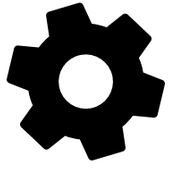
Progressive Web Apps

Manifest & Service Worker API



https://giftkugel.github.io/pwa-manifest-serviceworker/index.html

or

http://bit.ly/2tijRT3

giftkugel
www.skoczylas.net

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Karakun.

Karakun Developer Hub

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https://www.pexels.com/photo/road-pavement-229014/

Phone mockups generated with

https://mockuphone.com/#android

Icons

https://material.io/icons/
http://mariodelvalle.github.io/CaptainIconWeb/
https://github.com/alrra/browser-logos

Progressive

Add functionality step by step

Web

Web standards, high reach and best availability

Applications

Can be installed, network independent, secure

https://codelabs.developers.google.com/codelabs/your-first-pwapp

Progressive

Works for every user, regardless of browser choice because it's built with progressive enhancement as a core tenet.

Responsive

Fits 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

Feels like an app, because the app shell model separates the application functionality from application content.

Fresh

Always up-to-date thanks to the service worker update process.

https://codelabs.developers.google.com/codelabs/your-first-pwapp

Safe

Served via HTTPS to prevent snooping and to ensure content hasn't been tampered with.

Discoverable

Is identifiable as an "application" thanks to W3C manifest and service worker registration scope, allowing search engines to find it.

Re-engageable

Makes re-engagement easy through features like push notifications.

Installable

Allows users to add apps they find most useful to their home screen without the hassle of an app store.

Linkable

Easily share the application via URL, does not require complex installation.

Why?

Worthy of being on the home screen

Work reliably, no matter the network conditions

Increased engagement

Improved conversions

And at least ... because of the Web 😉 😃

PWA Case Studies

https://developers.google.com/web/showcase/

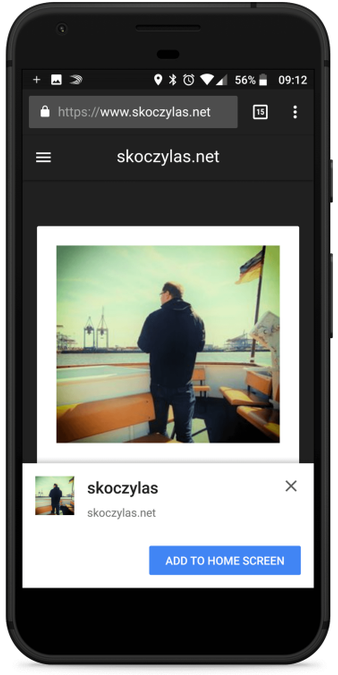
PWA or native application?

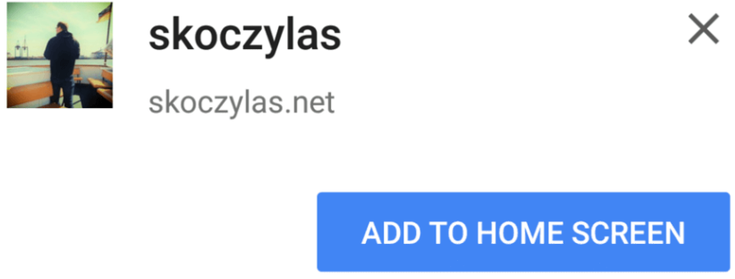
No competition because of different purposes
Go for a native app, if web standards don't fit your needs

Do you really know all Web APIs?

