	3.2-7.1										
	13-14	2-21	26-34	7.1-8	15-21	8-8.4		2.1-4.3								
6-10	15-86	22-82	35-86	9-13.1	22-71	9-13.7		4.4-4.4.4	12-12.1				4-11.2			
11	87	83	87	14	72	14	all	81	59	87	83	12.12	12.0	10.4	7.12	2.5

PerformanceCSS OverviewElementsConsoleSourcesNetworkMemoryApplicationSecurityLighthouseaxe

</neader>

<ciu-support-table> == \$0

#shadow-root (open)

<!-->

<div class="options">...</div>

<div class="wrap js-wrap view-mode-normal">

<div class="support-table has-tooltip" style="grid-template-columns: repeat(17, 78px); ">

<!-->

<ciu-browser-support>

<!-->

<h4 class="browser-heading browser--ie">...</h4>

<div class="released-versions">

::before

<!-->

<ciu-version-support tabindex="0">

#shadow-root (open)

</ciu-version-support>

<!-->

StylesComputedEvent ListenersDOM Breakpoints

Filter: :hov .cls +

element.style { }

Inherited from #shadow-root...

:host {display: block;position: relative;width: 100%;margin-bottom: 2em;padding: 1rem 0.7em 1rem 1rem;background: var(--primary-bg);color: var(--primary-fg);box-sizing: border-box;}

Inherited from main.ciu-pag...

...-content.js-contentciu-feature-list#shadow-rootsection.section__tablesdiv.feature-list-wrapciu-feature#template#shadow-rootciu-support-table...

² Find many more examples at <https://wild.open-wc.org/>

**I SHOULD BUILD AN EXAMPLE WEB
COMPONENT.**

But what could be a relevant example in November
2020?

 2020 ELECTION

President

Senate

House

Question 1

Question 2

Mass. races

Find a race



Joe Biden Dem

264

270 to win
60 undecided



Donald Trump GOP

214



Live Election Updates

Trump says he will ‘never give up fighting’

- 1:55 p.m.
Trump vows to ‘never give up fighting,’ in new statement
- 12:47 p.m.

* The Associated Press has called Joe Biden the winner in Arizona, which is reflected in this number. Some other major news organizations have yet to make a projection in the state.

President: Pennsylvania

+ FOLLOW

Biden

49.4%

<

Trump

Incumbent

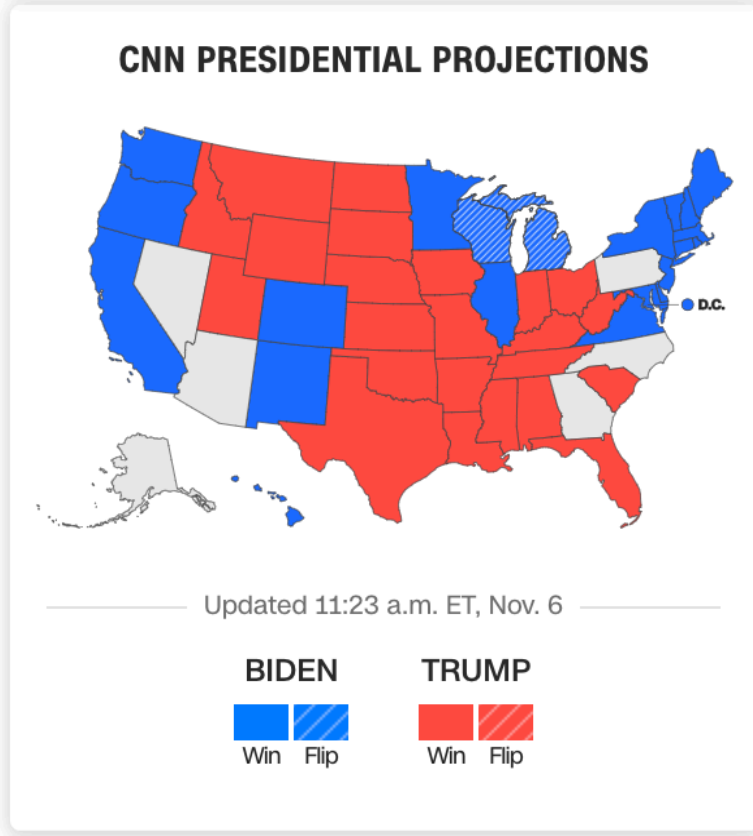
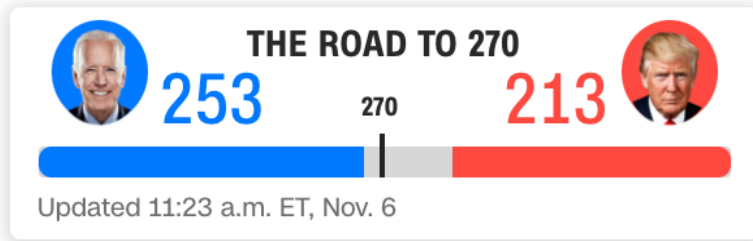
49.3%

