

Building Modern Progressive Web Apps

Ire Aderinokun at GDG DevFest SouthWest 2016



- Ire Aderinokun
- UI/UX **Designer** and Front-End **Developer**
- Head of Technology, **Big Cabal**
- **Google Developer Expert**, Web Technologies





Chrome Dev Summit

 Google Developers

bit.ly/chrome-dev-summit-2016

What are Progressive Web Apps?



Fast



Reliable

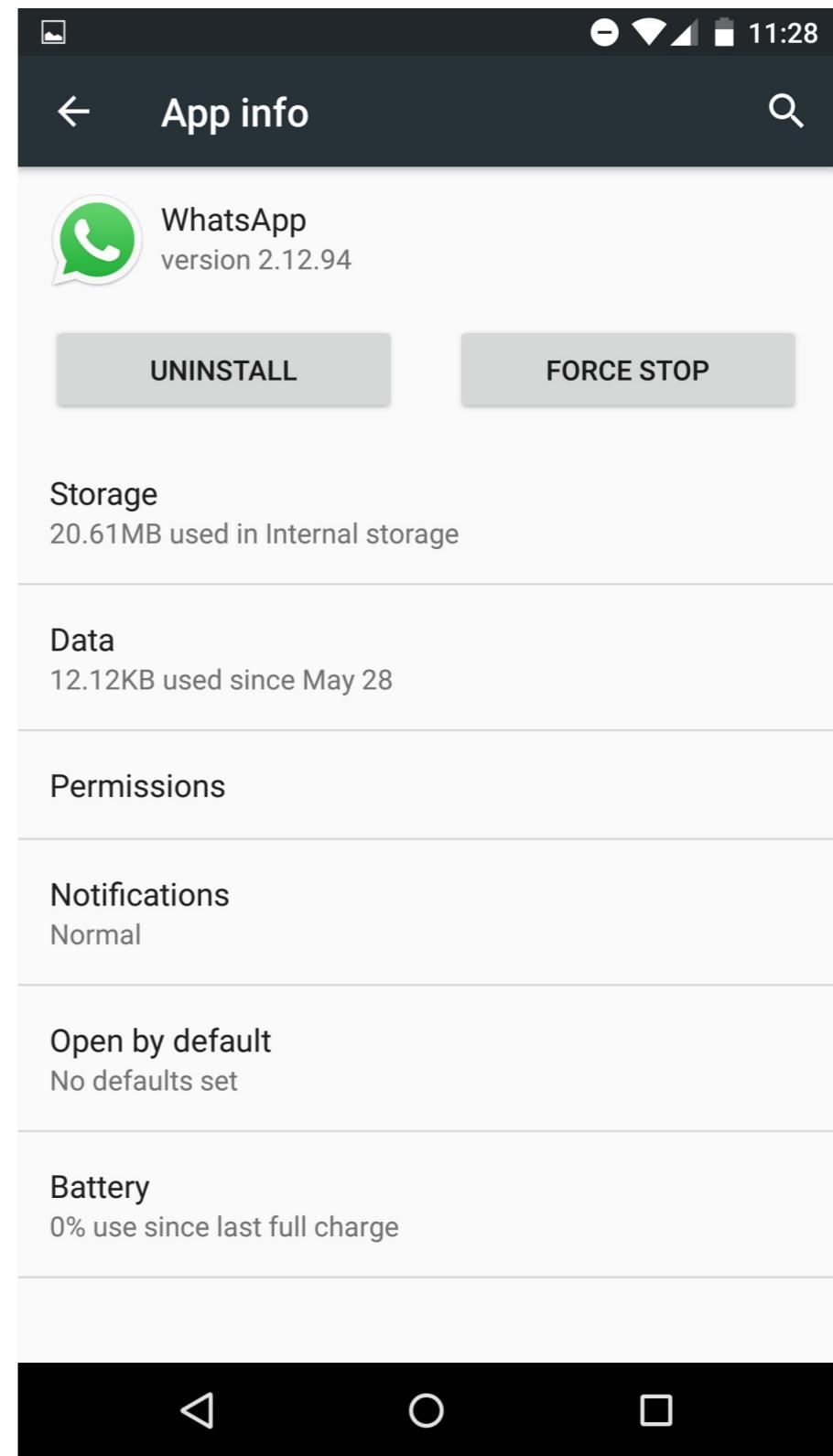
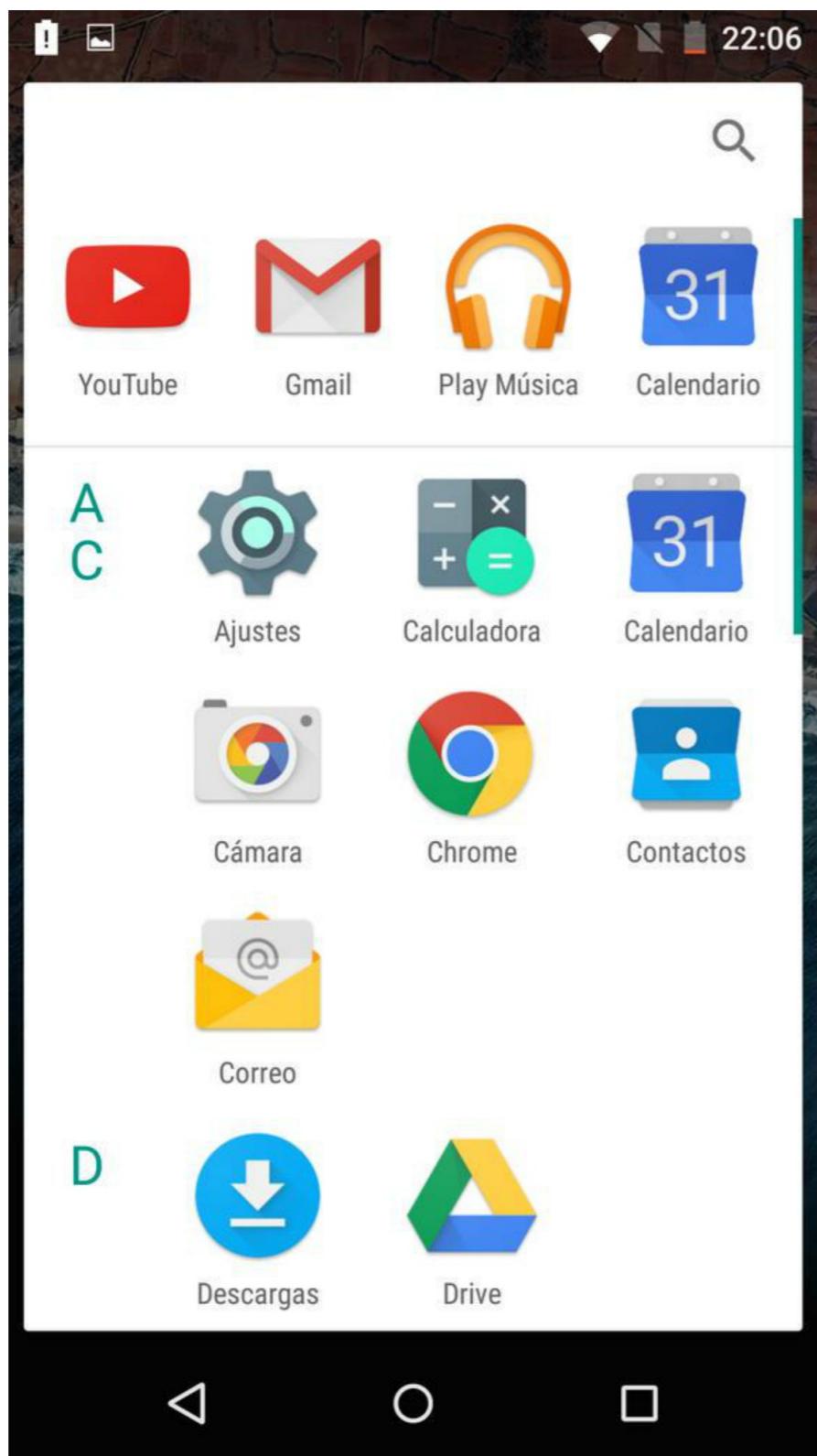


Engaging



Giving PWAs the Powers of Native

~~Add to Home screen~~
Install Application



Browser Support



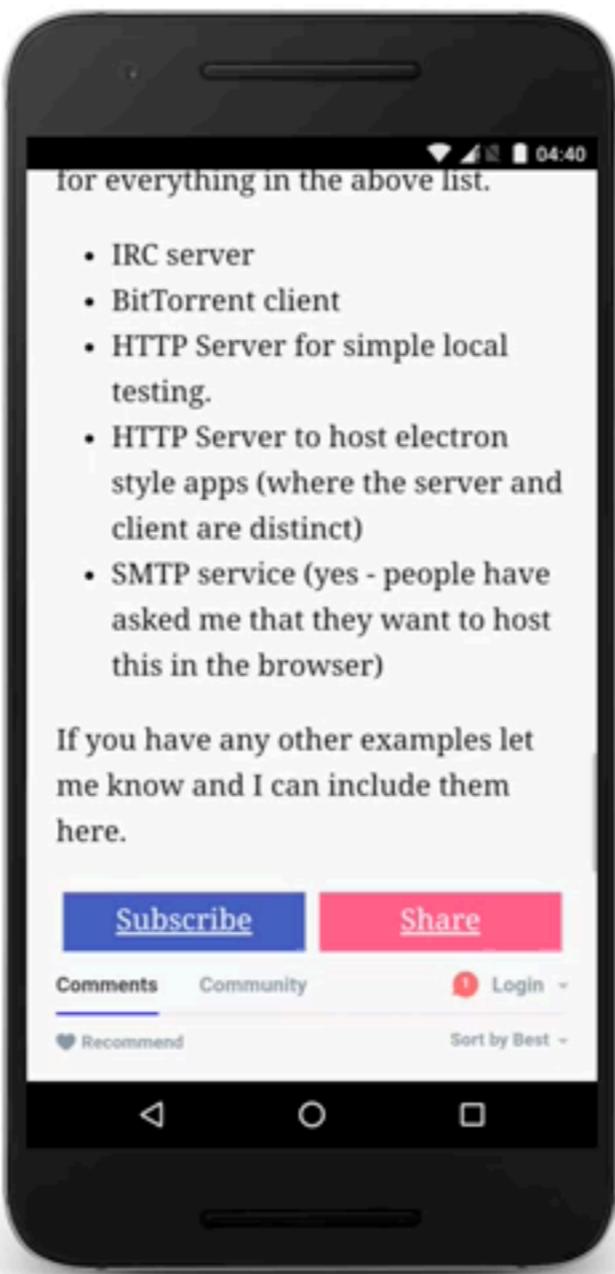
Coming Soon

Sharing

Web Share API

A proposed Web API to enable a site to **share data to an arbitrary destination** of the user's choice

<https://github.com/WICG/web-share/blob/master/docs/explainer.md>



<https://www.youtube.com/watch?v=IhUzYxCvWew>

Browser Support



Chrome 55

Account Management

Credential Management API

An API that will let websites interact with a **user agent's password system** so that websites can deal in a uniform way with site credentials and user agents can provide better assistance with the management of their credentials.

