

# Progressive Web Apps

Free Code Camp  
23 April, 2016



# About me



**Đinh Quang Trung**  
Developer



- Writing code since 2009
- Graduated **FPT University**
- Web Developer at **Silicon Straits Saigon**
- Web-tech Expert from **Google Developer Experts** Program



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# Experts

HOME

ABOUT

BECOME AN EXPERT



TECHNOLOGY



MARKETING



UX / UI



PRODUCT STRATEGY



LOCATION



**Gerwin Sturm**

Vienna, Austria

Technology

APIs, Authentication



**Daniel Viveiros**

Campinas, Brazil

Technology

Google Cloud Platform, Java Development,  
Software Architecture



**David González**

London, UK

Technology

Android TV, Material Design, Video  
streaming



**Maxime Basset**

Paris, France

UX / UI

Design Thinking, Information Architecture,  
Service Design





**WHICH ROLE  
MATCHES YOU?**



**PRODUCT  
MANAGER**

**SENIOR  
BACK-END  
DEVELOPER**

**SENIOR  
PYTHON / GOLANG  
DEVELOPER**

**SENIOR  
iOS  
DEVELOPER**

**SENIOR  
AUTOMATION  
QUALITY ASSURANCE**

**SENIOR  
FRONT-END  
DEVELOPER**

**NOTHING  
INTERESTING ENOUGH?  
CREATE YOURS!**

<http://www.siliconstrains.vn/careers>



# Progressive Web Apps

Compare Search terms ▼

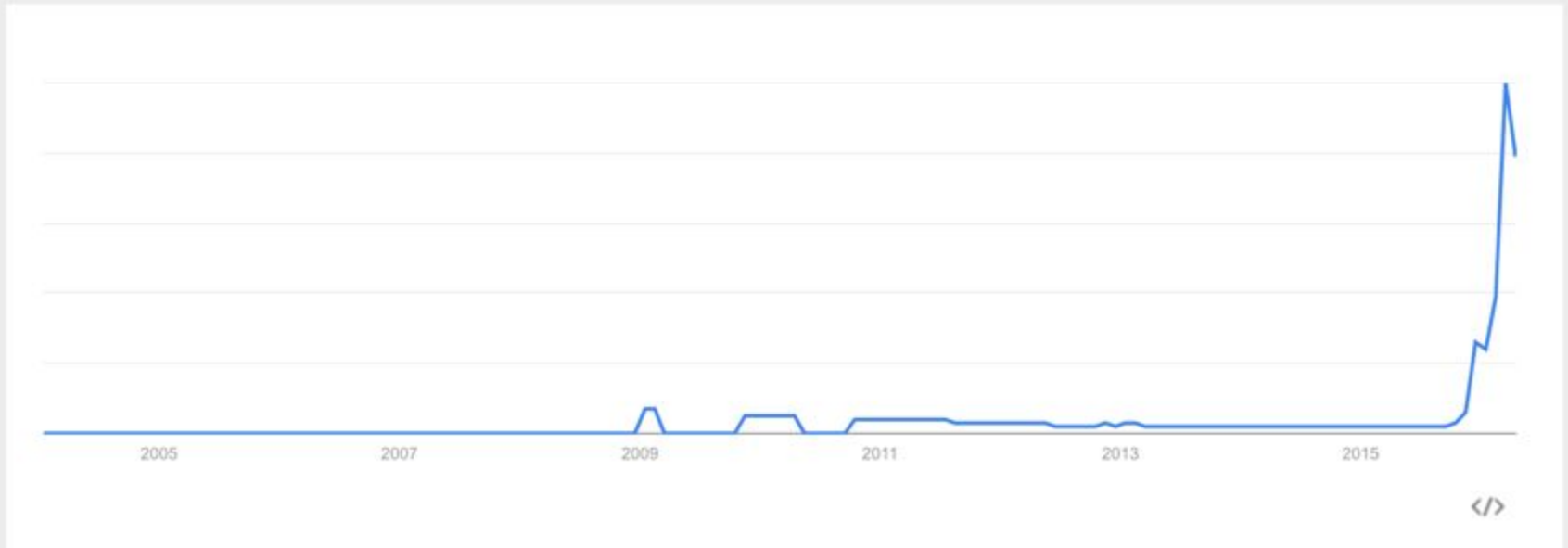
progressive web apps

Search term

+Add term

Interest over time ?

News headlines ? Forecast ?



**Get started!**



Web app

Hybrid app

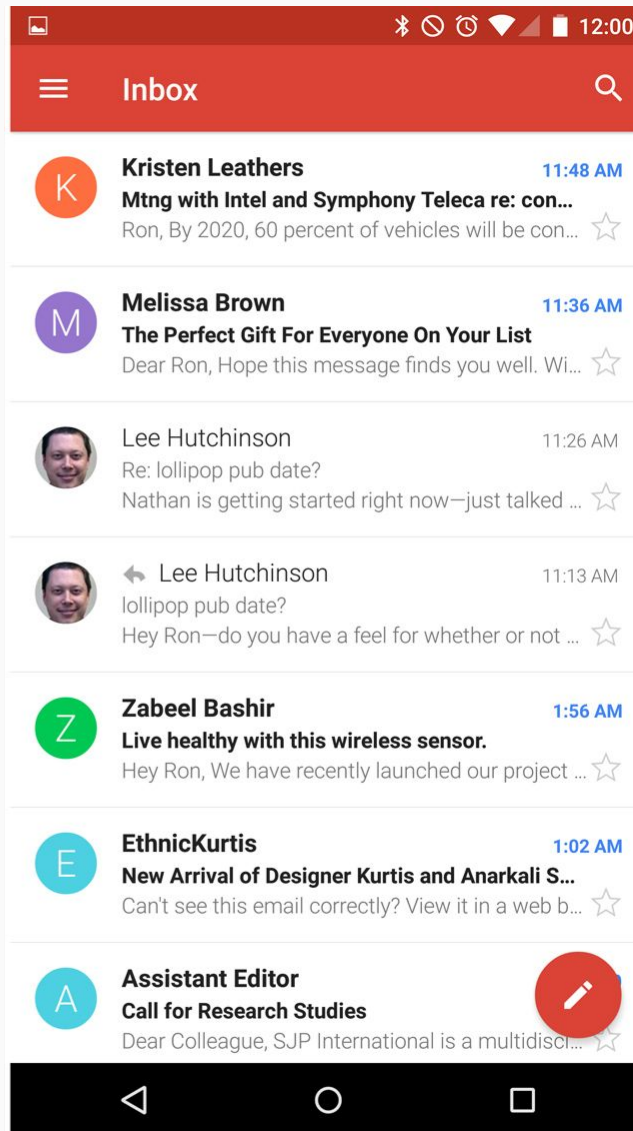
Native app



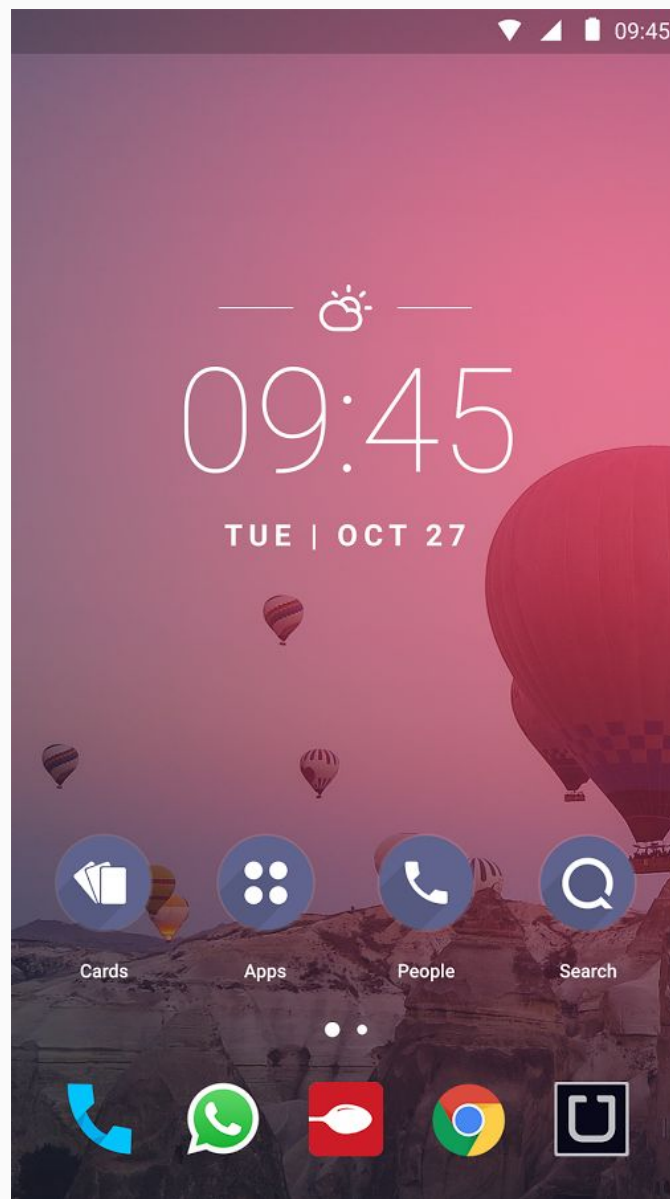
We love native apps



Fast



Offline



Engage



Native experiences

But... not always

## User search for content from browser

- They can search for everything without thinking about what app to use.
- Powerful search engine from Google
- More information on the web



Ăn uống ▾

Ở đâu

Ăn gì



Mới nhất ▾

Danh mục ▾

Khu vực ▾

**"MIỄN PHÍ CHUYẾN ĐI"**  
KHI GỌI XE UBER TRÊN

UBER

**FOODY APP**



TẢI APP NGAY →

7.5

**IZZIBING Snow Dessert Coffee - Bingsu**

49 Phố Quang, P. 2



**Phương Như**

7.0

Nên đi 2 đến 3 người, ở giữa có đậu đỏ mặc dù là trà xanh, 2 người nhưng ăn không hết, tổng

Ảnh Ảnh

8.0



**MỞ & LƯU VÀO APP**  
Truy cập nhanh hơn Web

**CÀI ĐẶT**  
IOS APP





f Đăng nhập

## Hot & Cold - Trà Sữa & Xiên Que - Trịnh Văn Cẩn

Café/Trà sữa

3.3 từ 18 người đánh giá

Lozi sẽ hoạt động tốt nhất khi bạn chuyển sang ứng dụng iOS thú vị của chúng mình nhé!