>

Est. 95% in

Updated 11:14 a.m. ET, Nov. 6

Biden



47

SENATE CONTROL

47

President: Pennsylvania

+ FOLLOW

Biden

49.4%

<

Trump

Incumbent

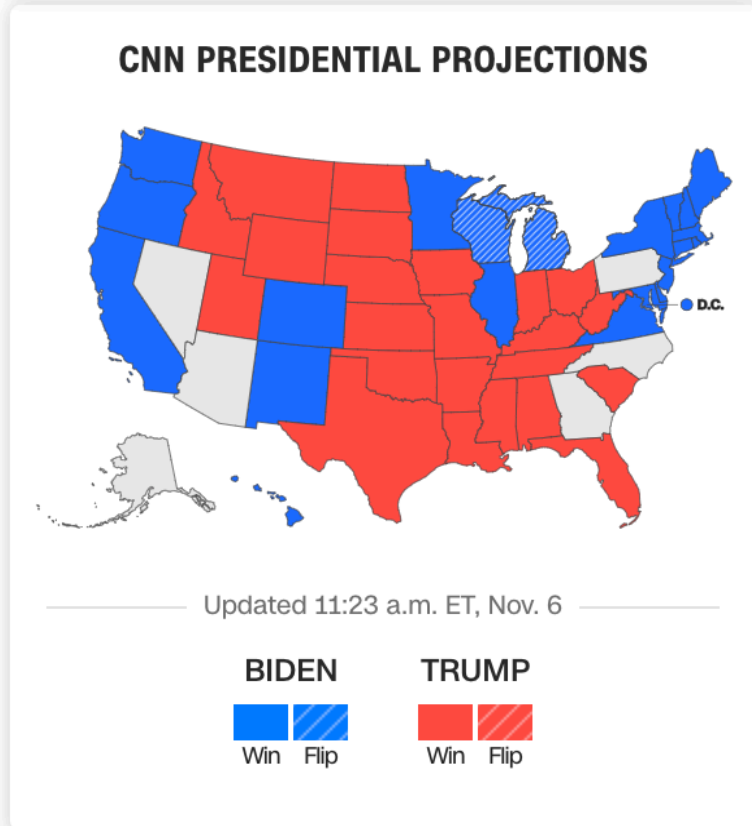
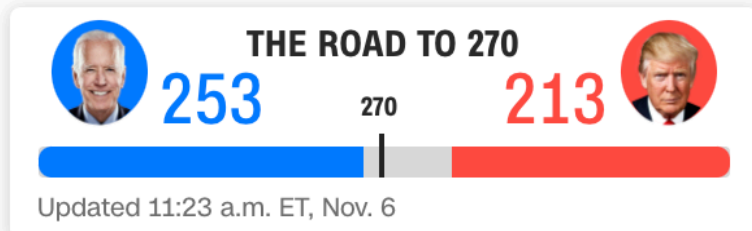
49.3%

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Est. 95% in

Updated 11:14 a.m. ET, Nov. 6

Biden



SENATE CONTROL

President: Pennsylvania

+ FOLLOW

Biden

49.4%

<

Trump

Incumbent

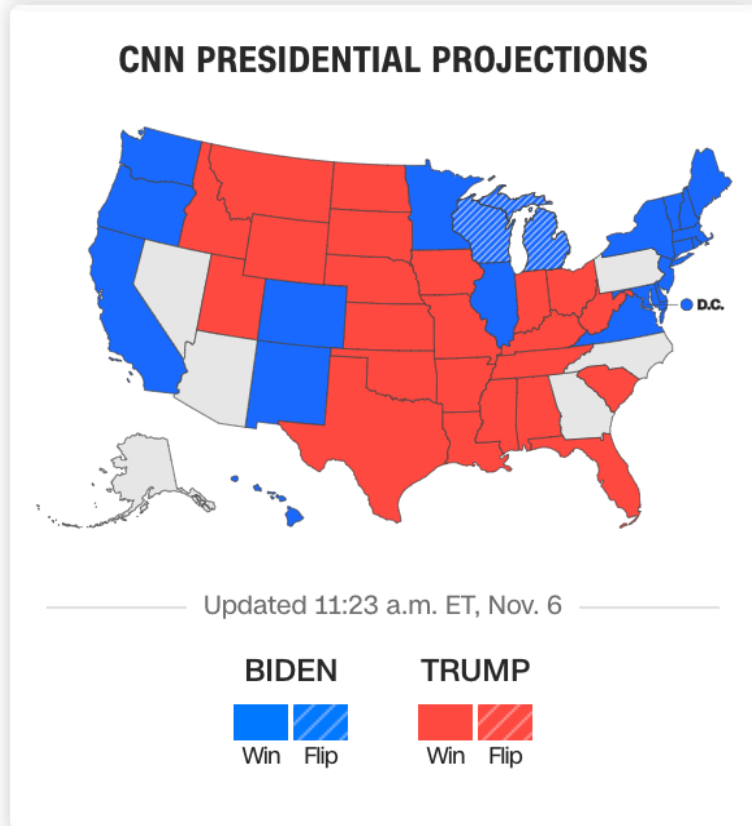
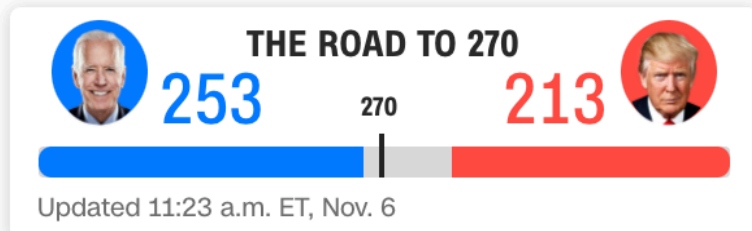
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49.3%