<https://developers.google.com/web/updates/2016/04/credential-management-api>

Credential Management API Demo

<https://www.youtube.com/watch?v=O3mBdKYMlsMY>

Browser Support

Credential Management API - WD

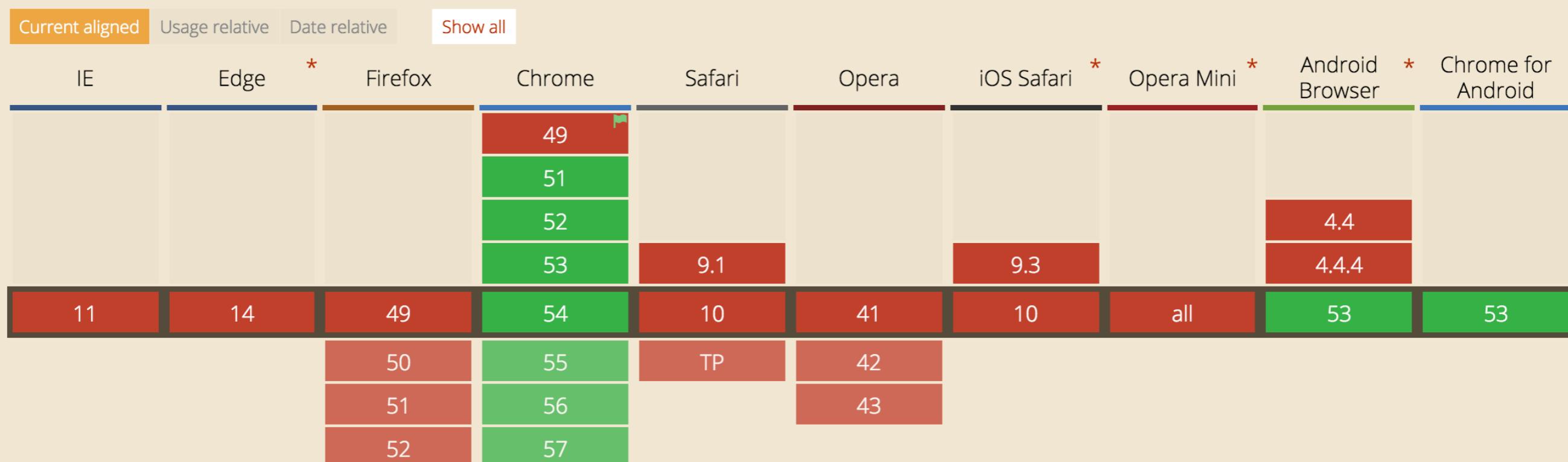
Global

47.46%

Nigeria

14.53%

API that provides a programmatic interface to the browser's credential manager. In short, an origin can request a user's credentials to sign them in, or can ask the browser to save credentials on the user's behalf. Both of these requests are user-mediated.

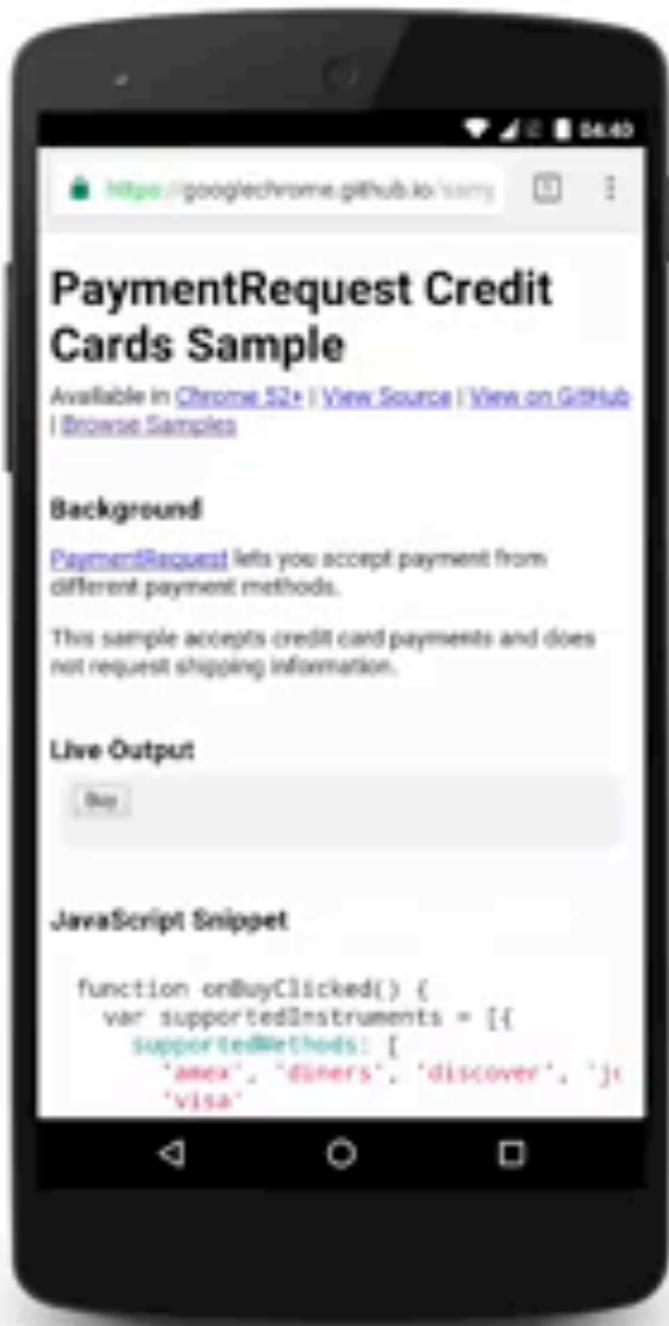


Payments

Payment Request API

The Payment Request API is a system that is meant to **eliminate checkout forms**. It vastly improves user workflow during the purchase process, providing a more **consistent user experience** and enabling web merchants to easily leverage disparate payment methods.

https://developer.mozilla.org/en-US/docs/Web/API/Payment_Request_API

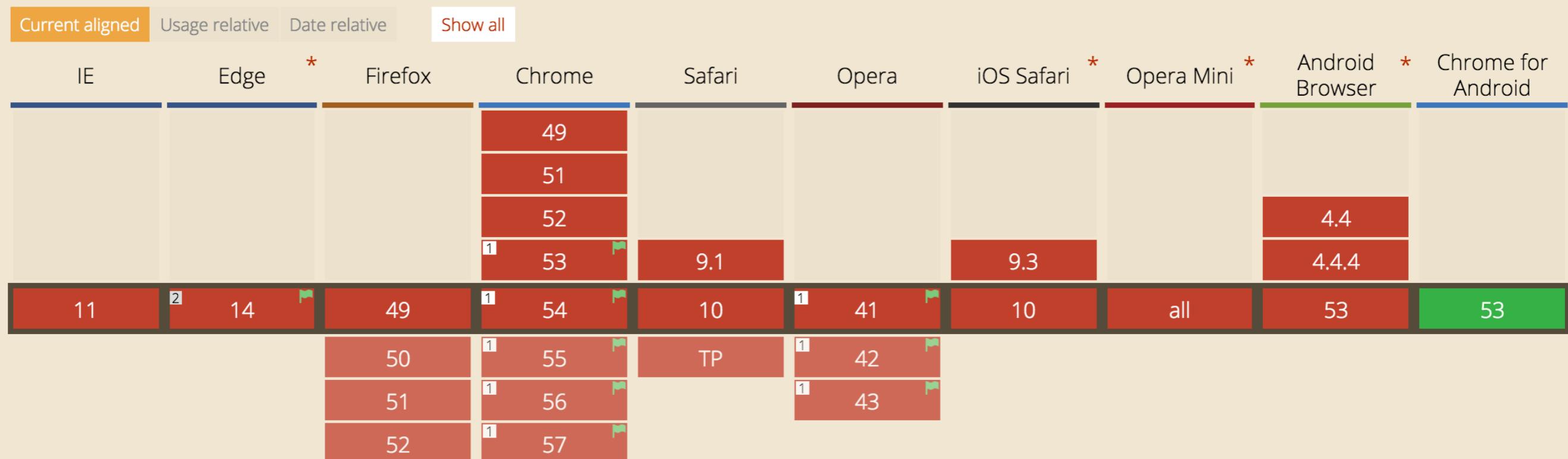


<https://www.youtube.com/watch?v=O3mBdKYMzMY>

Browser Support

Payment Request API	📄 - WD	Global	23.2%
		Nigeria	8.85%

Payment Request is a new API for the open web that makes checkout flows easier, faster and consistent on shopping sites.



PWAs and Performance

53% of visitors leave a site
if it takes more than 3 seconds
to load.