Ứng dụng Lozi cho iOS



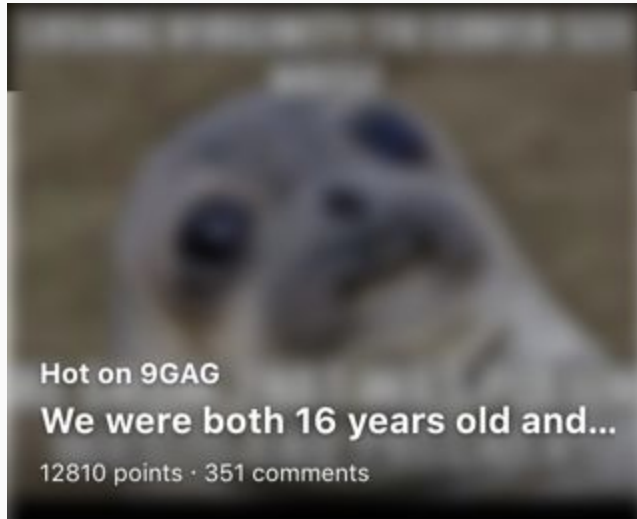
370,000 người đánh giá là ứng dụng tốt nhất

Tiếp tục



Còn nữa và đợi bạn khám phá tiếp với ứng dụng Lozi

Tiếp tục với ứng dụng Lozi!



**9GAG works best if you  
switch to our iPhone-  
friendly app**



**9GAG for iPhone**



900,000+ five-star reviews

**CONTINUE**

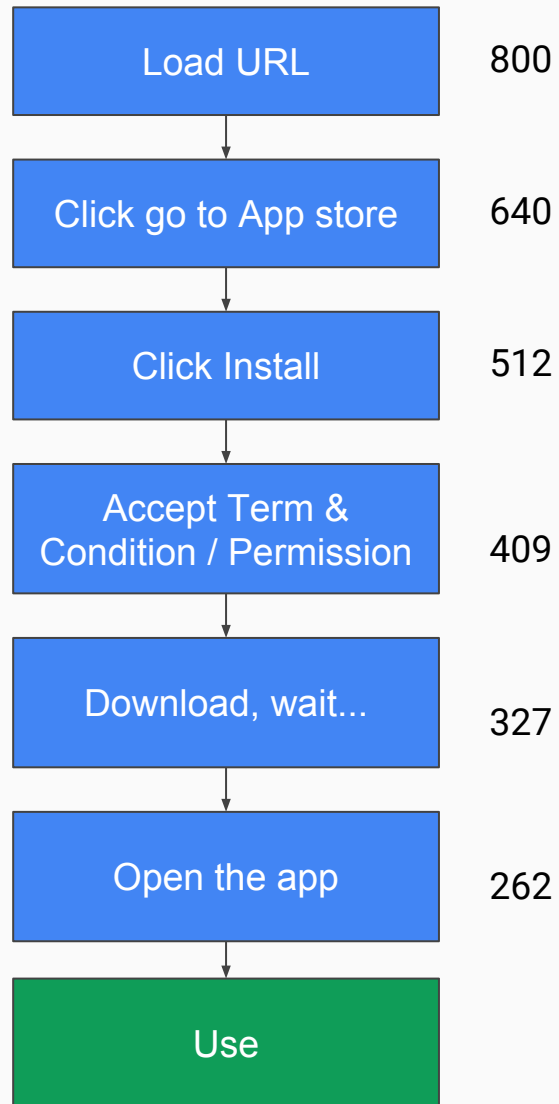
Scroll down to preview in browser

Do you really want an native app in this case?

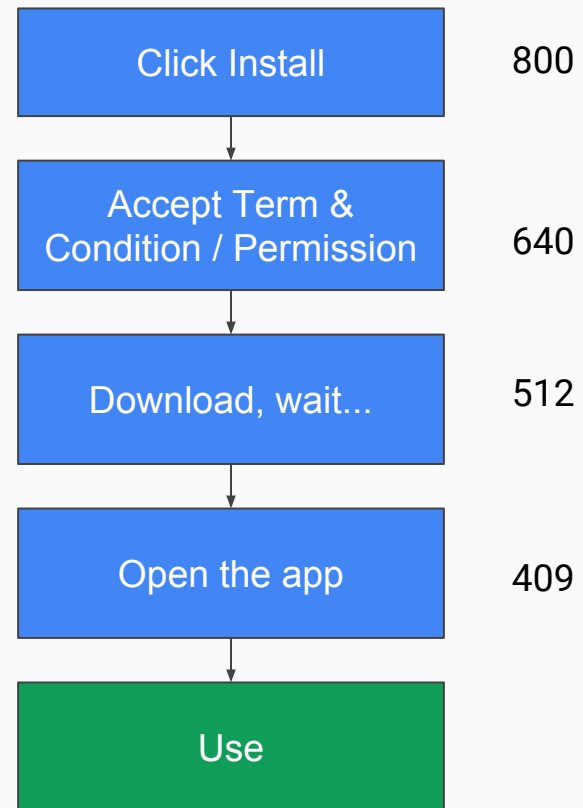
If user search for your content on browser, they **DO** want to view it on browser. Immediately.

*“In a consumer mobile app, every step you make a user perform before they get value out of your app will cost you 20% of users.”*

1000 users

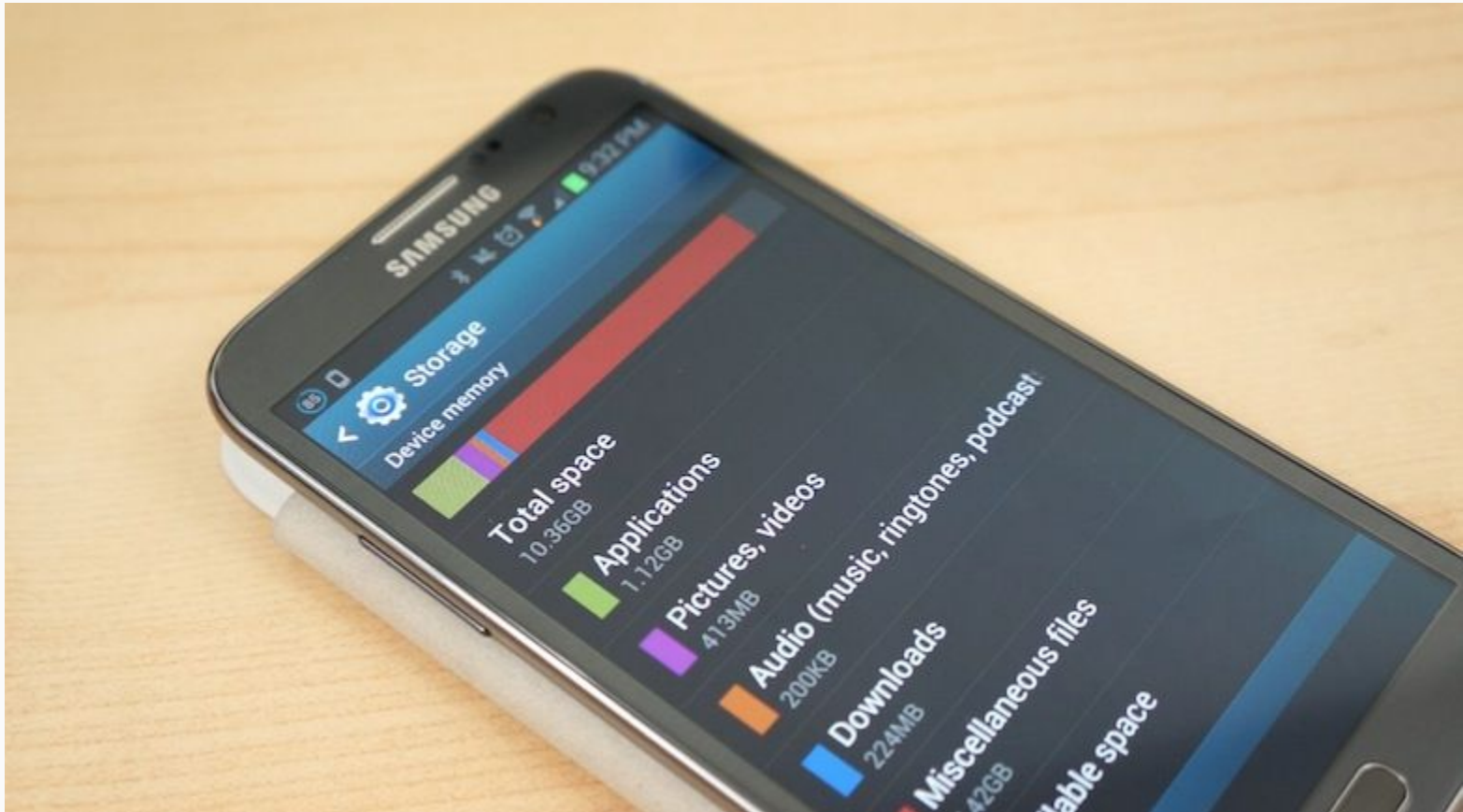


1000 users





More reasons



Users don't want to install a lot of apps in their phone. Especially one-time-usage apps.