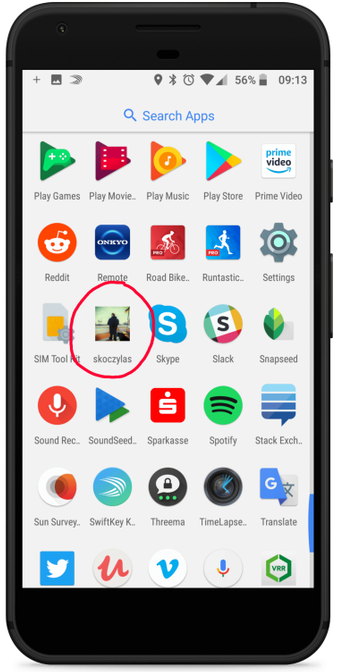
Take a look at my PWA

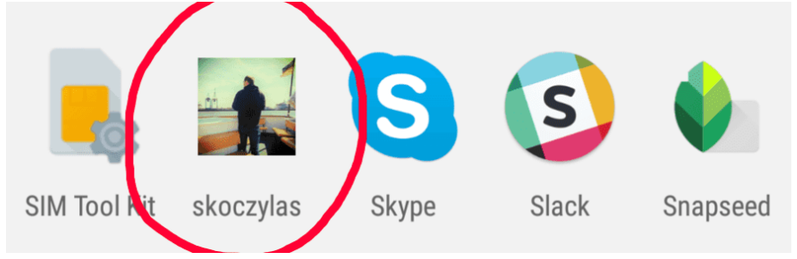
https://www.skoczylas.net



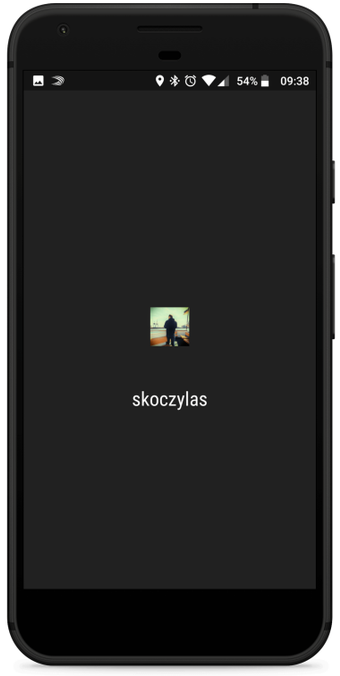


Add to home screen

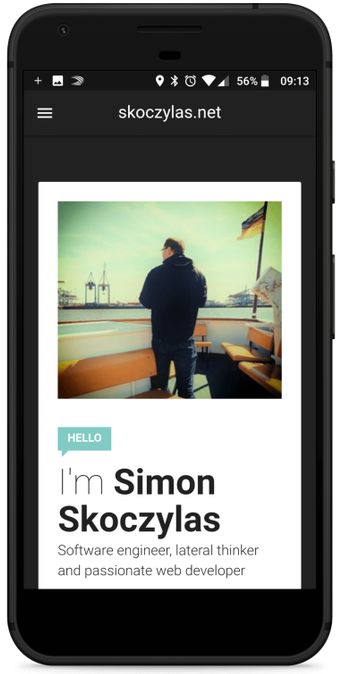




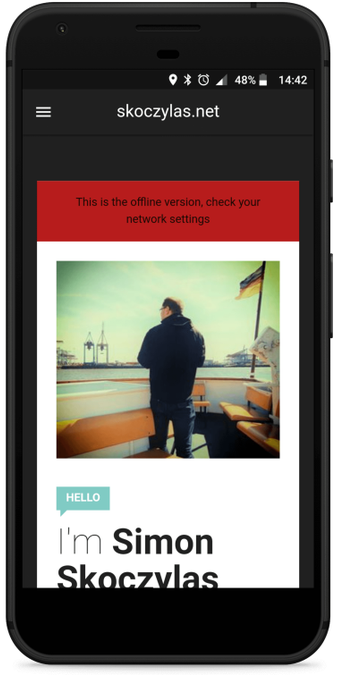
Listed as application in the launcher