#SpeedMatters



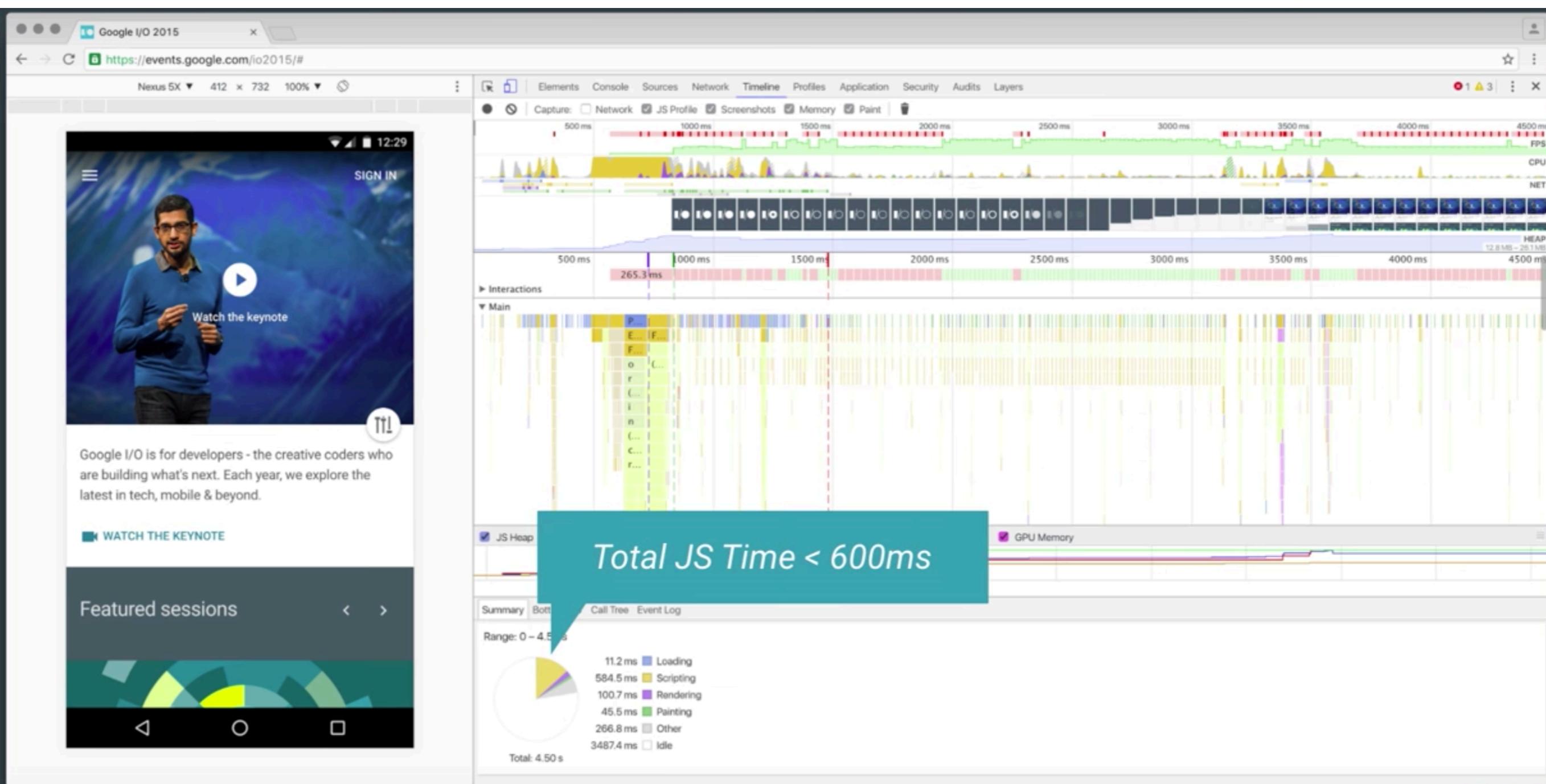
Google Data. Aggregated, anonymized Google Analytics data from a sample of mWeb sites opted into sharing benchmark data, n=3.7K, Global, March 2016

Test on Real Hardware

“Your Laptop is a Filthy Liar”

– [Alex Russell](#), Software Engineer, Google

JavaScript on Desktop



Alex Russell, "Progressive Performance"

<https://developer.chrome.com/devsummit/schedule/sessions/progressive-performance>

JavaScript on Mobile

A man with glasses and a dark suit is speaking on stage, holding a smartphone. To his right is a screenshot of a browser window showing the Google I/O 2015 keynote page. The browser's developer tools timeline is overlaid on the page, showing performance metrics. A callout box highlights the total JavaScript execution time.

Total JS Time: ~4 seconds

Developer Tools - <https://events.google.com/e2015/>

Elements Console Sources Network Timeline Profiles Resources Security Audits Layers

Timeline (ms)

JS Heap

Summary: Duration: 8.54s

Total: 8.54s

Category	Time (ms)
Loading	122.0
Scripting	3936.6
Rendering	522.9
Painting	105.7
Other	1207.2
Idle	2580.0

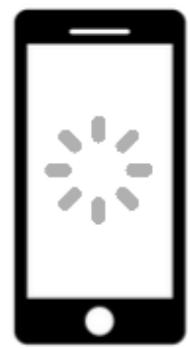
Alex Russell, "Progressive Performance"

<https://developer.chrome.com/devsummit/schedule/sessions/progressive-performance>

Get the Real Deal



Measure Performance with the RAIL Model

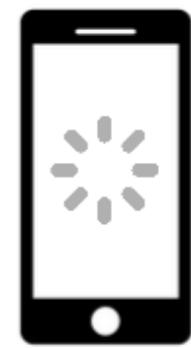


Response

Animation

Idle

Load



Response

Animation

Idle

Load

< 100 ms

**every
16 ms**

**50ms
chunks**

< 1000 ms

Implement the PRPL Pattern

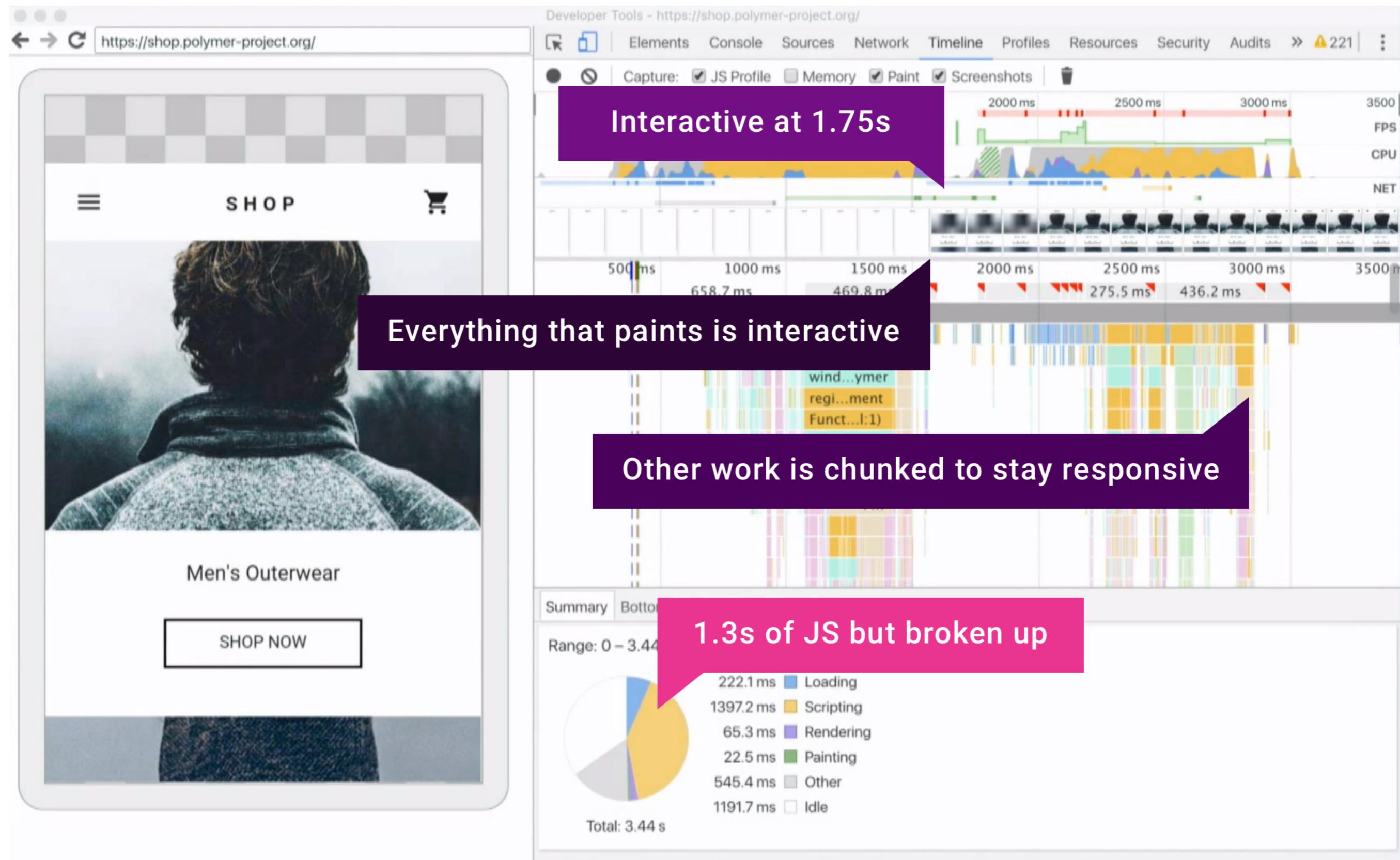
The PRPL Pattern

Push components for initial route

Render the initial route asap

Pre-cache components for remaining routes

Lazy-load & create next routes on-demand



Use Client-Side Storage

Storage Types

- **Cache Storage**
- **Indexed DB**
- Cookies
- Local Storage
- Session Storage

Cache Storage API

The CacheStorage interface represents the **storage for Cache objects**.

It provides a master directory of all the named caches that a ServiceWorker, other type of worker or window scope can access and maintains a mapping of string names to corresponding Cache objects.