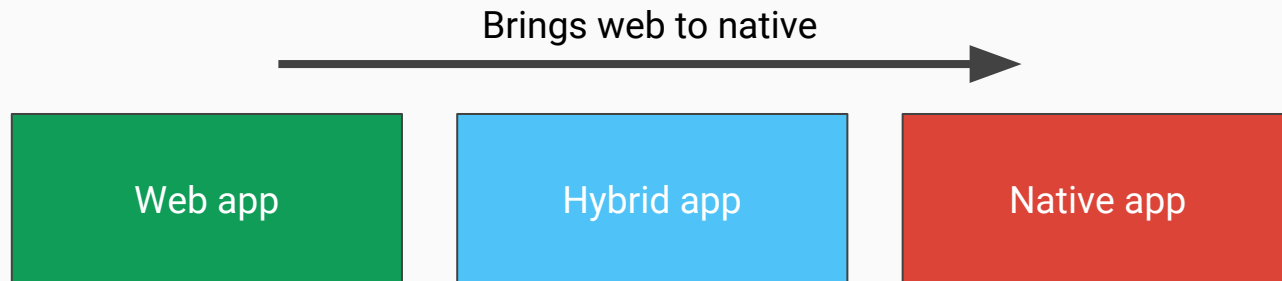
Multiple platforms app requires a lot of effort to develop and maintain



So...

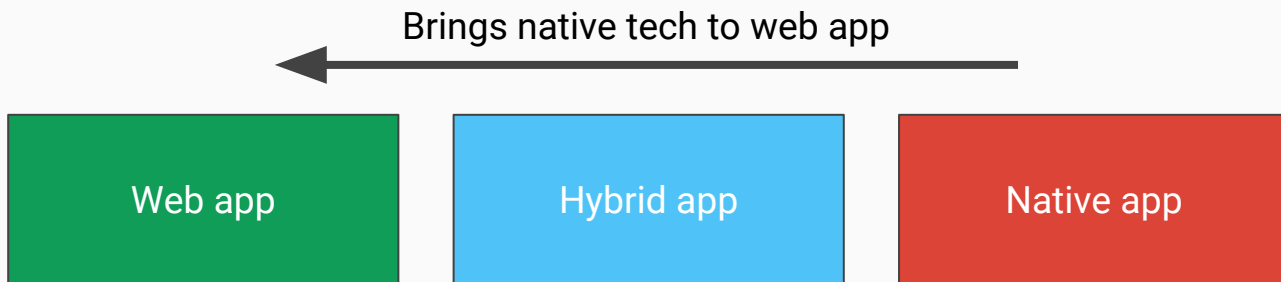
native apps are not always the solution

# We've seen a lot of attempts on bringing web apps to mobile devices



- Apache: Cordova  $\Rightarrow$  PhoneGap  $\Rightarrow$  Ionic, Famo, F7...
- Facebook: React Native
- Titanium
- Sencha Touch
- WebOS
- FirefoxOS
- ...

# What if we can make web apps more “like native” apps?



What's wrong with web apps?



# What's wrong with web apps?

- Requires internet  $\Rightarrow$  Not offline
- Open browser & type URL  $\Rightarrow$  Not engage
- Poor performance  $\Rightarrow$  Not fast
- Native experiences:
  - Push Notification
  - Splash screen
  - Home screen icon
  - GPS Location, sensors, cameras...
  - ...




What if I told you...  
the web is ready!


- = ~~Requires internet~~ ⇒ ~~Not offline~~
- = ~~Open browser & type URL~~ ⇒ ~~Not engage~~
- = ~~Poor performance~~ ⇒ ~~Not fast~~
- = ~~Native experiences:~~

- = ~~Push Notification~~
- = ~~Splash screen~~
- = ~~Home screen icon~~
- GPS Location, sensors, cameras...
- ...

Well, "almost"



Comming soon?