Incumbent

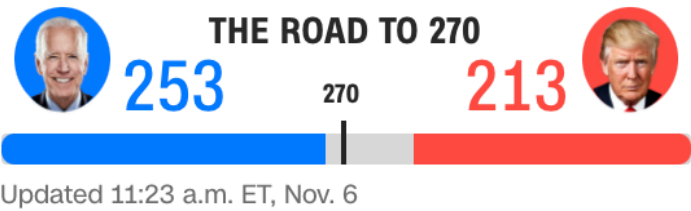
Est. 95% in

Updated 11:14 a.m. ET, Nov. 6

Biden

Biden

Biden



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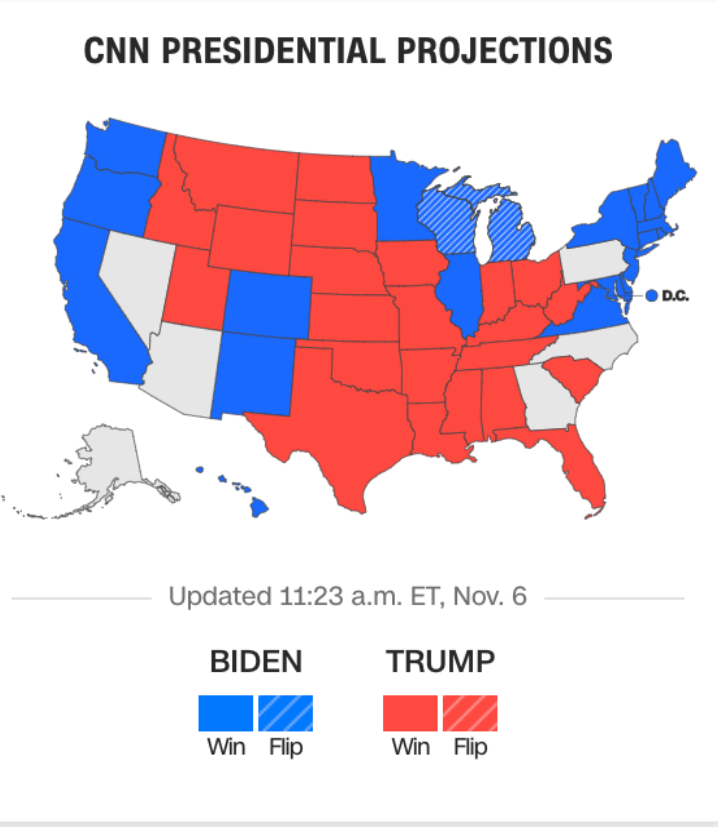
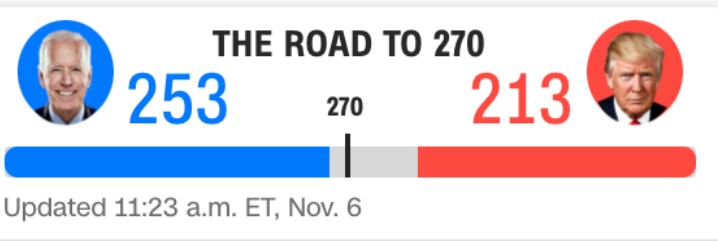
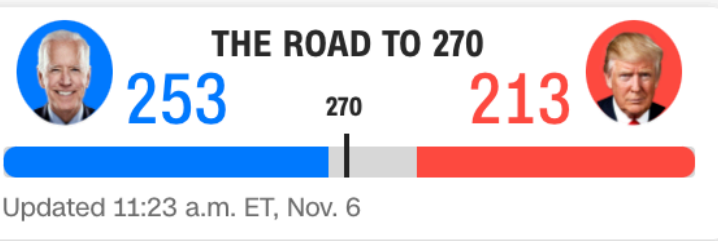
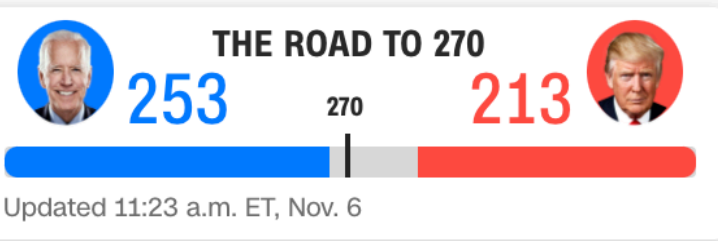
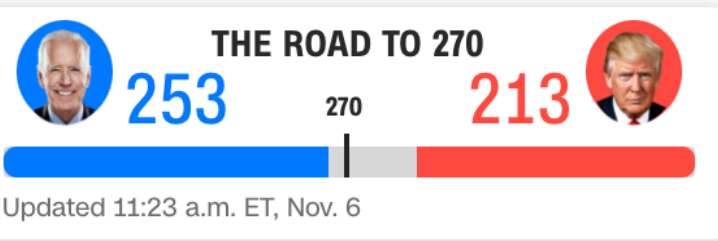
Updated 11:14 a.m. ET, Nov. 6

Biden

Biden

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President: Pennsylvania

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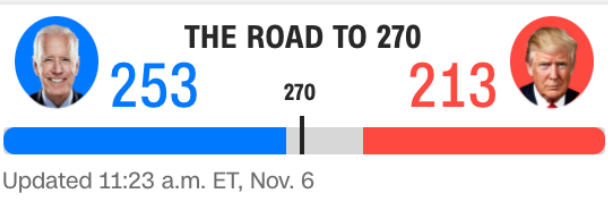
Trump