Browser Support



40



44

IndexedDB

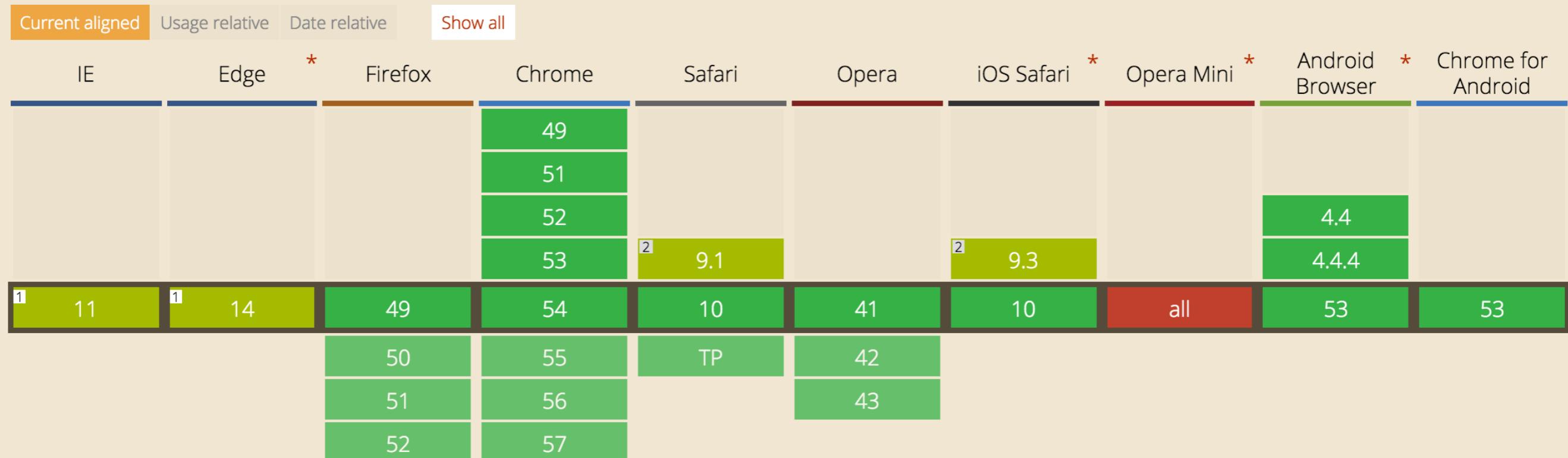
IndexedDB is a **low-level** API for client-side storage of significant amounts of **structured data**.

Browser Support

IndexedDB - REC

Method of storing data client-side, allows indexed database queries.

Global	71.93% + 10.32% = 82.25%
unprefixed:	71.85% + 10.05% = 81.9%
Nigeria	28.54% + 2.66% = 31.2%
unprefixed:	28.32% + 2.51% = 30.83%



Cache Storage API

URL addressable data

IndexedDB

Structured data

bitsofcode



This is a Progressive Web Application for my blog, [bitsofcode](#), in which I write weekly articles on Front-End Web Development. If you have any feedback on how I can make this better, contact me at [@IreAderinokun](https://twitter.com/IreAderinokun) on twitter.

Turn on Push Notifications

You will receive a push notification when a new article is released. New articles are released every Tuesday at 10am BST. ([when's that?](#))

Version 0.1.9 | [View Source](#) | [Visit bitsofcode](#)

Latest  Home  Bookmarks 

bitsofcode

Latest Articles

Variable and Function Hoisting in ES2015

⌚ Last Tuesday  javascript

Variable hoisting is a behaviour in JavaScript where variable declarations are moved to the top of the scope (function scope or global scope) that the variable is defined within. The typical JavaScript variable can be created in two stages - declaration and initialisation.

The declaration stage is where the variable...

 Read  Bookmark

The New System Font Stack?

⌚ Sep 20th, 2016  css

A few months ago, I wrote about how you can use system fonts in the browser using the built-in keywords that work with the font shorthand property ([How to Use System Fonts in the Browser](#)). These

Latest  Home  Bookmarks 

bitsofcode

nth-child vs nth-of-type

⌚ Sep 6th, 2016  css

The `nth-child()` and `nth-of-type()` selectors are ["structural" pseudo-classes](#), which are classes that allow us to select elements based on information within the document tree that cannot typically be represented by other simple selectors.

In the case of `nth-child()` and `nth-of-type()`, the extra information is the element's position in the document tree in relation to its parent and siblings. Although these two pseudo-classes are very similar, they work in fundamentally different ways.

How `nth-child()` Works

The `nth-child()` pseudo-class is used to match an element based on a number, which represents the element's position amongst its siblings. More specifically, the number represents the number of siblings that exist before the element in the document tree (minus 1).

This number is expressed as a function, `n+b`, where `n`

Latest  Home  Bookmarks 

<https://app.bitsofcode.de/>

Try WebAssembly

What is WebAssembly?

- **Source code:** What a developer writes.
- **Compiler:** An application that turns source code into assembly, bytecode or machine code (what other apps or hardware run).
- **Assembly:** A low-level source-like language specific to a machine or an application.
- **Bytecode:** A low-level binary representation of code that can be run by other applications.
- **Machine code:** A binary representation of code that can be run directly by hardware.



Auth0, "7 Things you should know about WebAssembly"

<https://auth0.com/blog/7-things-you-should-know-about-web-assembly/>

Why WebAssembly?