# Service Worker for offline caching

*<http://www.w3.org/TR/service-workers/>*



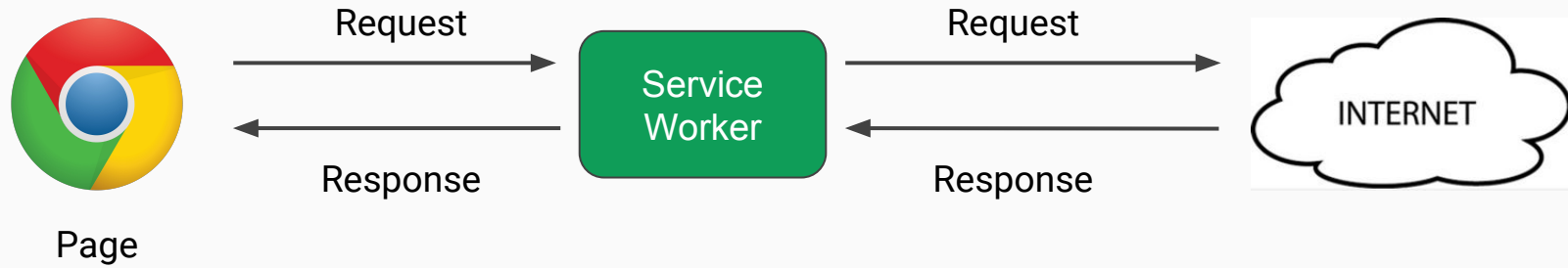
Page

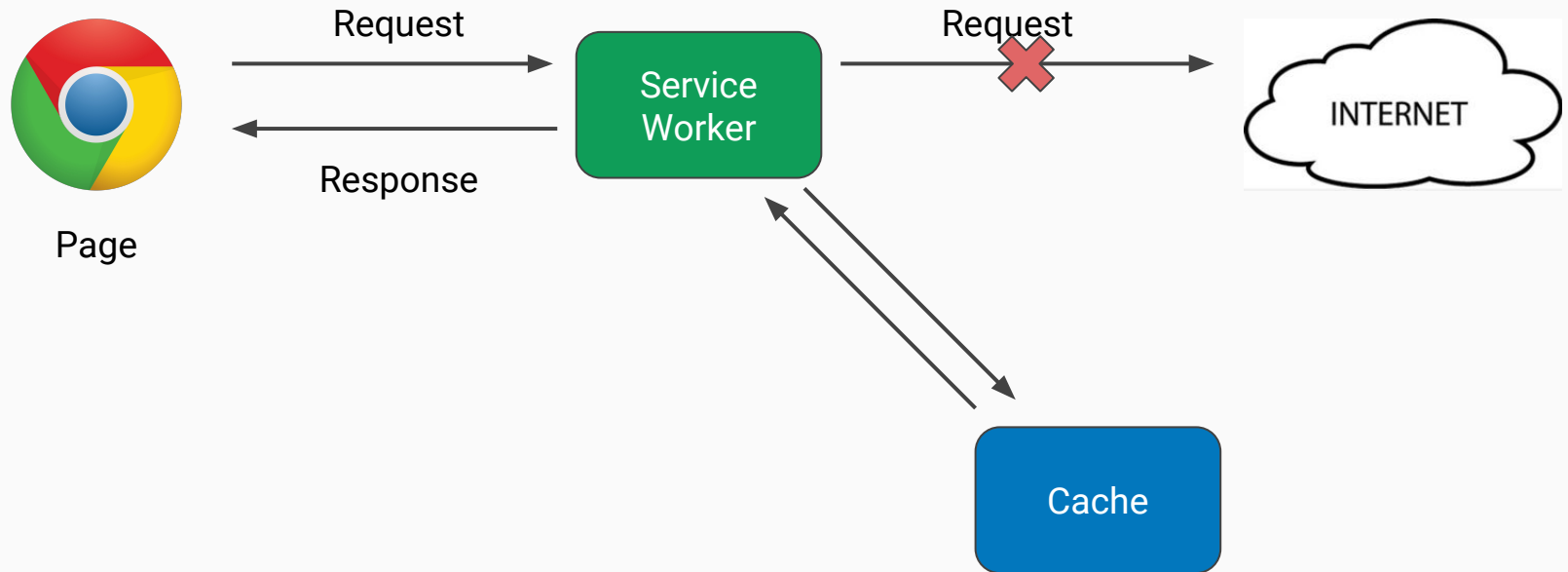
Request



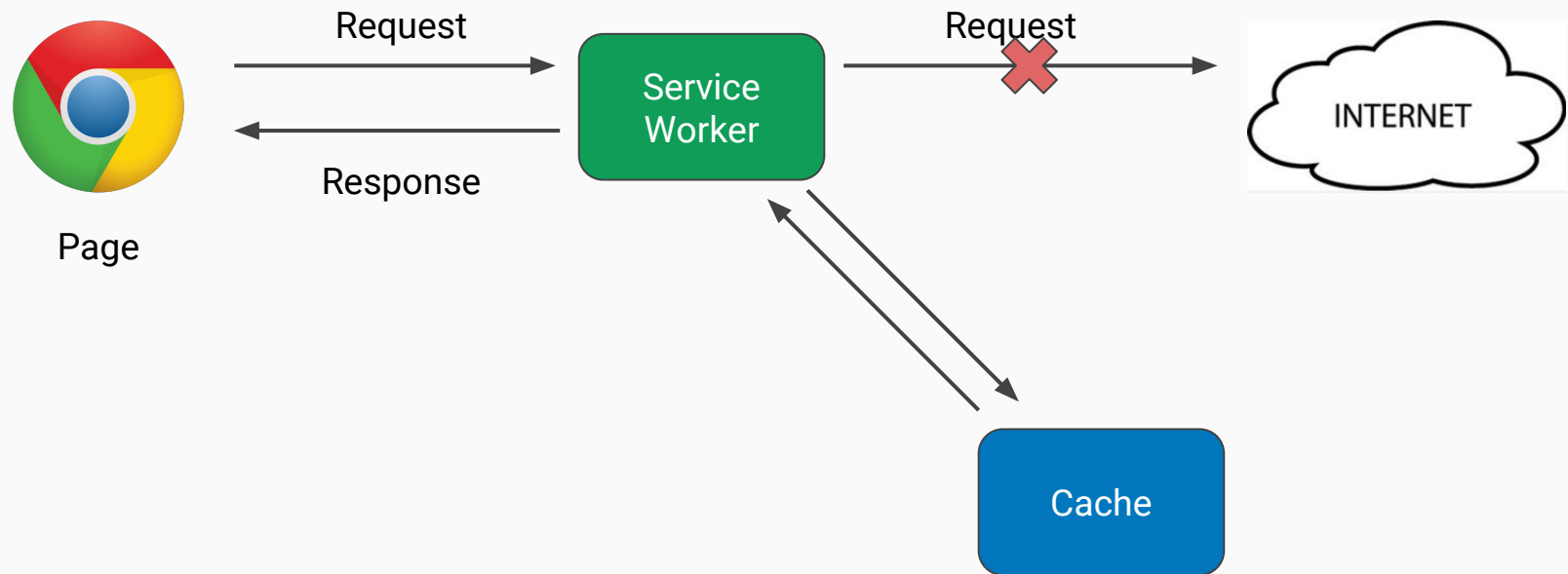
Response











Offline usage

```
if ('serviceWorker' in navigator) {  
  navigator.serviceWorker.register('/sw.js').then(function(registration) {  
    // Registration was successful  
    console.log('ServiceWorker registration successful with scope: ', registration.scope);  
  }).catch(function(err) {  
    // registration failed :(  
    console.log('ServiceWorker registration failed: ', err);  
  });  
}
```

# sw.js

```
// The files we want to cache
var urlsToCache = [
  '/',
  '/styles/main.css',
  '/script/main.js'
];

// Set the callback for the install step
self.addEventListener('install', function(event) {
  // Perform install steps
});
```

# sw.js

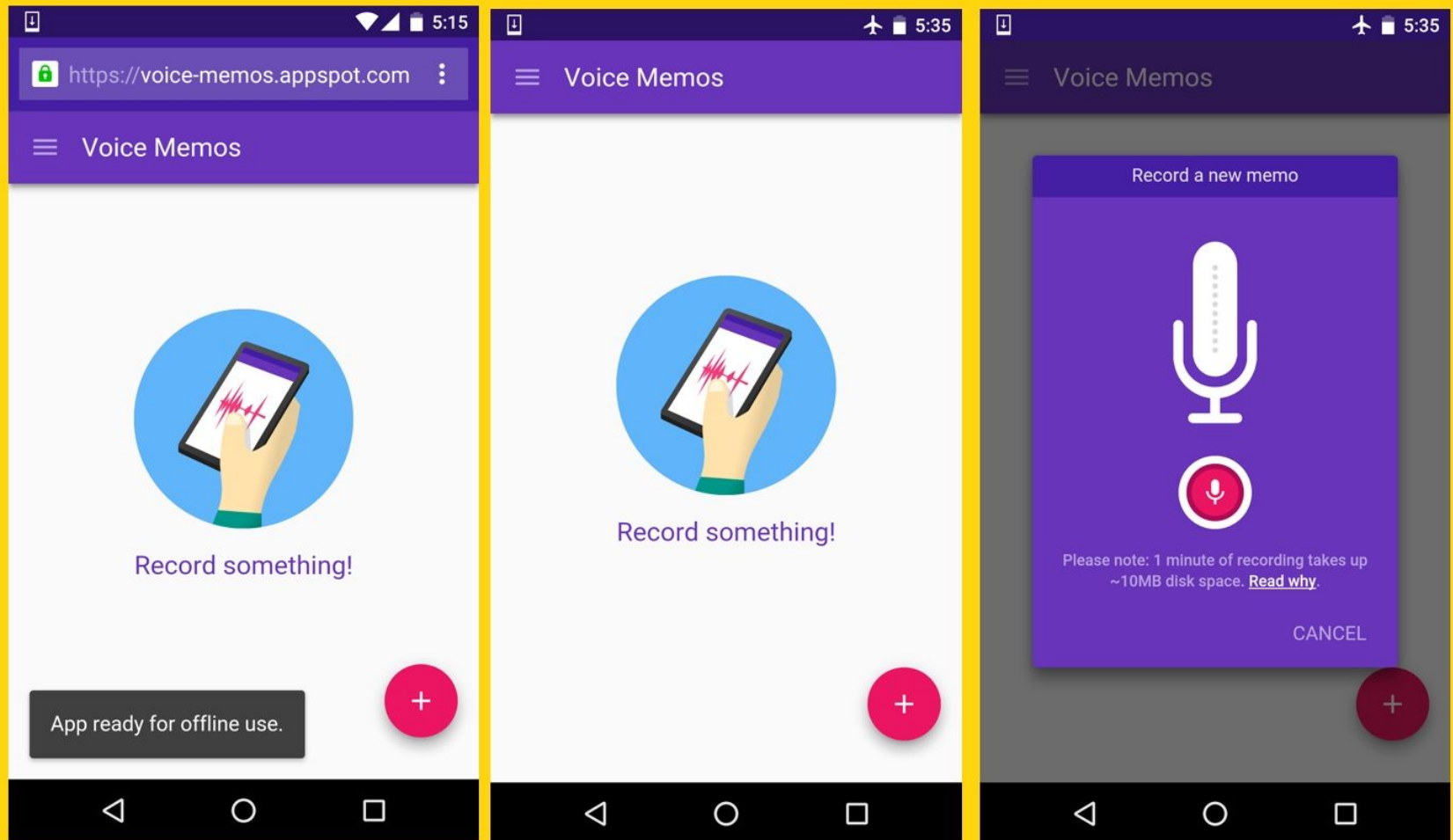
```
var CACHE_NAME = 'my-site-cache-v1';
var urlsToCache = [
  '/',
  '/styles/main.css',
  '/script/main.js'
];

self.addEventListener('install', function(event) {
  // Perform install steps
  event.waitUntil(
    caches.open(CACHE_NAME)
      .then(function(cache) {
        console.log('Opened cache');
        return cache.addAll(urlsToCache);
      })
  );
});
```

## How to Cache and Return Requests

```
self.addEventListener('fetch', function(event) {
  event.respondWith(
    caches.match(event.request)
      .then(function(response) {
        // Cache hit - return response
        if (response) {
          return response;
        }

        return fetch(event.request);
      })
  );
});
```



Service Worker caching of the app shell, allowing it to load without the network

# Web App Manifest

*<https://www.w3.org/TR/2016/WD-appmanifest-20160331/>*

## manifest.json

```
{
  "short_name": "Voice Memos",
  "name": "Voice Memos",
  "icons": [
    {
      "src": "launcher-icon-2x.png",
      "sizes": "96x96",
      "type": "image/png"
    },
    {
      "src": "launcher-icon-3x.png",
      "sizes": "144x144",
      "type": "image/png"
    },
    {
      "src": "launcher-icon-4x.png",
      "sizes": "192x192",
      "type": "image/png"
    }
  ],
  "start_url": "/index.html",
  "display": "standalone",
  "orientation": "landscape"
}
```



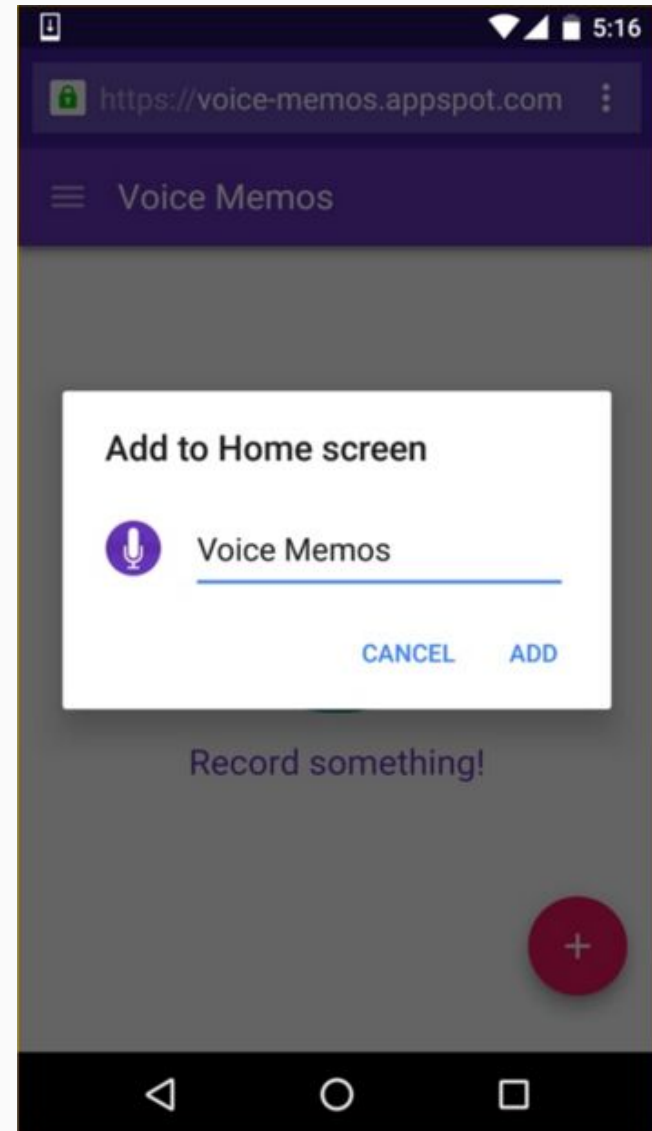
Telling the browser about your manifest

```
<link rel="manifest" href="/manifest.json">
```