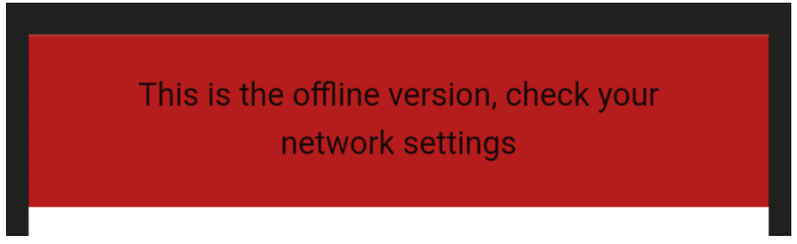


Splashscreen

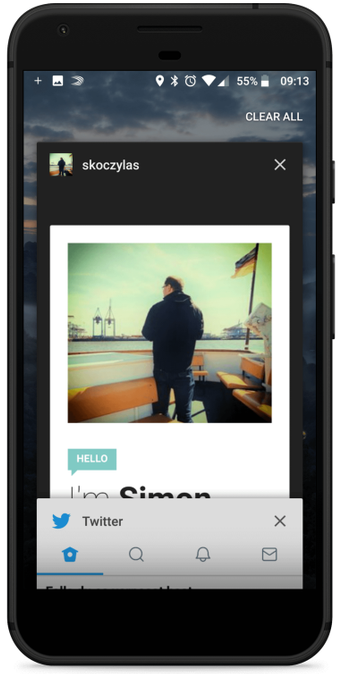


No browser visible





Behaves differently when offline



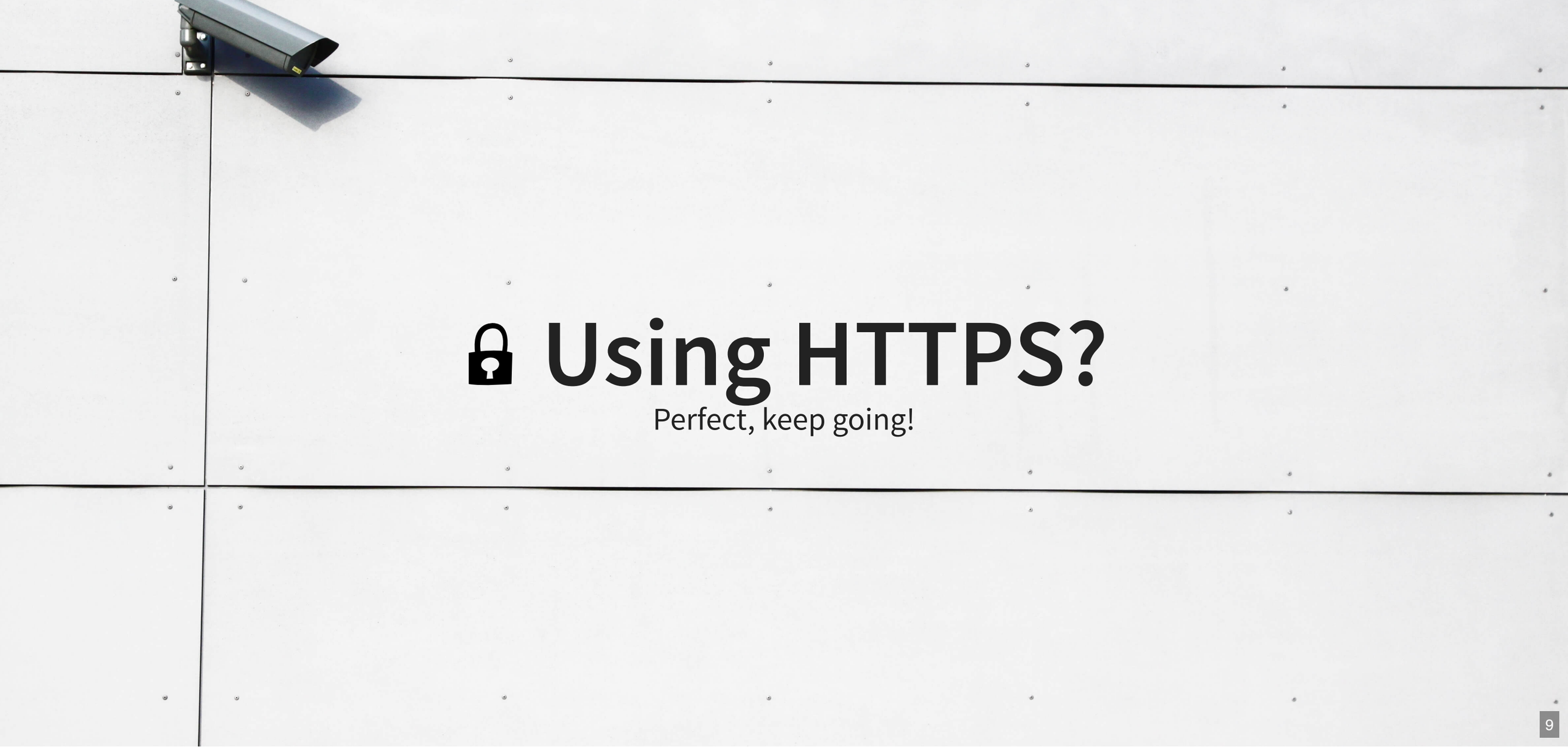
Listed as currently running application

Let's build a PWA

In just a few steps

Got a website?

First step accomplished!



Using HTTPS?

Perfect, keep going!