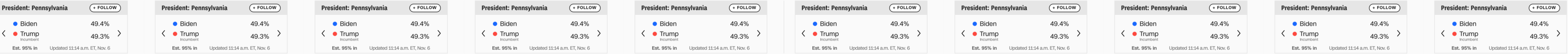
49.3%

Est. 95% in

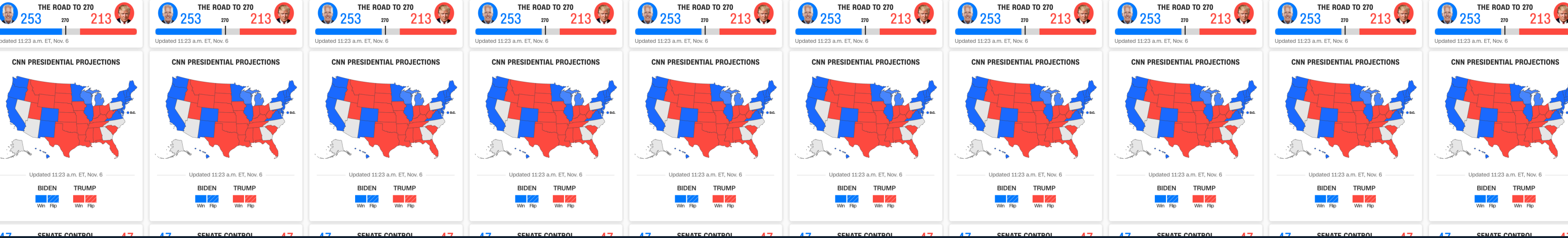
Updated 11:14 a.m. ET, Nov. 6

Biden Biden Biden Biden Biden





Biden Biden Biden Biden Biden Biden Biden Biden Biden Biden



MY OWN PERSONAL ELECTION TRACKER

Storybook

Find components

EXAMPLE

Introduction

COMPONENTS

Results Tracker

Primary

No Politics

Canvas

Docs

Race Between Old Men Too Close To Call

Nation tired of hitting reload in their web browsers.

President >

253

Joseph R. Biden Jr.

73,879,622 votes (51%)

214

Donald J. Trump

69,772,905 votes (49%)

270

TO WIN

Controls (5)

Actions

Name	Control
headline	Race Between Old Men Too Close To Call
subheadline	{ "strings": [" \n Nation tired of hitting reload in their web browsers.\n "], "values": [], "type": "html", "processor": {} }
race	President
total	538
candidates	[{ "name": "Joseph R. Biden Jr.", "primary": 253, "secondary": 73879622, "color": "#1375b7" }, { "name": "Donald J. Trump", "primary": 214, "secondary": 69772905, "color": "#c93135" }]

USING <ELECTION-TRACKER>

» Import script as JS module. Could be:

» local file

» NPM dependency (@backlineint/results-tracker)

» Use your custom element in markup

» Pass data in using attributes

Note: If your component has external dependencies, you'll need to use a bundler (Webpack, Rollup, Parcel, etc.)

CUSTOM ELEMENTS³

Election Results Tracker

Brian Perry

Save

Settings

Change View

HTML

```
2 <head>
3   <script type="module" src="https://unpkg.com/@backlineint/results-tracker@1.0.0/results-tracker.js?module"></script>
4   <link rel="preconnect" href="https://fonts.gstatic.com">
5   <link href="https://fonts.googleapis.com/css2?family=Domine:wght@700&family=Libre+Franklin:wght@500;600;700&display=swap" rel="stylesheet">
6 </head>
7 <body>
8   <results-tracker
9     headline="Race Between Old Men Too Close To Call"
10    race="President"
11    total="538"
12    candidates=[
13      {"name": "Joseph R. Biden Jr.", "primary": 253, "secondary": 73879622, "color": "#1375b7"},
14      {"name": "Donald J. Trump", "primary": 214, "secondary": 69772905, "color": "#c93135"}
15    ]'
16  >
17    <p>Nation tired of hitting reload in their web browsers.</p>
18  </results-tracker>
19 </body>
```

Race Between Old Men Too Close To Call

Nation tired of hitting reload in their web browsers.

President

253

270 TO WIN

214

Joseph R. Biden Jr.
73,879,622 votes (51%)

Donald J. Trump
69,772,905 votes (49%)

Console

Assets

Comments

⌘ Keys

Last saved LESS THAN A MINUTE ago

Delete

Add to Collection

Fork

Embed

Export

Share

³ <https://codepen.io/brianperry/pen/RwGPLBx>

SHADOW DOM

- » Encapsulated DOM Tree
- » Separate from main DOM
- » Elements won't collide
- » Scoped styles
- » Super spooky

```
<!DOCTYPE html>
<html>
  <head>...</head>
  <body>
    <results-tracker headline="Race Between Old Men Too Close To Call" race="President"
      total="538" candidates="[
        { "name": "Joseph R. Biden Jr.", "primary": 253, "secondary": 73879622,
          "color": "#1375b7"},
        { "name": "Donald J. Trump", "primary": 214, "secondary": 69772905, "color":
          "#c93135"}
      ]">
      <#shadow-root (open)
        <!-->
        <link href="https://fonts.googleapis.com/css2?family=Domine:wght@700&family=Libre+Franklin:wght@500;600;700&display=swap" rel="stylesheet">
        <div class="results-tracker">
          <div class="results-tracker__headline">
            <h2>
              <!-->
              "Race Between Old Men Too Close To Call"
              <!-->
            </h2>
          </div>
          <div class="results-tracker__sub-headline">...</div> == $0
          <div class="results-tracker__race">...</div>
          <div class="results-tracker__counts">...</div>
          <div class="results-tracker__bars">...</div>
          <div class="results-tracker__candidates">...</div>
        </div>
        <!-->
        <p>Nation tired of hitting reload in their web browsers.</p>
      </results-tracker>
    <script>...</script>
  </body>
</html>
```