<http://webassembly.org/demo/>

Browser Support

WebAssembly

- OTHER

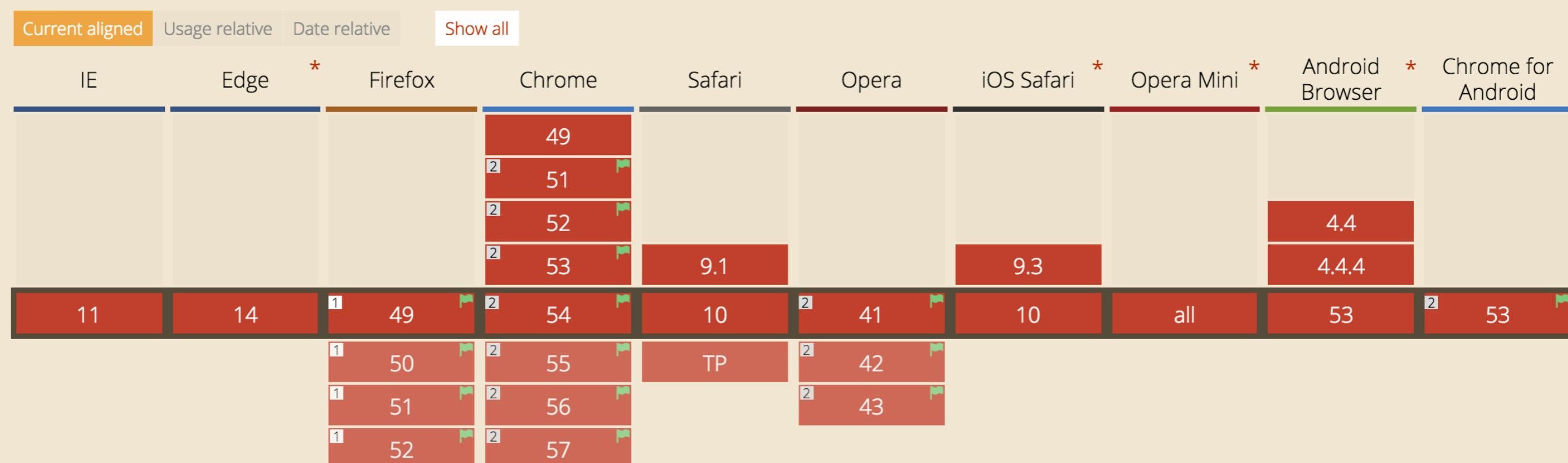
Global

0%

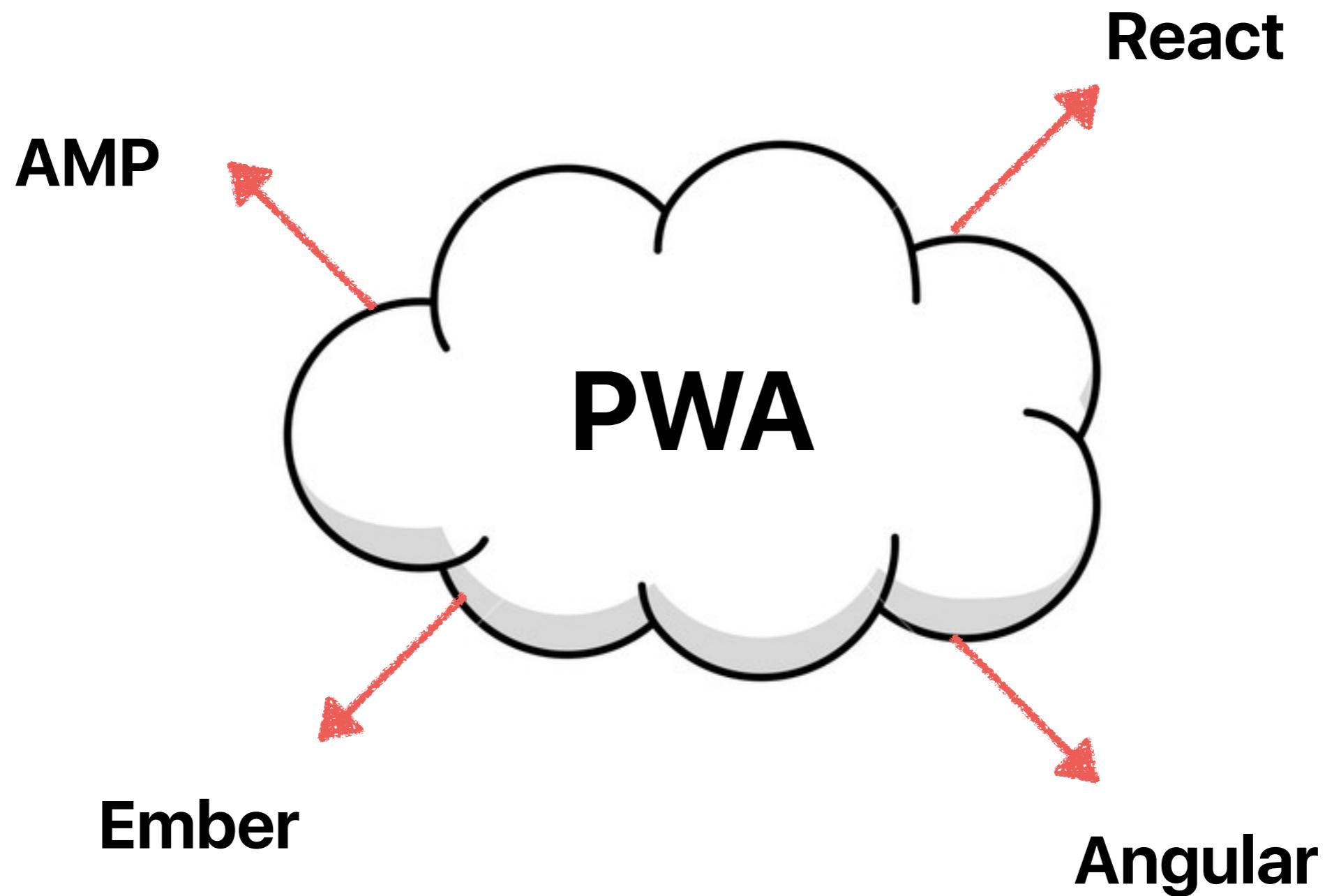
Nigeria

0%

WebAssembly or "wasm" is a new portable, size- and load-time-efficient format suitable for compilation to the web.



PWAs and Modern Frameworks



PWA + AMP = PWAMP

AMP

Instant delivery

Optimized discovery

No user scripts

Static content

PWA

Advanced platform features

Highly dynamic

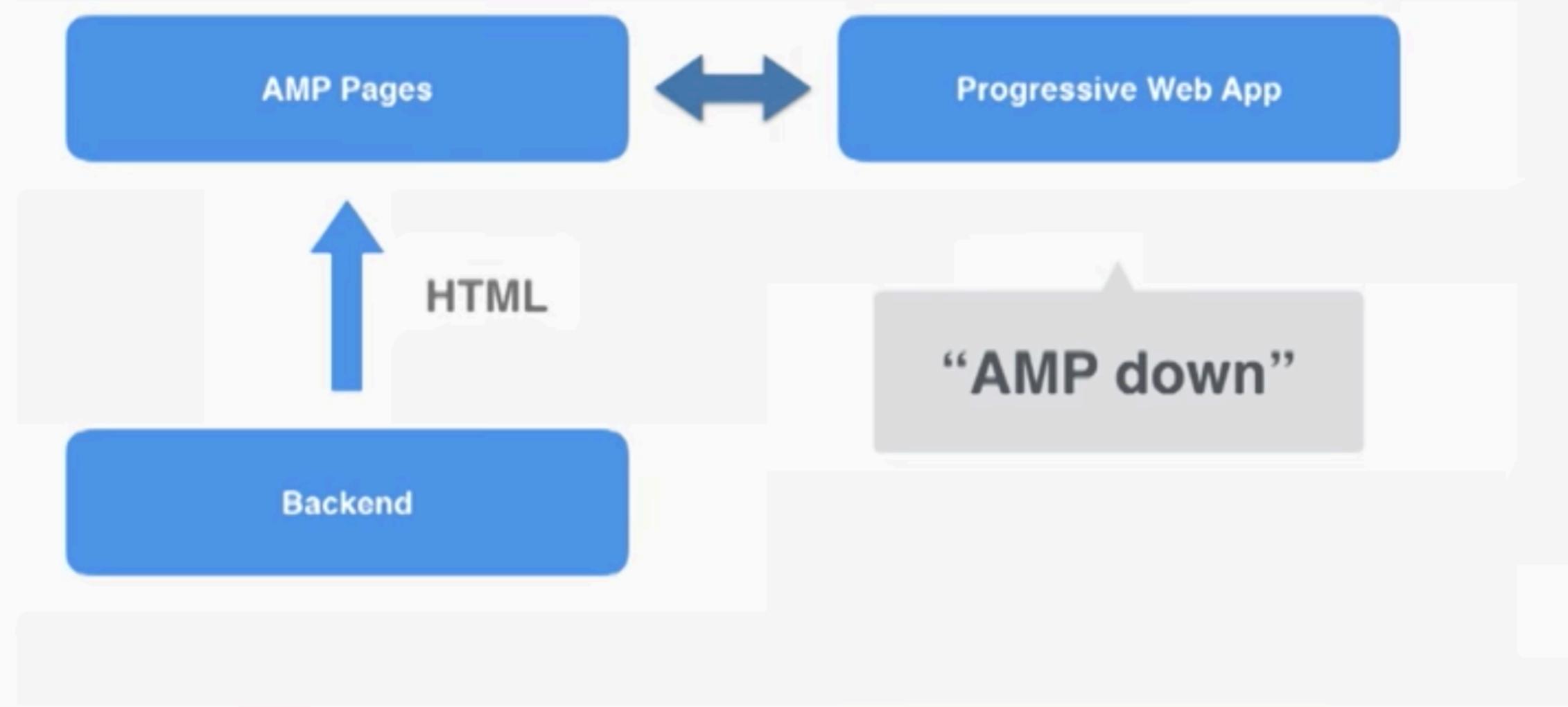
Slower first delivery

Not easily embedded

Paul Bakaus, "From AMP to PWA"

<https://developer.chrome.com/devsummit/schedule/sessions/from-amp-to-pwa>

AMP as data format



Paul Bakaus, "From AMP to PWA"

<https://developer.chrome.com/devsummit/schedule/sessions/from-amp-to-pwa>

Use Performance-Friendly Alternatives

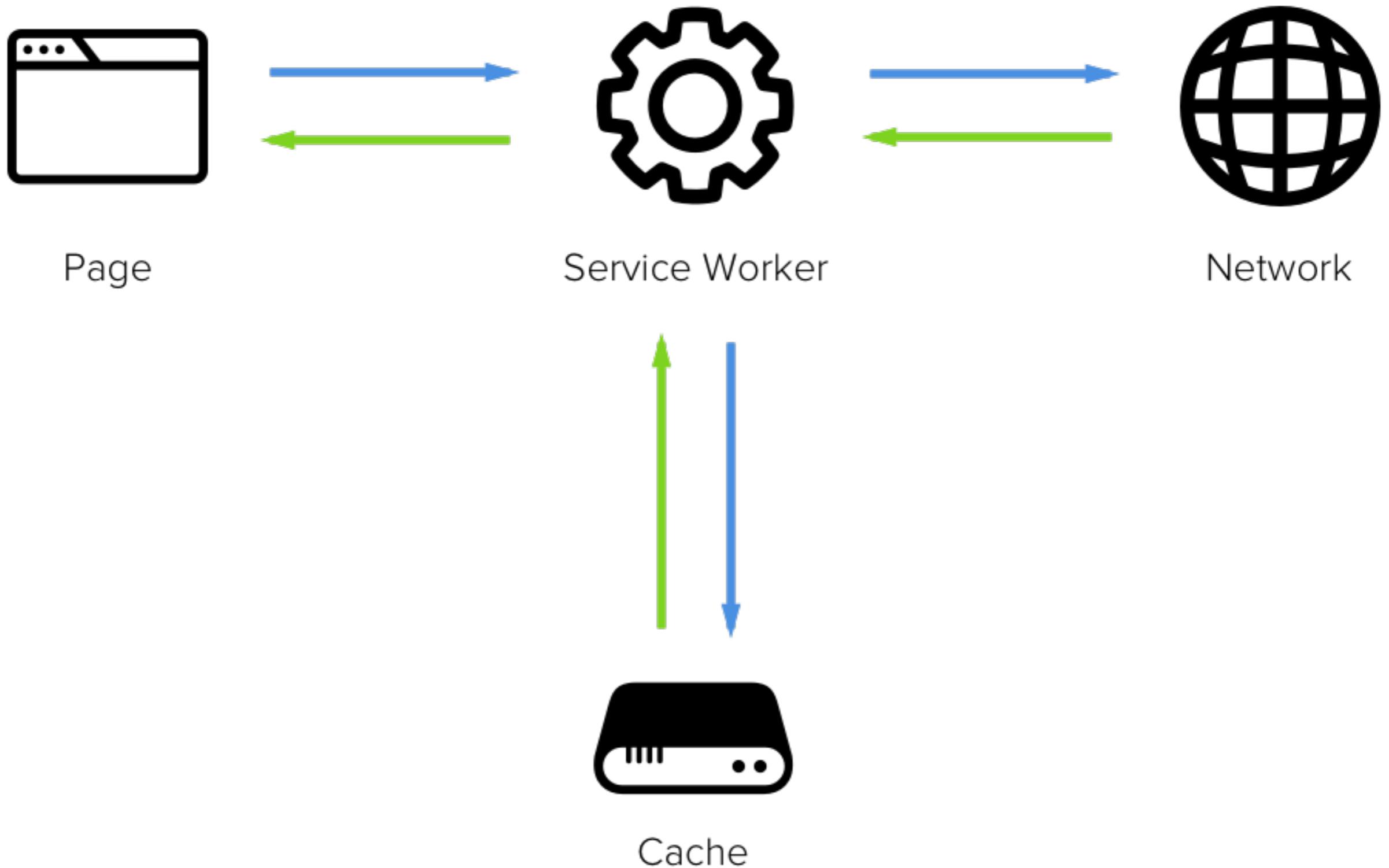


3KB

Advanced Service Worker

What is a Service Worker?