## Add to home screen

manifest.json

```
{
  "short_name": "Voice Memos",
  "name": "Voice Memos",
  "icons": [
    {
      "src": "launcher-icon-2x.png",
      "sizes": "96x96",
      "type": "image/png"
    },
    {
      "src": "launcher-icon-3x.png",
      "sizes": "144x144",
      "type": "image/png"
    },
    {
      "src": "launcher-icon-4x.png",
      "sizes": "192x192",
      "type": "image/png"
    }
  ],
  "start_url": "/index.html",
  "display": "standalone",
  "orientation": "landscape"
}
```



## Launch from homescreen

manifest.json

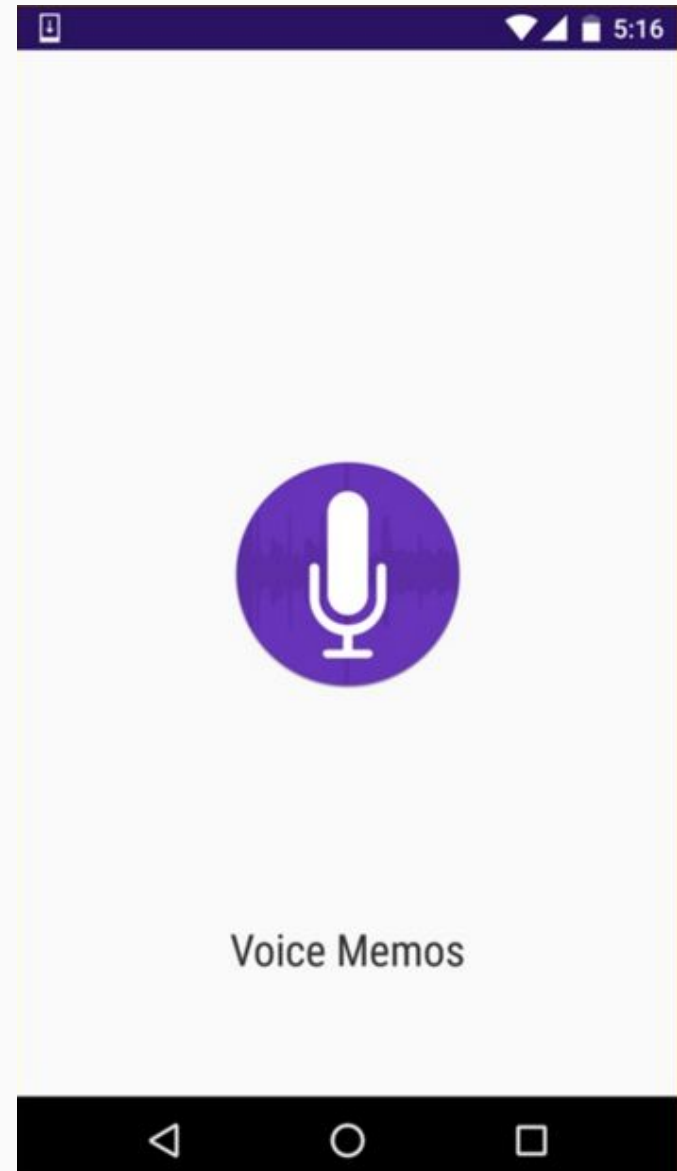
```
{
  "short_name": "Voice Memos",
  "name": "Voice Memos",
  "icons": [
    {
      "src": "launcher-icon-2x.png",
      "sizes": "96x96",
      "type": "image/png"
    },
    {
      "src": "launcher-icon-3x.png",
      "sizes": "144x144",
      "type": "image/png"
    },
    {
      "src": "launcher-icon-4x.png",
      "sizes": "192x192",
      "type": "image/png"
    }
  ],
  "start_url": "/index.html",
  "display": "standalone",
  "orientation": "landscape"
}
```



## Full screen mode with splash screen

manifest.json

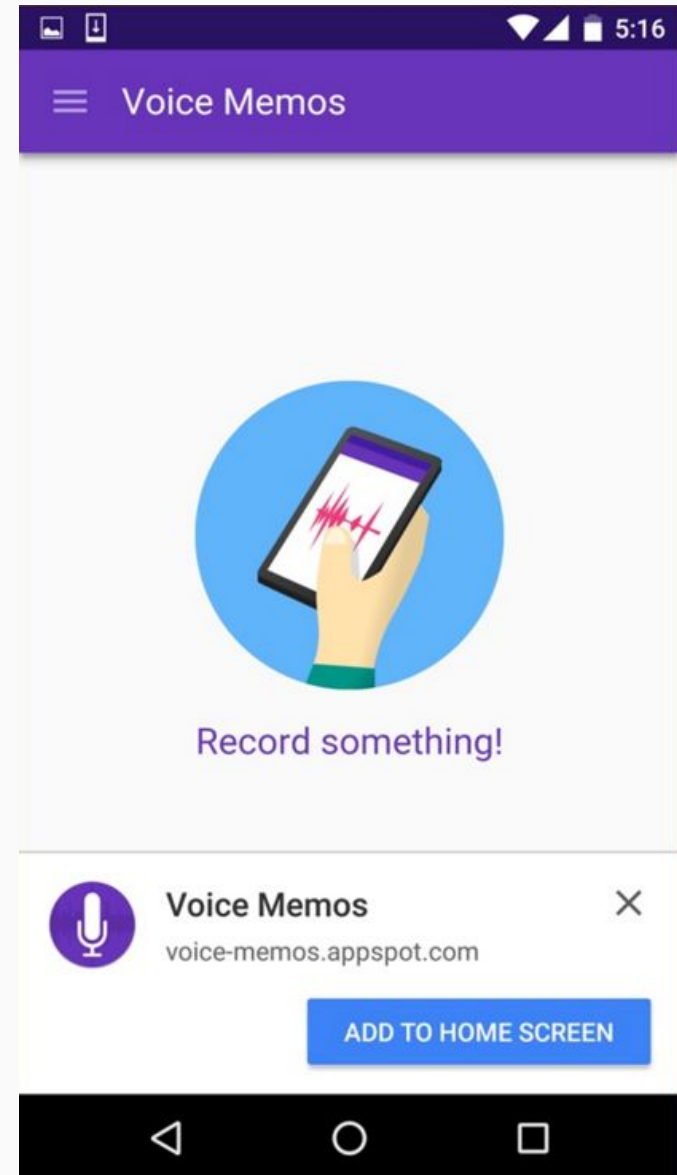
```
{
  "short_name": "Voice Memos",
  "name": "Voice Memos",
  "icons": [
    {
      "src": "launcher-icon-2x.png",
      "sizes": "96x96",
      "type": "image/png"
    },
    {
      "src": "launcher-icon-3x.png",
      "sizes": "144x144",
      "type": "image/png"
    },
    {
      "src": "launcher-icon-4x.png",
      "sizes": "192x192",
      "type": "image/png"
    }
  ],
  "start_url": "/index.html",
  "display": "standalone",
  "orientation": "landscape"
}
```



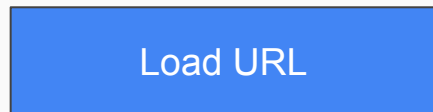
## Add to home screen banner

manifest.json

```
{
  "short_name": "Voice Memos",
  "name": "Voice Memos",
  "icons": [
    {
      "src": "launcher-icon-2x.png",
      "sizes": "96x96",
      "type": "image/png"
    },
    {
      "src": "launcher-icon-3x.png",
      "sizes": "144x144",
      "type": "image/png"
    },
    {
      "src": "launcher-icon-4x.png",
      "sizes": "192x192",
      "type": "image/png"
    }
  ],
  "start_url": "/index.html",
  "display": "standalone",
  "orientation": "landscape"
}
```