SCOPED STYLES ⁴

JS index.js

<> index.html

styles.css x

...

```
1  /* These styles are not inheritted, and thus won't
2  apply to divs in the shadow dom */
3  div {
4    border: 4px dashed black;
5  }
6
7  /* This fon't family rule won't apply to the h2 in the
8  custom element - its own scoped rule overrides it.
9  Also - custom element styles won't apply outside of
10 shadow dom. */
11 h2 {
12   font-family: Impact, Haettenschweiler, "Arial Narrow Bold",
13 }
14
15 /* Inheritted properties do cascade though, so this
16 will make the custom element subheading purple
17 and italic */
18 p {
19   font-style: italic;
20   font-size: 20px;
21   color: purple;
22 }
23
```

Browser

Tests

< > ↺ https://wdxvx.csb.app/

Some global div styles that don't leak into component

Main DOM H2 with Global Styling

Race Between Old Men Too Close To Call

Nation tired of hitting reload in their web browsers.

President ›

253

270 TO WIN

214

Joseph R. Biden Jr.
73,879,622 votes (51%)

Donald J. Trump
69,772,905 votes (49%)

Same paragraph outside of custom element:

Nation tired of hitting reload in their web browsers.

⁴ <https://codesandbox.io/s/election-results-tracker-wdxvx?file=/src/styles.css>

GLOBAL STYLING

TBH, I'm still confused 😞

- » CSS Inheritance

- » CSS custom properties (css variables)

- » CSS ::part

 - » <div part="headline">

 - » results-tracker::part(headline) { color: red; }

- » Opt out of the shadow DOM

BUILDING <ELECTION-TRACKER> TAKE 1: VANILLA JS

Rendering a Headline

index.html

```
<html>
  <head>
    <title>Results Tracker Heading</title>
    <meta charset="UTF-8" />
  </head>

  <body>
    <results-tracker headline="Race Between Old Men Too Close To Call" />

    <script type="module" src="src/results-tracker.js"></script>
  </body>
</html>
```

results-tracker.js

```
class ResultsTracker extends HTMLElement {
  constructor() {
    // Always call super first in constructor
    super();

    // Create a shadow root
    const shadow = this.attachShadow({ mode: "open" }); // sets and returns 'this.shadowRoot'

    // Create wrapping element
    const wrapper = document.createElement("div");
    wrapper.setAttribute("class", "results-tracker");

    this.headlineElement = document.createElement("h2");
    this.headlineElement.setAttribute("class", "results-tracker__headline");
    this.headlineElement.textContent = this.getAttribute("headline");
    wrapper.appendChild(this.headlineElement);

    // Attach the results tracker to the shadow DOM.
    shadow.appendChild(wrapper);
  }
}

// Define the new element
customElements.define("results-tracker", ResultsTracker);
```

Refactoring to use <template>

```
class ResultsTracker extends HTMLElement {
  constructor() {
    super();
    this.shadow = this.attachShadow({ mode: "open" });

    // Templates are not referenced in the DOM, but can be referenced / cloned using js
    const template = document.createElement("template");

    template.innerHTML = `
      <div class="results-tracker">
        <div class="results-tracker__headline">
          <h2>${this.getAttribute("headline")}</h2>
        </div>
      </div>
    `;

    // Attach the template to the Shadow DOM
    this.shadow.appendChild(template.content);
  }
}

customElements.define("results-tracker", ResultsTracker);
```

Add scoped styling

```
class ResultsTracker extends HTMLElement {
  constructor() {
    super();
    /* Removed for brevity... */

    // Create CSS to apply to the shadow dom
    const style = document.createElement("style");

    style.textContent = `
      :host {
        font-family: 'Libre Franklin', helvetica, arial, sans-serif;
      }
      h2 {
        margin: .5rem 0;
        font-family: 'Domine', serif;
        font-weight: 700;
        font-size: 36px;
        text-align: center;
      }
    `;

    // Attach the styles to the shadow dom
    shadow.appendChild(style);

    /* Removed for brevity... */
  }
}
```