Take the next step

Add a manifest

Web App Manifest

https://w3c.github.io/manifest/

JSON file that provides information about your application

General information

name, short_name, description

Colors

background_color, theme_color

Icons

Array of Icons with *src, sizes, type*

and more...

lang, orientation, display, scope, start_url, dir, related_applications

Deploy a manifest

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

Content-Type

application/manifest+json 🤔

application/json

Example

```
{
  name: "skoczylas",
  short_name: "skoczylas",
  icons: [
    {
      src: "img/fav/android-icon-36x36.png",
      sizes: "36x36",
      type: "image/png",
      density: "0.75"
    },
    {
      src: "img/fav/android-icon-48x48.png",
      sizes: "48x48",
      type: "image/png",
      density: "1.0"
    }
  ],
  lang: "en",
  start_url: "index.html",
  display: "standalone",
  orientation: "portrait",
  theme_color: "#212121",
  background_color: "#212121"
}
```

We're almost there

Add a service worker

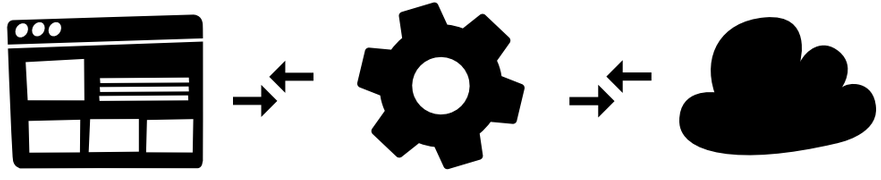
Service Worker is a script that runs in the background

A special Web Worker (Thread)

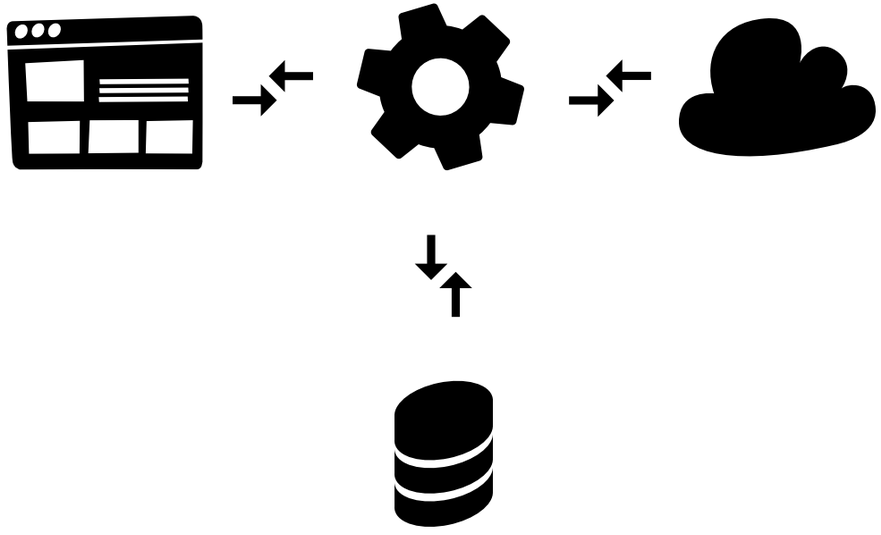
As a Worker it can't access the DOM directly

Can communicate with the page via the postMessage interface

It's a programmable network proxy, allowing you to control how network requests are handled



It can access the Cache API to read and write assets

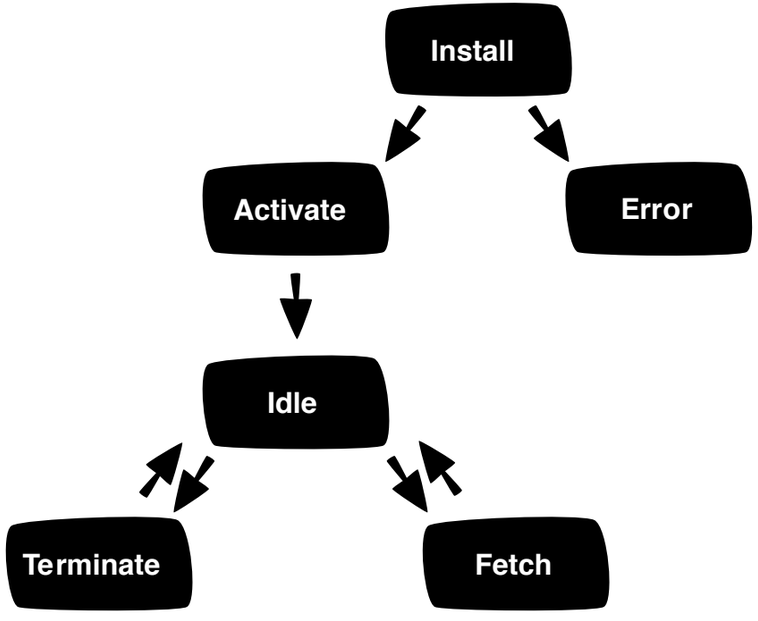


Requires HTTPS

Works without HTTPS on localhost (for development)