1000 users

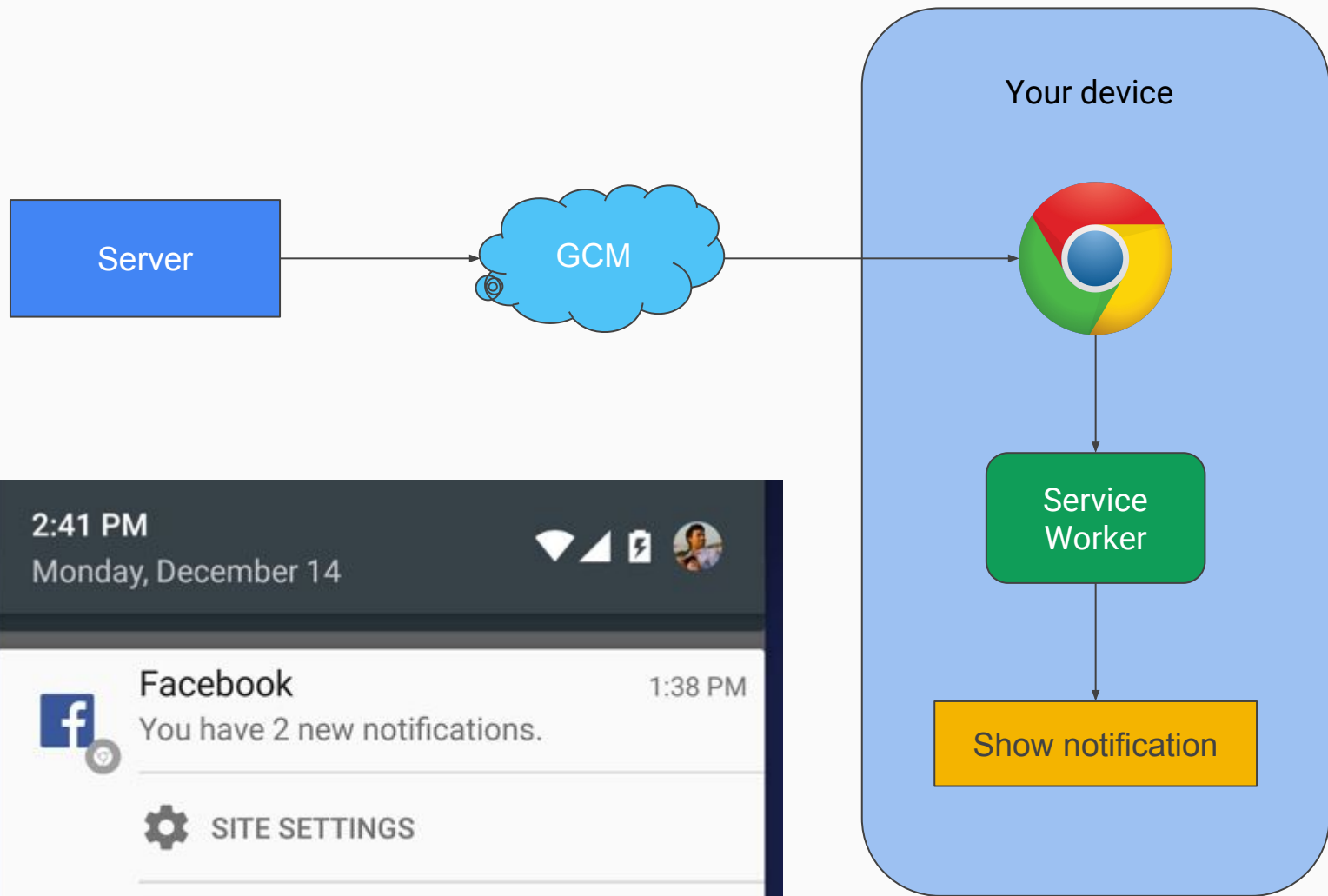


800



# Push Notifications for re-engagement

*<https://w3c.github.io/push-api/>*





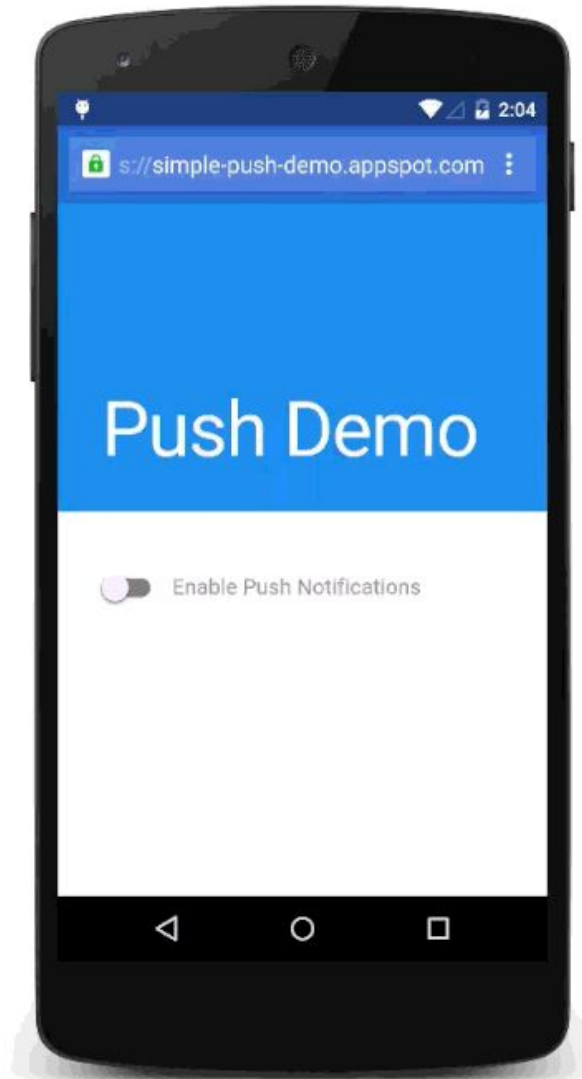
```
self.addEventListener('push', function(event) {
  console.log('Received a push message', event);

  var title = 'Yay a message.';
  var body = 'We have received a push message.';
  var icon = '/images/icon-192x192.png';
  var tag = 'simple-push-demo-notification-tag';

  event.waitUntil(
    self.registration.showNotification(title, {
      body: body,
      icon: icon,
      tag: tag
    })
  );
});
```

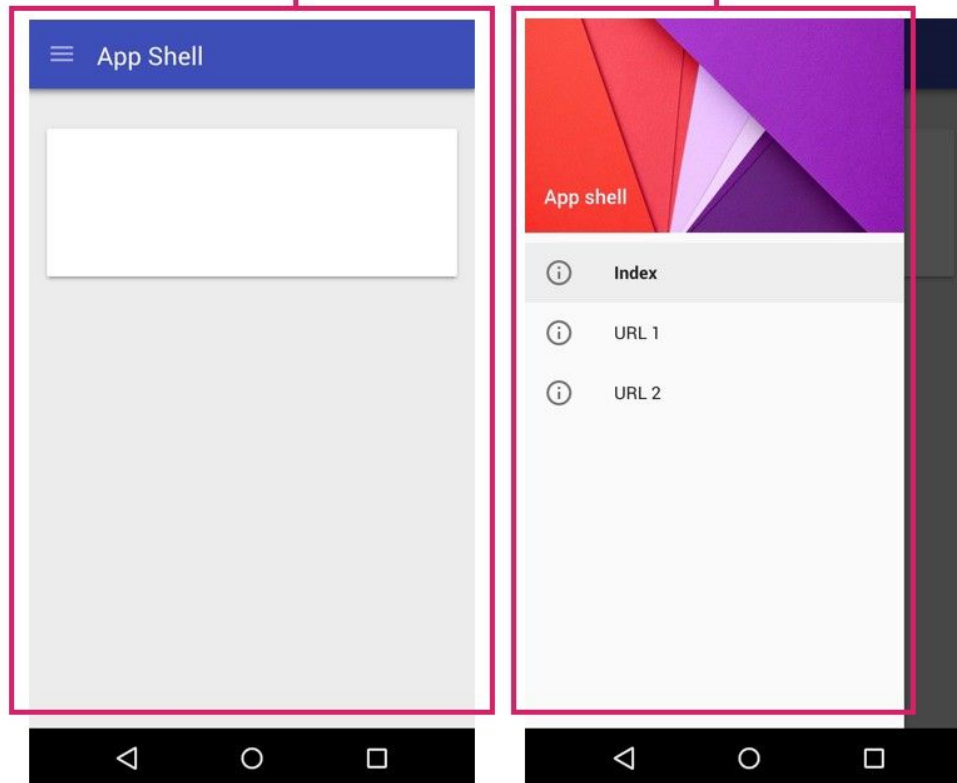
See an example

<https://developers.google.com/web/updates/2015/03/push-notifications-on-the-open-web>



Better performance

# application shell



Cached shell loads **instantly** on repeat visits.