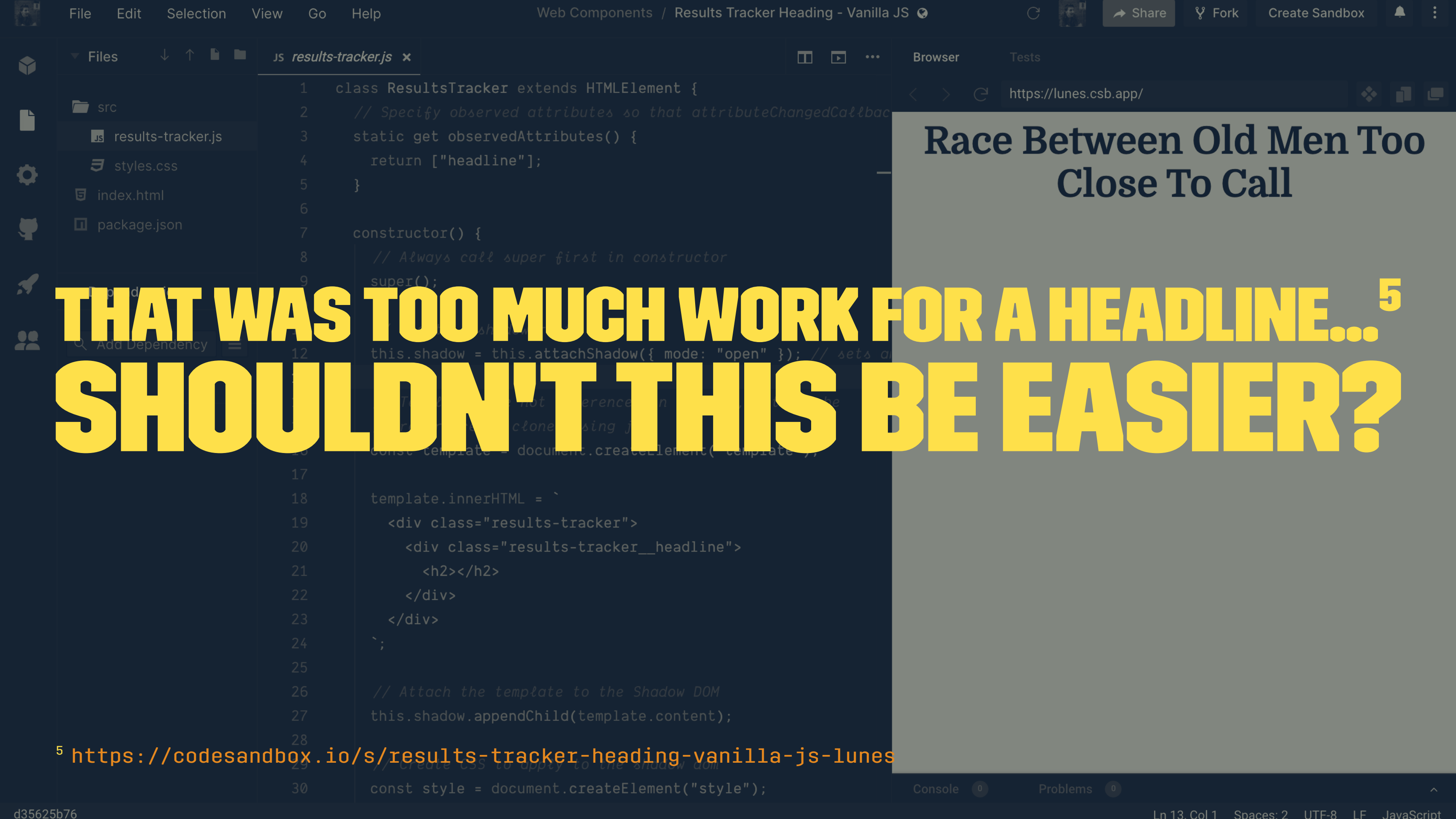

Observe attributes and re-render if changed

```
class ResultsTracker extends HTMLElement {
  // Specify observed attributes for attributeChangedCallback
  static get observedAttributes() {
    return ["headline"];
  }

  constructor() {
    /* Removed for brevity */
  }

  // Custom element lifecycle callback function
  attributeChangedCallback(name, oldValue, newValue) {
    // Compare old to new to prevent unnecessary re-rendering
    if (oldValue !== newValue && name === "headline") {
      this.shadow.querySelector(
        ".results-tracker__headline h2"
      ).textContent = newValue;
    }
  }
}

// Define the new element
customElements.define("results-tracker", ResultsTracker);
```



THAT WAS TOO MUCH WORK FOR A HEADLINE...⁵
SHOULDN'T THIS BE EASIER?

⁵ <https://codesandbox.io/s/results-tracker-heading-vanilla-js-lunes>

WAIT FOR IT...

**SO.
MANY.
LIBRARIES.**

- » LitElement
- » Stencil
- » FastElement
- » Haunted
- » Hybrids
- » Many more...

**AREN'T WE JUST BACK WHERE WE
STARTED?**

Only one way to find out...

**BUILDING <ELECTION-TRACKER>
TAKE 2: LIT-ELEMENT**

Rendering a headline (LitElement version)

index.html

```
<html>
  <head>
    <title>Results Tracker Heading - Lit</title>
    <meta charset="UTF-8" />
  </head>

  <body>
    <results-tracker headline="Race Between Old Men Too Close To Call" />

    <script type="module" src="src/results-tracker.js"></script>
  </body>
</html>
```

(same as vanilla js version)

results-tracker.js

```
import { LitElement, html } from "lit-element";

export class ResultsTracker extends LitElement {
  static get properties() {
    return {
      headline: { type: String }
    };
  }

  render() {
    return html`
      <div class="results-tracker">
        <div class="results-tracker__headline">
          <h2>${this.headline}</h2>
        </div>
      </div>
    `;
  }
}

window.customElements.define("results-tracker", ResultsTracker);
```

A LOT WITH LESS

- » Renders custom element
- » Templating
- » Observes updates to attributes

Just need to add scoped styles.

Add scoped styling

```
import { LitElement, html, css } from "lit-element";

export class ResultsTracker extends LitElement {
  static get styles() {
    return css`
      :host {
        font-family: "Libre Franklin", helvetica, arial, sans-serif;
      }
      .results-tracker__headline h2 {
        margin: 0.5rem 0;
        font-family: "Domine", serif;
        font-weight: 700;
        font-size: 36px;
        text-align: center;
      }
    `;
  }

  // Properties...

  // Render method...
}

window.customElements.define("results-tracker", ResultsTracker);
```