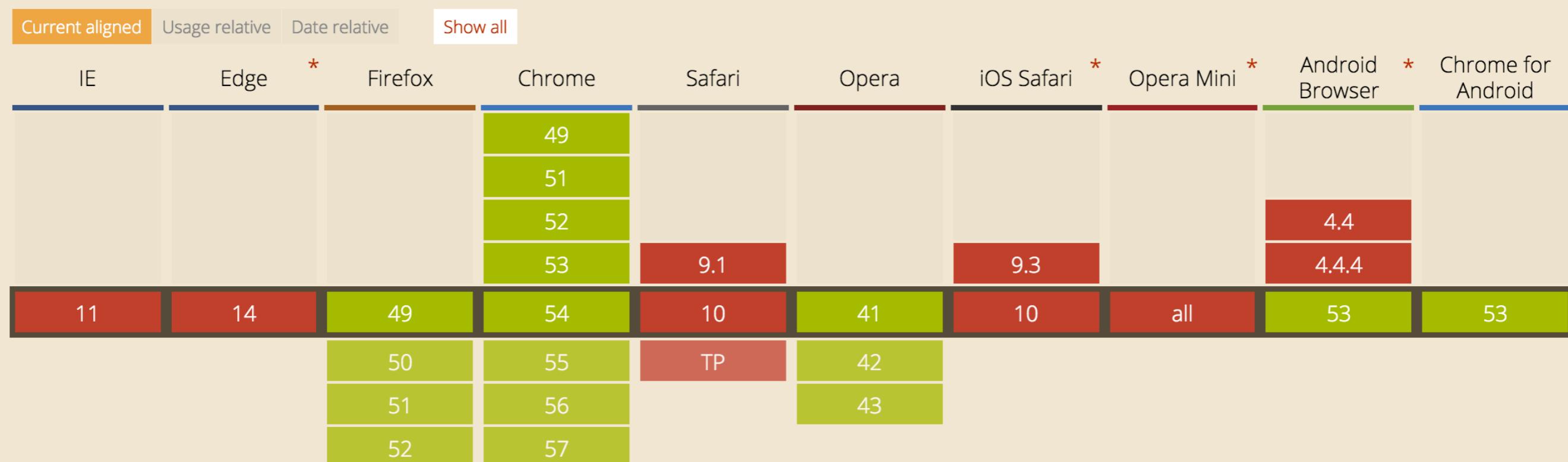
A service worker is a script that runs in the background that can provide features like intercepting and handling **fetch requests, background sync, push notifications** and more.



Browser Support

Service Workers - WD

Method that enables applications to take advantage of persistent background processing, including hooks to enable bootstrapping of web applications while offline.



Background Fetch

In the page

```
const registration = await
```

```
registration.backgroundFetch.addEventListener('fetch', (event) =>
```

In the service worker

```
self.addEventListener('fetch')
```

```
  event.waitUntil(async () =>
```

```
    if (event.tag === 'download')
```

```
      const cache = await
```

```
      const cacheAll = await
```

```
        .map(([request, response]) =>
```

```
          await Promise.all([
```

```
            response.blob(),
```

```
            response.clone().json()
```

```
          ])
```

```
        ).catch(() =>
```

```
          console.error('Failed to cache', event.request)
```

```
        )
```

```
      ).then(() =>
```

```
        cacheAll
```

```
      ).catch(() =>
```

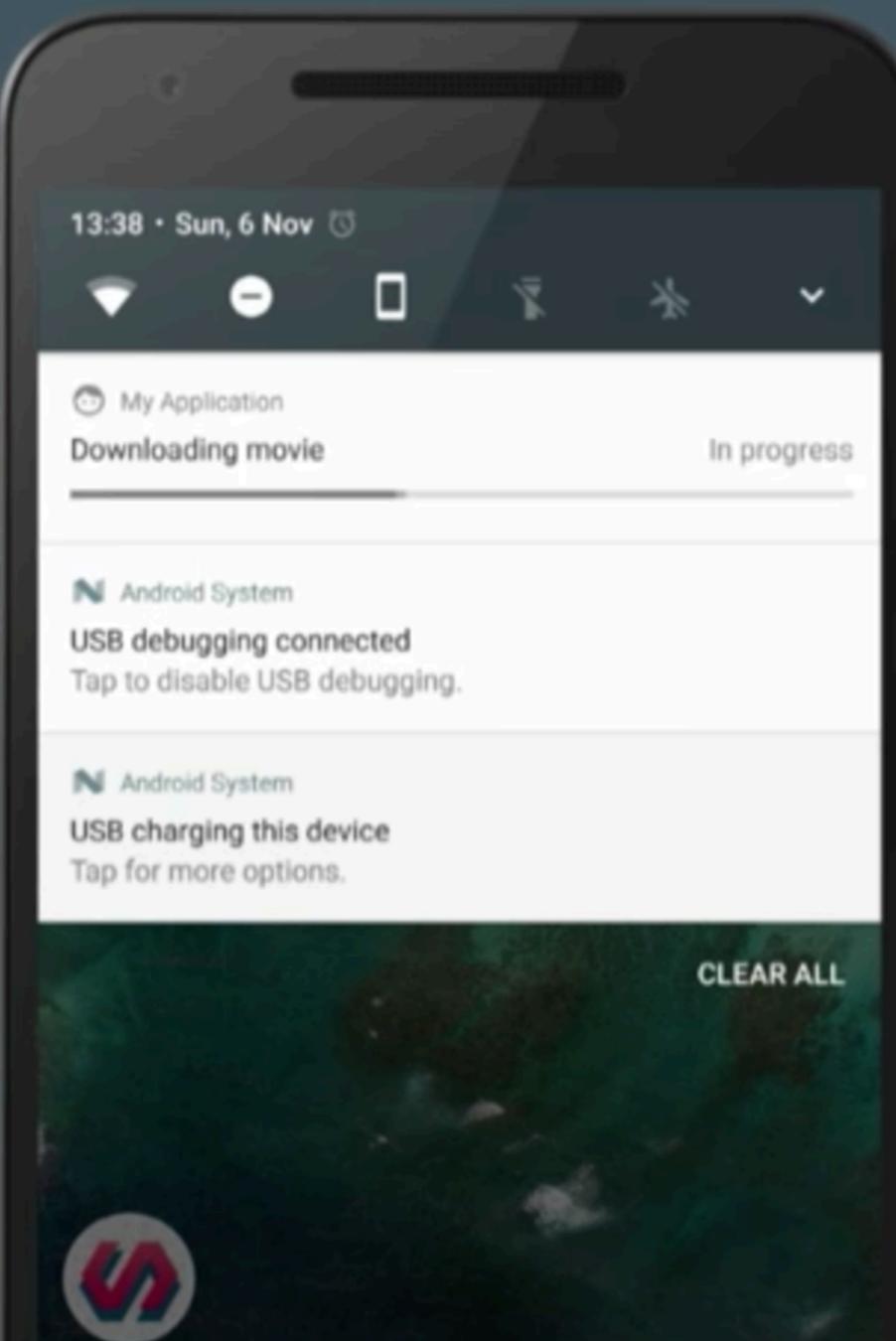
```
        console.error('Failed to cache all', event.request)
```

```
      )
```

```
    )
```

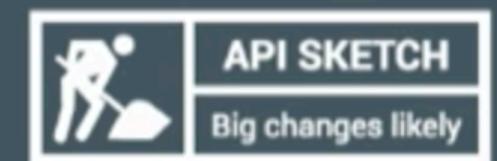
```
  )
```

```
);
```



```
sts);
```

```
response));
```



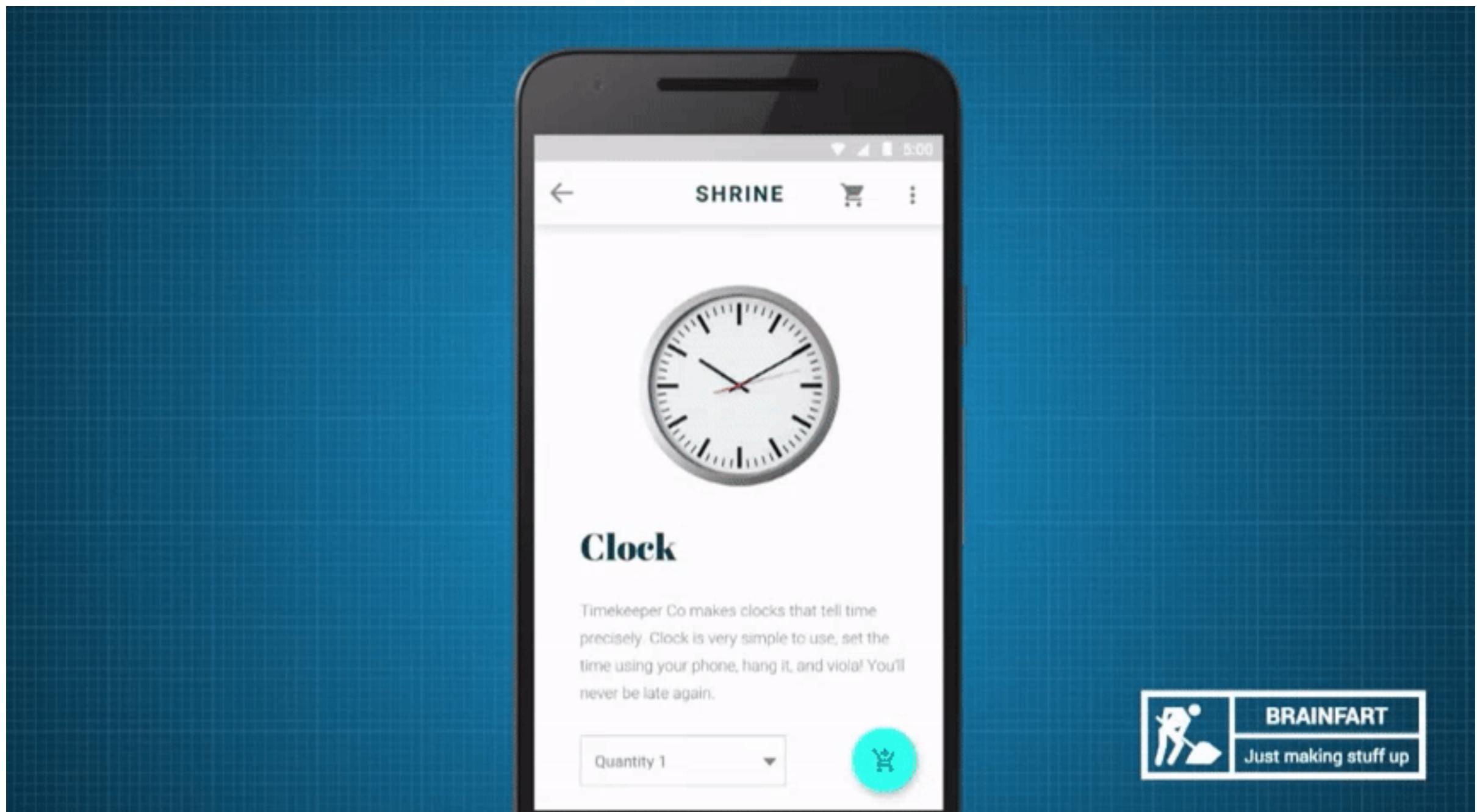
Jake Archibald, "Future App Model"