# content

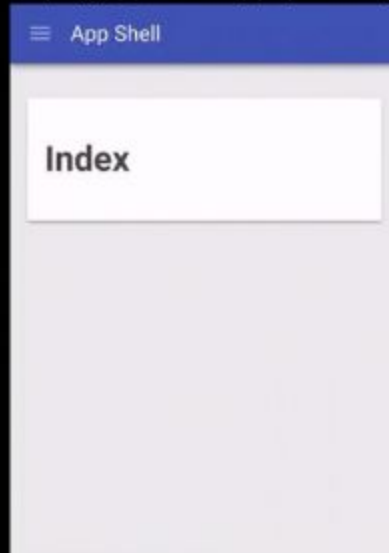


Dynamic content then populates the view

# Cable

## First visit

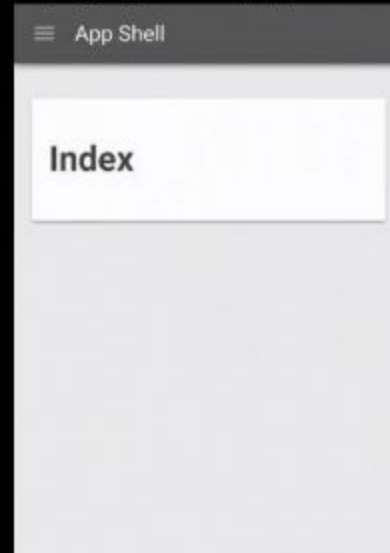
<https://app-shell.appspot.com/>



1.2

## Repeat visit

<https://app-shell.appspot.com/>



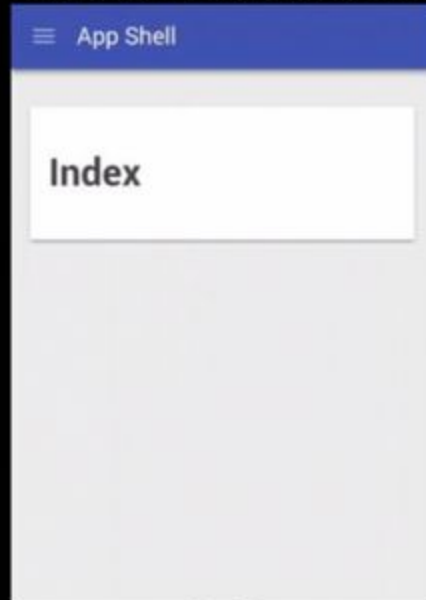
0.5

Time to first meaningful paint

# 3G

## First visit

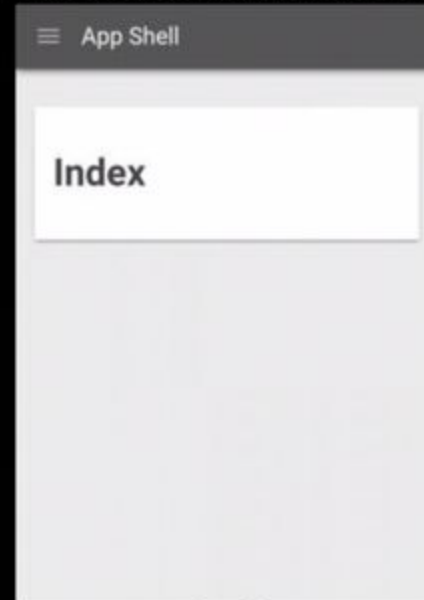
<https://app-shell.appspot.com/>



2.5

## Repeat visit

<https://app-shell.appspot.com/>



0.8

Time to first meaningful paint

# Animate @ 60fps

## GPU Rasterization

Chrome on Android > 4.4

```
<meta name="viewport" content="width=device-width, minimum-scale=1.0">
```

## FLIP Your Animations

<https://aerotwist.com/blog/flip-your-animations/>

## Optimize rendering performance

<https://github.com/trungdq88/public-speaks/blob/master/Rendering%20Performance.pdf>

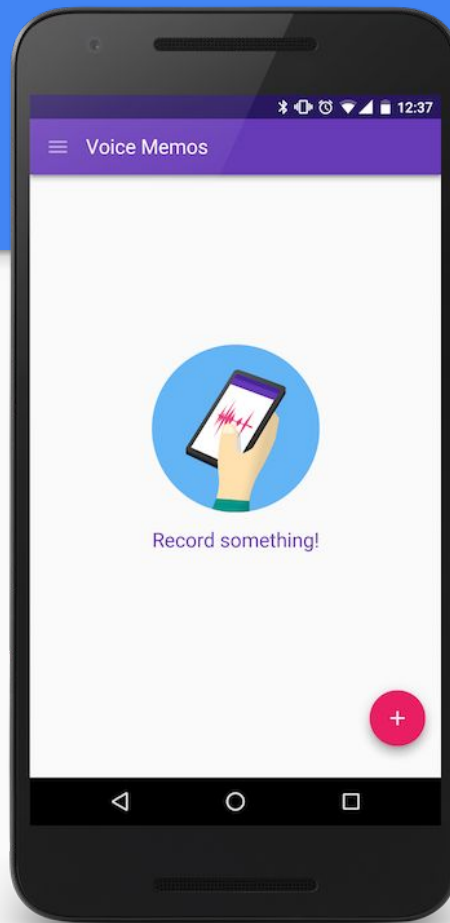
- Application Shell Architecture
- GPU Rasterization
- CSS accelerated animation
- FLIP animation
- Others: Virtual DOM, Component, Server Render...



# Progressive Web Apps

- **Progressive** - Work for every user, regardless of browser choice because they're built with progressive enhancement as a core tenet.
- **Responsive** - Fit any form factor: desktop, mobile, tablet, or whatever is next.
- **Connectivity independent** - Enhanced with service workers to work offline or on low quality networks.
- **App-like** - Feel like an app to the user with app-style interactions and navigation because it's built on the app shell model.
- **Fresh** - Always up-to-date thanks to the service worker update process.
- **Safe** - Served via HTTPS to prevent snooping and ensure content hasn't been tampered with.
- **Discoverable** - Are identifiable as "applications" thanks to W3C manifests and service worker registration scope allowing search engines to find them.
- **Re-engageable** - Make re-engagement easy through features like push notifications.
- **Installable** - Allow users to "keep" apps they find most useful on their home screen without the hassle of an app store.
- **Linkable** - Easily share via URL and not require complex installation.

Let's see some examples



<http://voice-memos.appspot.com>

iPhone 5 ▾ 320 X 568 84% ▾

Mobile S - 320px

## Voice Memos

alo 123

a minute ago



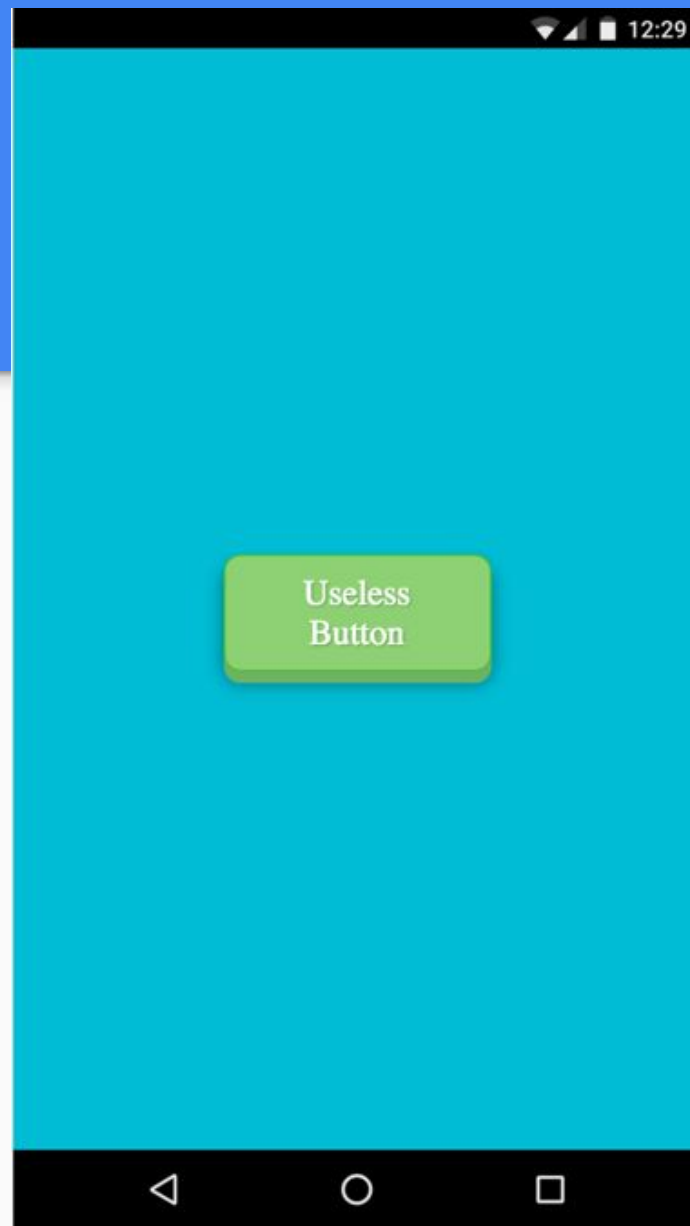
Network							
View:							
Preserve log <input checked="" type="checkbox"/> Disable cache <input checked="" type="checkbox"/> Offline (0 kb/s ↓ 0 k ▾)							
Filter <input type="text"/> <input type="checkbox"/> Hide data URLs <b>All</b> XHR JS CSS Img Media Font Doc WS Manifest Other							
Name	Status	Type	Initiator	Size	Time	Timeline - Start	Timeline - End
voice-memos.appspot.com	200	docu...	Other	(from ServiceWorker)	3 ms		
voicememo-core.js	200	script	(index):246	(from ServiceWorker)	27 ms		
ic_menu_24px.svg	200	svg+x...	(index):246	(from ServiceWorker)	21 ms		
side-nav-bg@2x.jpg	200	jpeg	(index):246	(from ServiceWorker)	23 ms		
ic_delete_24px.svg	200	svg+x...	(index):246	(from ServiceWorker)	23 ms		
ic_info_outline_24px.svg	200	svg+x...	(index):246	(from ServiceWorker)	23 ms		
ic_feedback_24px.svg	200	svg+x...	(index):246	(from ServiceWorker)	23 ms		
ic_add_24px.svg	200	svg+x...	(index):246	(from ServiceWorker)	24 ms		
analytics.js	(failed)		(index):250		0 B 70 ms		
analytics.js	(failed)		Other		0 B 3 ms		
chrome-touch-icon-384x384.png	(failed)		Other		0 B 2 ms		
voicememo-list.js	200	script	voicememo-core.js:16	(from ServiceWorker)	3 ms		
voicememo-details.js	200	script	voicememo-core.js:16	(from ServiceWorker)	3 ms		
voicememo-record.js	200	script	voicememo-core.js:16	(from ServiceWorker)	4 ms		
voicememo-list.css	200	xhr	voicememo-list.js:16	(from ServiceWorker)	2 ms		
moment.min.js	200	script	voicememo-list.js:16	(from ServiceWorker)	2 ms		
recorder.js	200	script	voicememo-record.js:16	(from ServiceWorker)	2 ms		
voicememo-record.css	200	xhr	voicememo-record.js:16	(from ServiceWorker)	2 ms		
voicememo-details.css	200	xhr	voicememo-details.js:16	(from ServiceWorker)	2 ms		
voicememo-edit.css	200	xhr	voicememo-details.js:16	(from ServiceWorker)	2 ms		
ic_arrow_back_24px.svg	200	svg+x...	voicememo-details.js:16	(from ServiceWorker)	5 ms		
ic_file_download_24px.svg	200	svg+x...	voicememo-details.js:16	(from ServiceWorker)	5 ms		
ic_mode_edit_24px.svg	200	svg+x...	voicememo-details.js:16	(from ServiceWorker)	5 ms		
ic_delete_white_24px.svg	200	svg+x...	voicememo-details.js:16	(from ServiceWorker)	6 ms		
ic_play_arrow_24px.svg	200	svg+x...	voicememo-details.js:16	(from ServiceWorker)	6 ms		
icon-cassette.svg	200	svg+x...	voicememo-details.js:16	(from ServiceWorker)	6 ms		