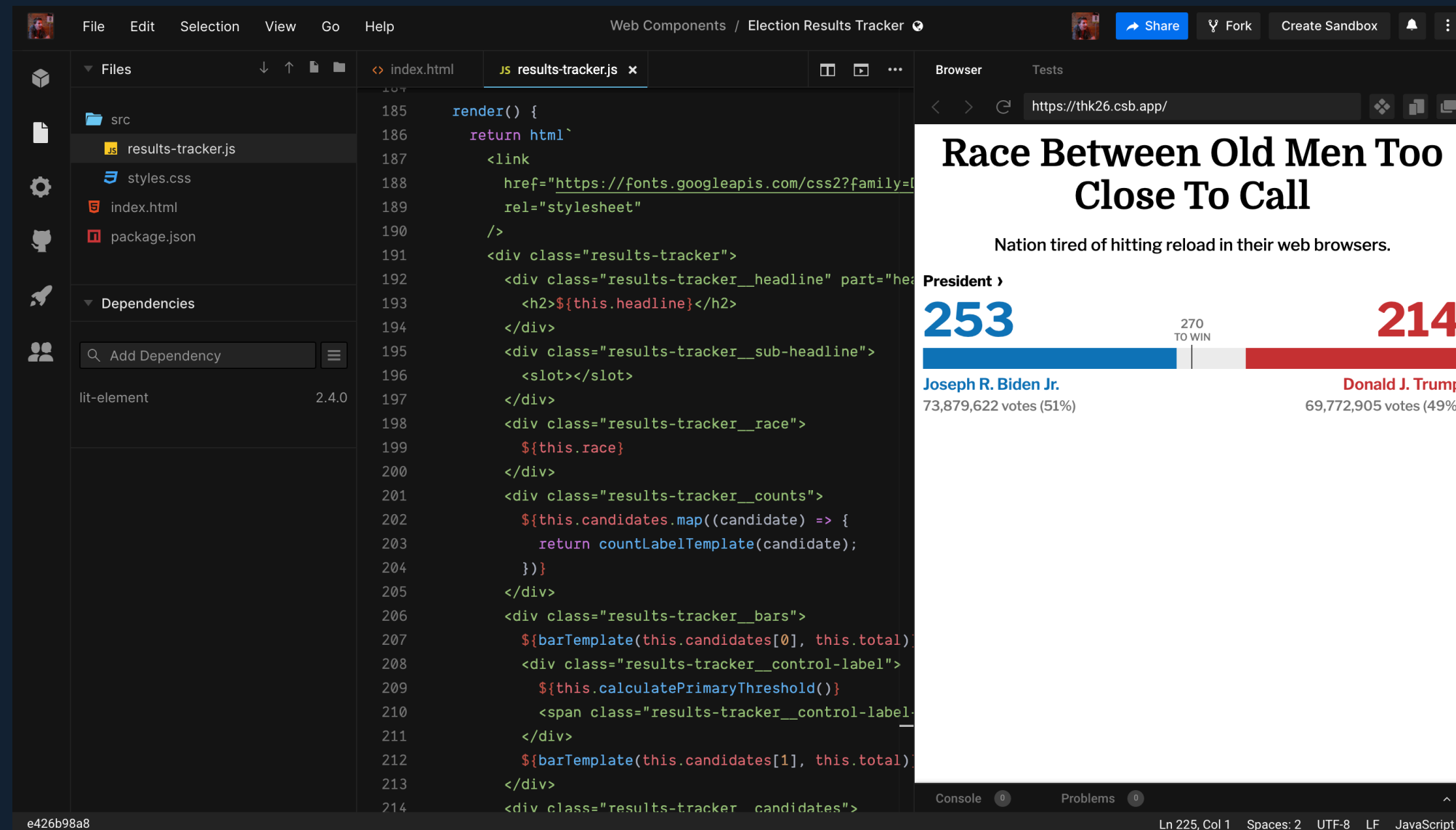
Converting attributes

```
// Vanilla JS - have to manually transform string attributes
processCandidates() {
  this.candidates = JSON.parse(this.getAttribute('candidates'));
  // ...
}

// Define the type of your property, and LitElement will automatically
// handle conversion for you.
static get properties() {
  return {
    /**
     * An array of objects containing data for each candidate
     */
    candidates: {type: Array},
  };
}
```

(And many other DX niceties)

Feels like a more appropriate amount of work for a headline... and especially the full results-tracker ⁶



⁶ <https://codesandbox.io/s/election-results-tracker-thk26>

STENCIL

“Compiler that generates web components”

Provides extra capabilities on top of Web Components:

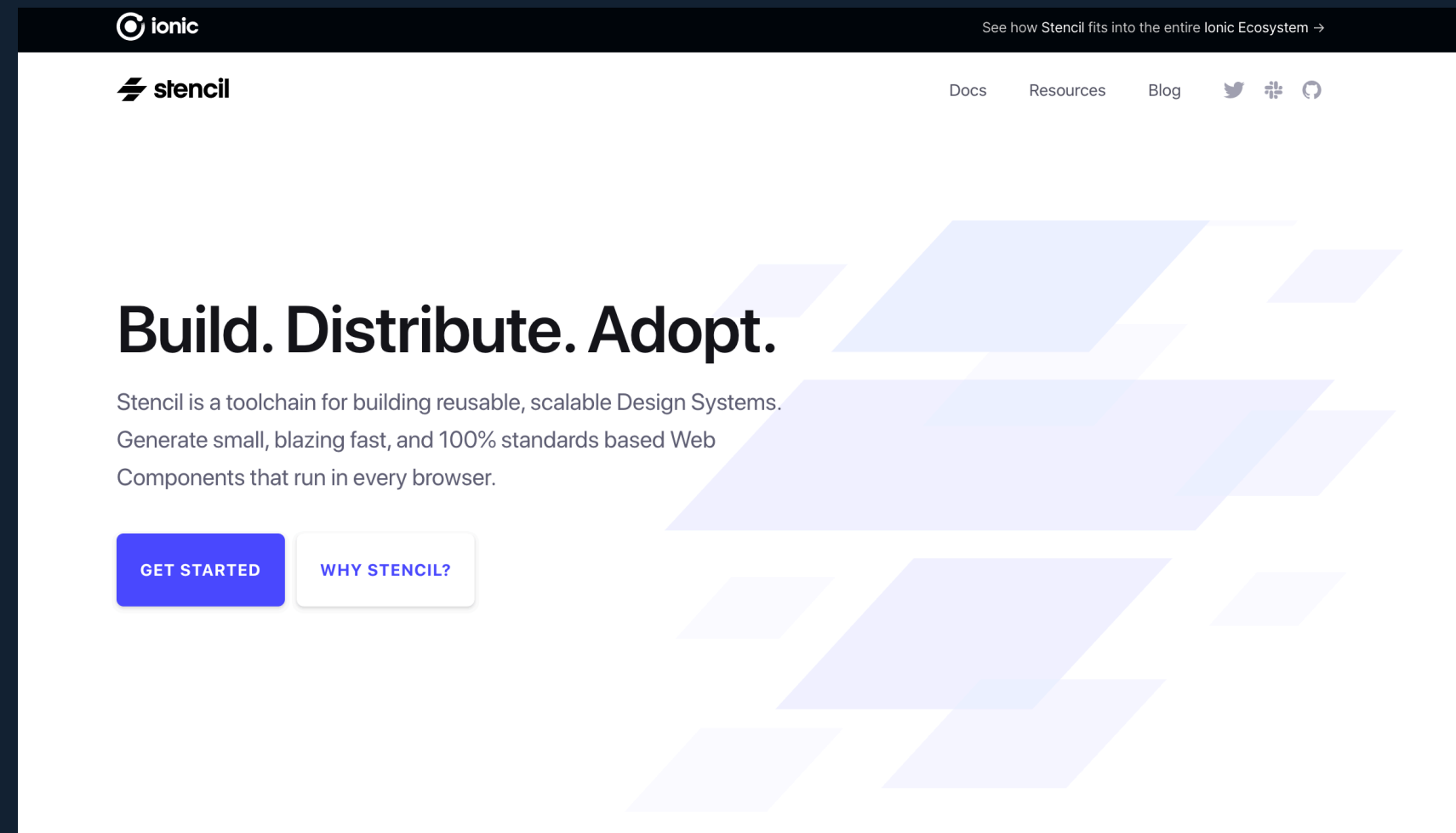
» Prerendering

» Objects-as-properties

» Virtual DOM

» JSX

» Async Rendering



VUE

Supports web components as a build target.

But...

It still requires the Vue library as a global dependency.



Vue CLI

Guide

Config Reference

Plugins

Migrating From v3

Changelog

Languages

GitHub

Basics

Instant Prototyping

Creating a Project

Plugins and Presets

CLI Service

Development

Browser Compatibility

HTML and Static Assets

Working with CSS

Working with Webpack

Modes and Environment Variables

Build Targets

App

Library

Vue vs. JS/TS Entry Files

Web Component

Bundle that Registers Multiple Web Components

Async Web Component

Using vuex in builds

Deployment

Troubleshooting

Web Component

Note on Compatibility

Web Component mode does not support IE11 and below. [More details](#)

Note on Vue Dependency

In web component mode, Vue is *externalized*. This means the bundle will not bundle Vue even if your code imports Vue. The bundle will assume `Vue` is available on the host page as a global variable.

To avoid this behavior provide `--inline-vue` flag to `build` command.

```
vue-cli-service build --target wc --inline-vue
```

You can build a single entry as a web component using

```
vue-cli-service build --target wc --name my-element [entry]
```

Note that the entry should be a `*.vue` file. Vue CLI will automatically wrap and register the component as a Web Component for you, and there's no need to do this yourself in `main.js`. You can use `main.js` as a demo app solely for development.

The build will produce a single JavaScript file (and its minified version) with everything inlined. The

THE DOG ATE MY HOMEWORK SECTION

USING WEB COMPONENTS WITH A FRAMEWORK

custom-elements-everywhere.com outlines support for many frameworks.

Support is pretty solid across the board.

React has some notable limitations. 😞

LIBRARY	SCORE	BASIC TESTS	ADVANCED TESTS
Angular 8.2.14	100%	16/16	14/14

Handling data

Angular's default binding syntax will always set properties on an element. This works well for rich data, like objects and arrays, and also works well for primitive values so long as the Custom Element author has mapped any exposed attributes to corresponding properties.

Angular also provides binding syntax specifically for setting an attribute, if a developer would prefer to communicate with an element that way.

Handling events

Angular components can listen to native DOM events dispatched from Custom Elements. It supports all styles of events (lowercase, camelCase, kebab-case, etc).

[View the tests](#)

Related Issues



Yay! No open issues!

MANAGING APPLICATION STATE

- » Didn't come accross any clear pattern or best pratice.
- » Could roll your own.
- » Could use any JS based state management library.
- » Would be nice if a default standard existsted (think React context)

MY (SLIGHTLY) MORE EDUCATED VIEWS ON WEB COMPONENTS

- » This was pretty hard to learn!
- » I'd turn to this for special purpose components today.
- » Not yet comfortable enough for a full app/design system.
- » I would use a library, but one close to the vanilla API.

ON AN INFINITE TIMESCALE...

- » I think some version of this concept will win out.
- » But how infinite is that timescale?
- » And will it be this take on web components?

At least I've got this cool election tracker.

THANKS!

brian.perry@bounteous.com
@bricomedu