<https://developer.chrome.com/devsummit/schedule/sessions/future-app-model>

Browser Support

None Yet

Navigation Transitions



Jake Archibald, "Future App Model"

<https://developer.chrome.com/devsummit/schedule/sessions/future-app-model>

Browser Support

None Yet

Doing More with PWAs

PWA Don't Have to Look Like This...

bitsofcode

This is a Progressive Web Application for my blog, [bitsofcode](#), in which I write weekly articles on Front-End Web Development. If you have any feedback on how I can make this better, contact me at [@IreAderinokun](https://twitter.com/IreAderinokun) on twitter.

Turn on Push Notifications

You will receive a push notification when a new article is released. New articles are released every Tuesday at 10am BST. (when's that?)

Version 0.1.9 / [View Source](#) / [Visit bitsofco.de](#)

Latest Home Bookmarks

bitsofcode

Latest Articles

Variable and Function Hoisting in ES2015

⌚ Last Tuesday 📰 javascript

Variable hoisting is a behaviour in JavaScript where variable declarations are moved to the top of the scope (function scope or global scope) that the variable is defined within. The typical JavaScript variable can be created in two stages - declaration and initialisation.

The declaration stage is where the variable...

Read **Bookmark**

The New System Font Stack?

⌚ Sep 20th, 2016 📰 css

A few months ago, I wrote about how you can use system fonts in the browser using the built-in keywords that work with the font shorthand property ([See Using System Fonts in the Browser](#)). Then...

Latest Home Bookmarks

bitsofcode

nth-child vs nth-of-type

⌚ Sep 6th, 2016 📰 css

The `nth-child()` and `nth-of-type()` selectors are ["structural" pseudo-classes](#), which are classes that allow us to select elements based on information within the document tree that cannot typically be represented by other simple selectors.

In the case of `nth-child()` and `nth-of-type()`, the extra information is the element's position in the document tree in relation to its parent and siblings. Although these two pseudo-classes are very similar, they work in fundamentally different ways.

How `nth-child()` Works

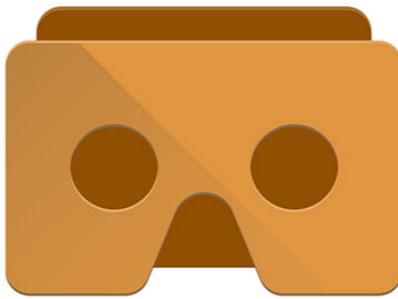
The `nth-child()` pseudo-class is used to match an element based on a number, which represents the element's position amongst its siblings. More specifically, the number represents the number of siblings that exist before the element in the document tree (minus 1).

This number is expressed as a function, `n+b`, where `n`

Latest Home Bookmarks

<https://app.bitsofco.de/>

WebVR



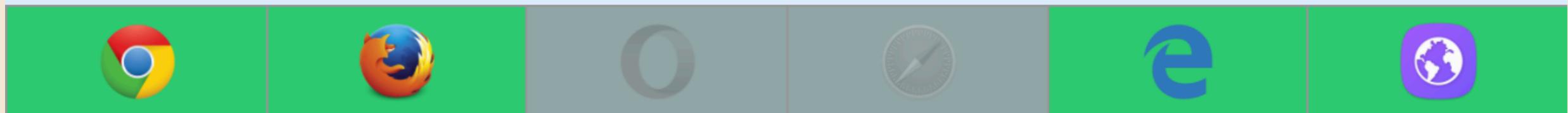
bit.ly/webvr-demos

Created by Martin Split

Browser Support

WebVR enthusiasm

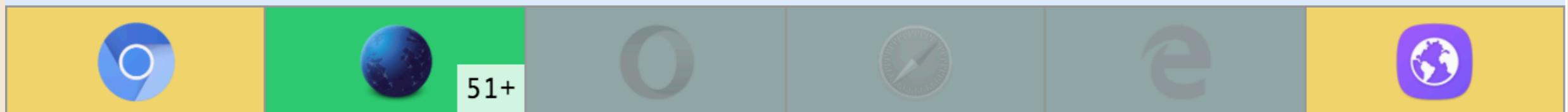
The first thing any implementation needs.



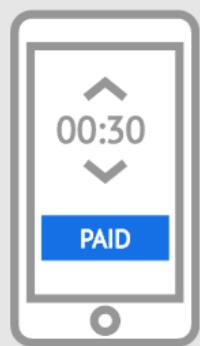
WebVR API (`navigator.getVRDisplays`)

Client-side JavaScript API for querying connected VR headsets and peripherals. Returns a Promise that resolves an array of available **VRDisplays**.

Spec. Test.

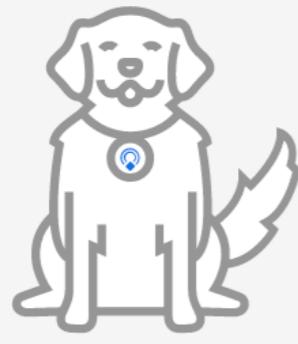
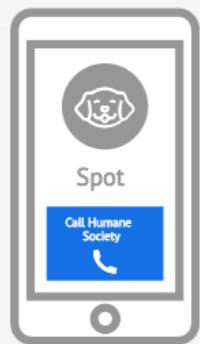


Physical Web



Everything is a tap away

Walk up and interact with any object -- a parking meter, a toy, a poster -- or location -- a bus stop, a museum, a store -- without installing an app first. Interactions are only a tap away.



See what's useful around you

See web pages associated with the space around you. Choose the page most useful to you.



Any object or place can broadcast content

When *anything* can offer information and utility, the possibilities are endless.

Turn On Physical Web (Now!)

ios	Android
<ol style="list-style-type: none">1. Install Google Chrome2. Go to the Widgets Screen3. Click on Edit4. Add the Chrome Widget5. Wait for the Physical Web Information, then click Enable	<ol style="list-style-type: none">1. Install or Open Google Chrome2. Go to Settings3. Go to Privacy (under Advanced)4. Click Physical Web5. Toggle Enable

Look for “bitsofcode” or “Building Modern PWA”