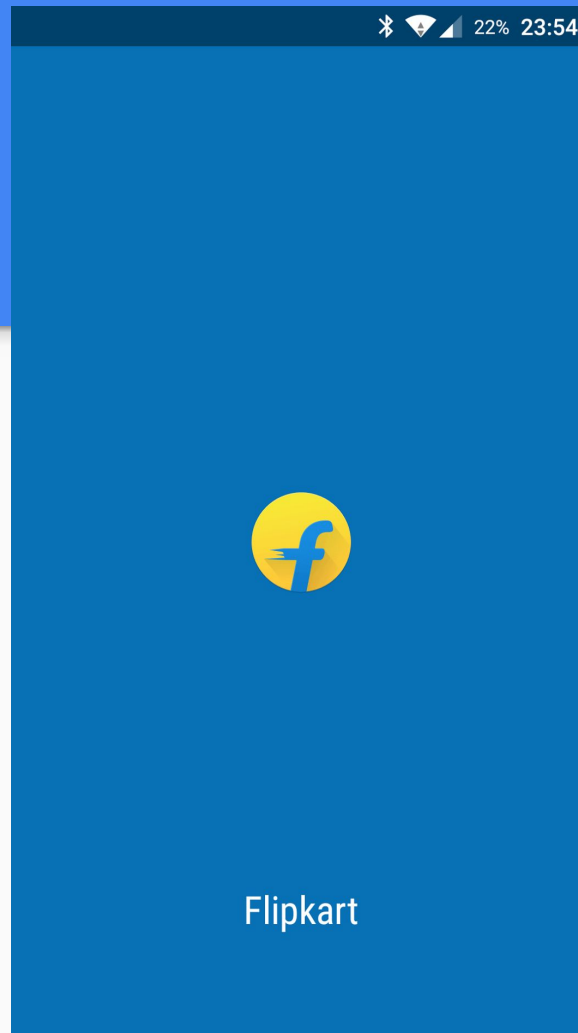
# My App

<http://j.mp/pwa-d>

- Service Worker
- App Cache
- Offline
- Add to screen
- Splash screen

Source code: <https://github.com/trungdq88/progressive-web-app-demo>





<http://flipkart.com>



The screenshot displays the Chrome DevTools Network tab. At the top, there's a toolbar with icons for Elements, Console, Sources, Network, Timeline, Profiles, Resources, and Security. The 'Network' panel is active, showing a filter input set to 'All'. Below the filter, there's a timeline view with a horizontal axis representing time from 0 to 14,000 ms. A single request, 'getSearch?count=5&params=%7B...', is highlighted in red. To the right of the timeline, a table lists the details of the requests:

Name	Status	Type	Initiator	Size	Time	Timeline - Start	Timeline - End
<input checked="" type="checkbox"/> getSearch?count=5&params=%7B...	(failed)	json	Other		0 B	3 ms	
<input type="checkbox"/> data:image/svg+xml;...	200	svg+xml	vendor.877095e...js:2		(from cache)	0 ms	
<input type="checkbox"/> data:image/svg+xml;...	200	svg+xml	vendor.877095e...js:2		(from cache)	0 ms	
<input type="checkbox"/> data:image/svg+xml;...	200	svg+xml	vendor.877095e...js:2		(from cache)	0 ms	
<input type="checkbox"/> data:image/svg+xml;...	200	svg+xml	vendor.877095e...js:2		(from cache)	0 ms	
<input type="checkbox"/> data:image/png;base...	200	png	vendor.877095e...js:2		(from cache)	0 ms	
<input type="checkbox"/> data:image/png;base...	200	png	vendor.877095e...js:2		(from cache)	0 ms	
<input checked="" type="checkbox"/> data:image/png;base...	200	png	vendor.877095e...js:2		(from cache)	0 ms	
<input checked="" type="checkbox"/> data:image/png;base...	200	png	vendor.877095e...js:2		(from cache)	0 ms	
<input checked="" type="checkbox"/> data:image/png;base...	200	png	vendor.877095e...js:2		(from cache)	0 ms	
<input checked="" type="checkbox"/> data:image/png;base...	200	png	vendor.877095e...js:2		(from cache)	0 ms	
<input type="checkbox"/> data:image/png;base...	200	png	vendor.877095e...js:2		(from cache)	0 ms	
<input type="checkbox"/> data:image/png;base...	200	png	vendor.877095e...js:2		(from cache)	0 ms	
<input checked="" type="checkbox"/> data:image/png;base...	200	png	vendor.877095e...js:2		(from cache)	0 ms	
<input checked="" type="checkbox"/> data:image/png;base...	200	png	vendor.877095e...js:2		(from cache)	0 ms	
<input checked="" type="checkbox"/> data:image/png;base...	200	png	vendor.877095e...js:2		(from cache)	0 ms	
<input type="checkbox"/> data:image/png;base...	200	png	vendor.877095e...js:2		(from cache)	0 ms	
<input checked="" type="checkbox"/> data:image/png;base...	200	png	vendor.877095e...js:2		(from cache)	0 ms	
<input type="checkbox"/> state	(failed)	fetch	vendor.877095e...js:8		0 B	23 ms	
<input type="checkbox"/> data:image/svg+xml;...	200	svg+xml	vendor.877095e...js:2		(from cache)	0 ms	
<input type="checkbox"/> data:image/svg+xml;...	200	svg+xml	vendor.877095e...js:2		(from cache)	0 ms	
<input type="checkbox"/> ?value=0&label=5BIXCLOpwQMQtWd...	(failed)	Other			0 B	12 ms	
<input type="checkbox"/> ?value=0&label=eJWIClydxgMQIMeP4...	(failed)	Other			0 B	12 ms	
<input checked="" type="checkbox"/> flip-logo-527ae59f.png	200	png	Other		(from ServiceWorker)	4 ms	



# Progressive Web App

Started as a browser tab and then get engage as user use it more often: offline, push notifications, on-demand permissions...

How does it play with  
frameworks?

# Frameworks

## Polymer

- [Zuperkulblog](#) by Rob Dodson ([slides](#))
- [Snapdrop](#) - an Apple Airdrop-like PWApp built with Polymer and Web RTC

## React

- [iFixit](#) by Jeff Posnick - uses sw-precache for application shell caching ([slides](#))

## Virtual-DOM

- [Pokedex](#) by Nolan Lawson - excellent progressive web app applying a "do everything in a web worker" approach to help with progressive rendering. ([write-up](#))

## Angular.js

- [Timey.in](#) by Kenneth Auchenberg - also uses sw-precache for resource precaching
- The Angular team have also started an early [ng2-application-shell](#) project based on the app-shell architecture.

The future of web apps is here?

## Service Worker

- Offline Usage
- App Shell Architecture

### Service Workers 📄 - WD

Global

0% + 53.5% = 53.5%

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

Current aligned

Usage relative

Show all

IE	Edge	Firefox	Chrome	Safari	Opera	iOS Safari	Opera Mini	Android Browser	Chrome for Android
			47					4.3	
8			48					4.4	
9		44	49	9		8.4		4.4.4	
11	13	45	50	9.1	36	9.2	8	47	49
	14	46	51	TP	37	9.3			
		47	52		38				
		48	53						

<https://jakearchibald.github.io/isserviceworkerready/>

## Web App Manifest

- Add to home screen
- Full screen mode
- Splash screen

### Chrome 49 on Android:

- 😊 Add to home screen
- 😊 Full screen mode
- 😊 Splash screen
- 😊 Add to home screen banner

### Opera:

- 😊 Add to home screen
- 😊 Full screen mode
- 😊 Splash screen
- 😞 Add to home screen banner

### Safari:

- 😞 Add to home screen
- 😞 Full screen mode
- 😞 Splash screen
- 😞 Add to home screen banner

Learn more

# Learn more

- This slide:  
<http://j.mp/pwa-slide>
- Getting started to Progressive Web Apps  
<https://developers.google.com/web/progressive-web-apps?hl=en>
- Web Fundamentals  
<https://developers.google.com/web/fundamentals/getting-started/?hl=en>
- Progressive Web Apps reading list  
<https://gist.github.com/nolanlawson/d9e66349635452a95bb1>
- Progressive Web Apps the long game  
<https://remysharp.com/2016/03/18/progressive-web-apps-the-long-game>
- Getting started with Progressive Web Apps  
<https://addyosmani.com/blog/getting-started-with-progressive-web-apps/>
- The offline cookbook  
<https://jakearchibald.com/2014/offline-cookbook/>



Thank you