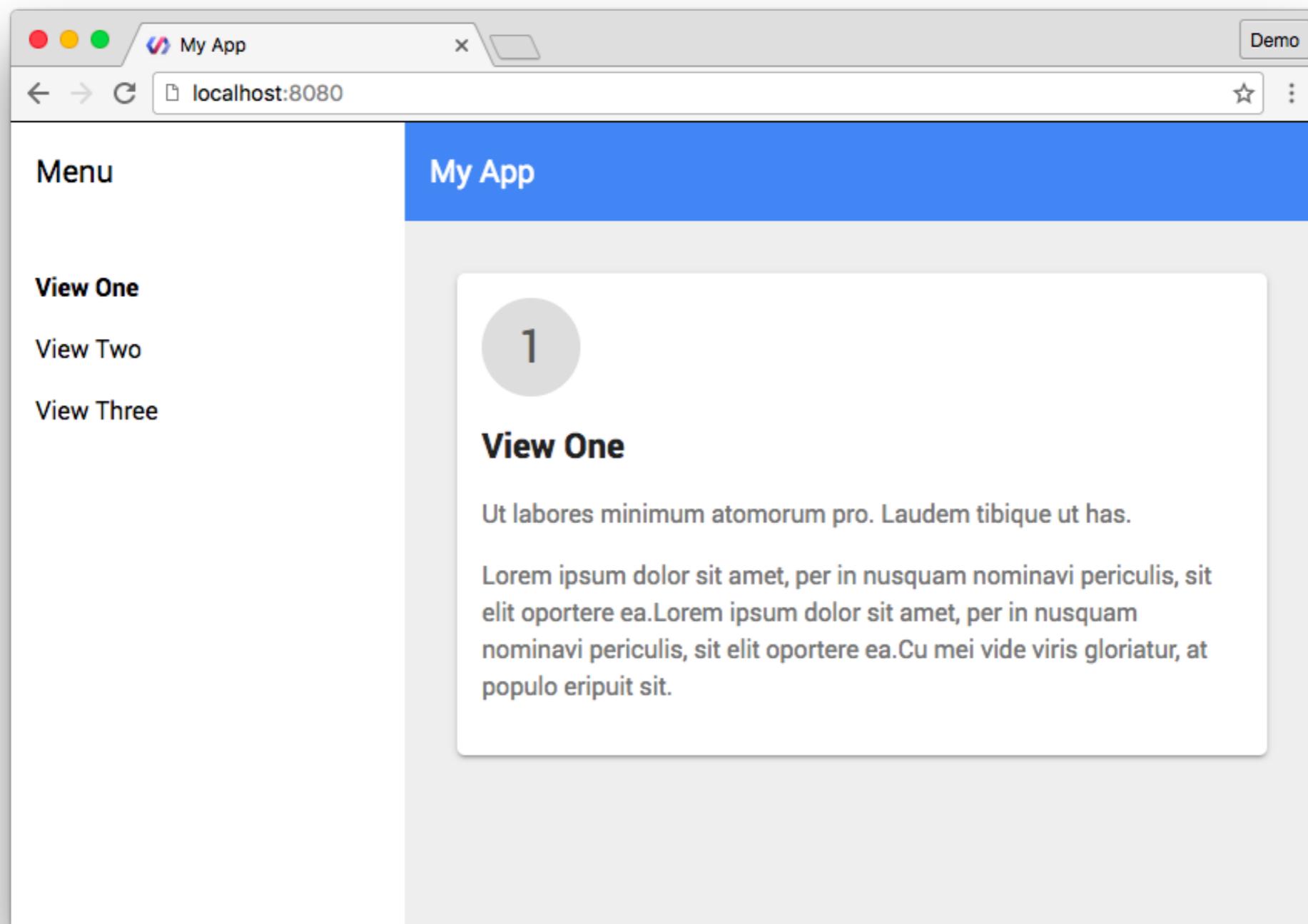
Tools for Developing PWAs

Web Starter Kit



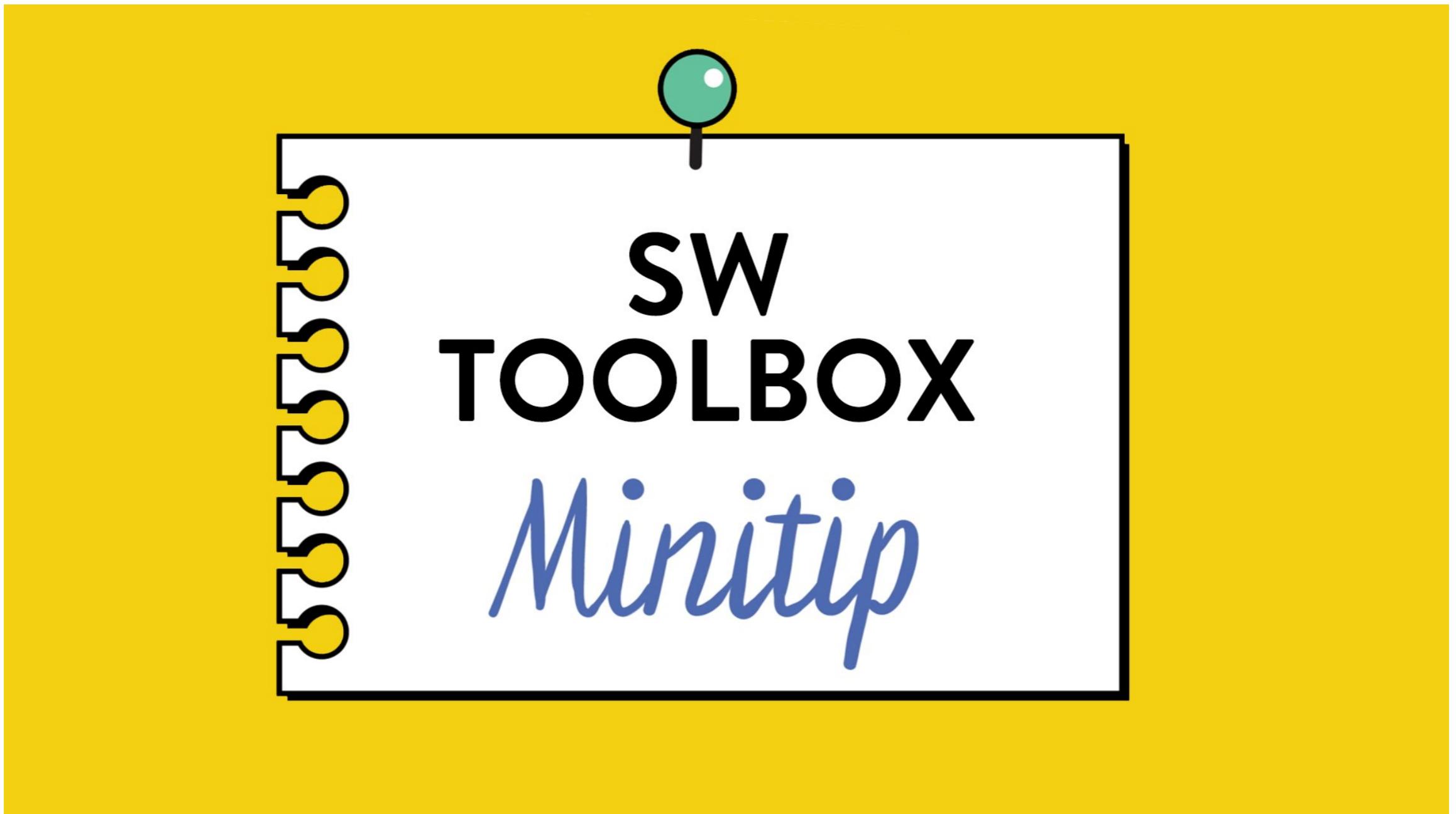
<https://github.com/google/web-starter-kit>

Polymer Starter Kit



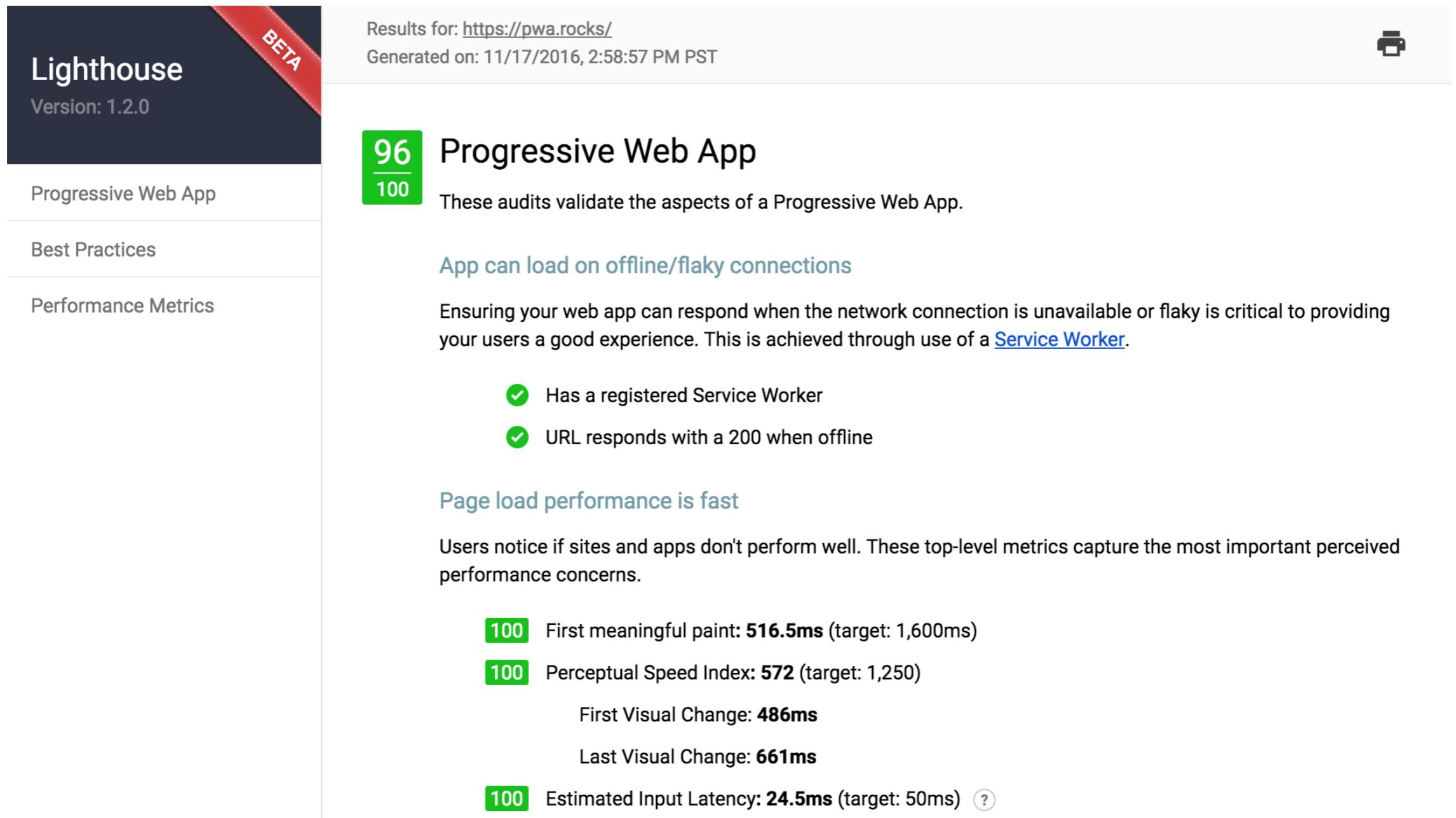
<https://github.com/PolymerElements/polymer-starter-kit>

SW Precache & SW Toolbox



<https://github.com/GoogleChrome/sw-precache> & <https://github.com/GoogleChrome/sw-toolbox>

Lighthouse



Results for: <https://pwa.rocks/>
Generated on: 11/17/2016, 2:58:57 PM PST 🖨️

96 / **100** **Progressive Web App**

These audits validate the aspects of a Progressive Web App.

App can load on offline/flaky connections

Ensuring your web app can respond when the network connection is unavailable or flaky is critical to providing your users a good experience. This is achieved through use of a [Service Worker](#).

- ✓ Has a registered Service Worker
- ✓ URL responds with a 200 when offline

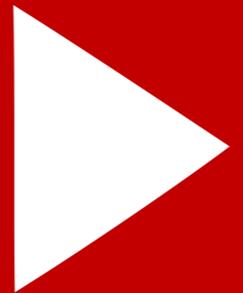
Page load performance is fast

Users notice if sites and apps don't perform well. These top-level metrics capture the most important perceived performance concerns.

- 100** First meaningful paint: **516.5ms** (target: 1,600ms)
- 100** Perceptual Speed Index: **572** (target: 1,250)
 - First Visual Change: **486ms**
 - Last Visual Change: **661ms**
- 100** Estimated Input Latency: **24.5ms** (target: 50ms) ?

<https://github.com/GoogleChrome/lighthouse>

Chrome Dev Summit 2016



bit.ly/chrome-dev-summit-2016

Thank You!