Requirement can be disabled through browser settings 🤫

Lifecycle



Register your service worker

```
if ('serviceWorker' in navigator) {
  navigator.serviceWorker.register('/sw.js');
}
```

Easy 😍

Maybe add a scope, wait for an event and handle result?

```
if ('serviceWorker' in navigator) {
  window.addEventListener('load', function() {
    navigator.serviceWorker.register('/sw.js', {scope: './'})
    .then((registration) => { ... })
    .catch((error) => { ... });
  });
}
```

ServiceWorkerRegistration

Online and offline events

```
window.addEventListener('online', (event) => { ... });

window.addEventListener('offline', (event) => { ... });

if (navigator.onLine) { ... }
```

Network status, not server connection

this and self

Both points to the ServiceWorkerGlobalScope

Use *self*, because you never get a guarantee about *this* 😱

Service Worker Events

```
self.addEventListener('install', (event) => { ... }); // InstallEvent

self.addEventListener('activate', (event) => { ... }); // ExtendableEvent

self.addEventListener('message', (event) => { ... }); // MessageEvent
```

aka ExtendableEvent

Service Worker Functional Events

```
self.addEventListener('fetch', (event) => { ... }); // FetchEvent

self.addEventListener('sync', (event) => { ... }); // SyncEvent

self.addEventListener('push', (event) => { ... }); // PushEvent
```

aka ExtendableEvent

It's my turn now!

```
self.skipWaiting();
```

Skip waiting on install event

I am working, don't terminate me...

```
event.waitUntil(promise);
```

on ExtendableEvent

Store assets in cache

```
event.waitUntil(
  self.caches.open(name)
  .then(cache => cache.addAll([ ... ]))
);
```

Cache stuff during installation (App shell)

Get asset from cache

```
event.respondWith(
  self.caches.match(event.request)
  .then((response) => {
    if (response) {
      return response; // cached response
    }

    const fetchRequest = event.request.clone();

    return fetch(fetchRequest); // network reponse
  })
);
```

Check cache on fetch event

Get asset from cache, or store missing asset in cache

```
event.respondWith(
  self.caches.match(event.request)
  .then((response) => {
    if (response) {
      return response; // cached response
    }
    const fetchRequest = event.request.clone();
    return fetch(fetchRequest).then((response) => {
      if(!response || response.status !== 200 || response.type !== 'basic') {
        return response; // network reponse which should not be cached
      }
      const responseToCache = response.clone();
      self.caches.open(name)
      .then((cache) => cache.put(event.request, responseToCache)); // update cache
      return response; // network reponse
    });
  })
);
```

Check cache on fetch event, refresh cache over network

Caching strategies

https://serviceworke.rs/caching-strategies.html

Network or cache

The service worker tries to retrieve the most up to date content from the network but if the network is taking too much, it will serve cached content instead.

Cache only

Always answering from cache on fetch events.

Cache and update

Responding from cache to deliver fast responses and also updating the cache entry from the network.

Cache, update and refresh

Responding from cache to deliver fast responses and also updating the cache entry from the network. When the network response is ready, the UI updates automatically.

Embedded fallback

Serving an embedded content fallback in case of missing resources.

See also

https://developers.google.com/web/fundamentals/instant-and-offline/offline-cookbook/

Is Service Worker ready?

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


Keep going further with
HTTP/2
Push notifications

Lighthouse 👍

https://developers.google.com/web/tools/lighthouse/

Workbox

https://developers.google.com/web/tools/workbox/

Webpack OfflinePlugin

https://github.com/NekR/offline-plugin

PWA Builder

https://www.pwabuilder.com

Service Worker Toolchain, you even get a Mock 🤗

https://github.com/pinterest/service-workers

Service Worker Precache & Toolbox
https://github.com/GoogleChromeLabs

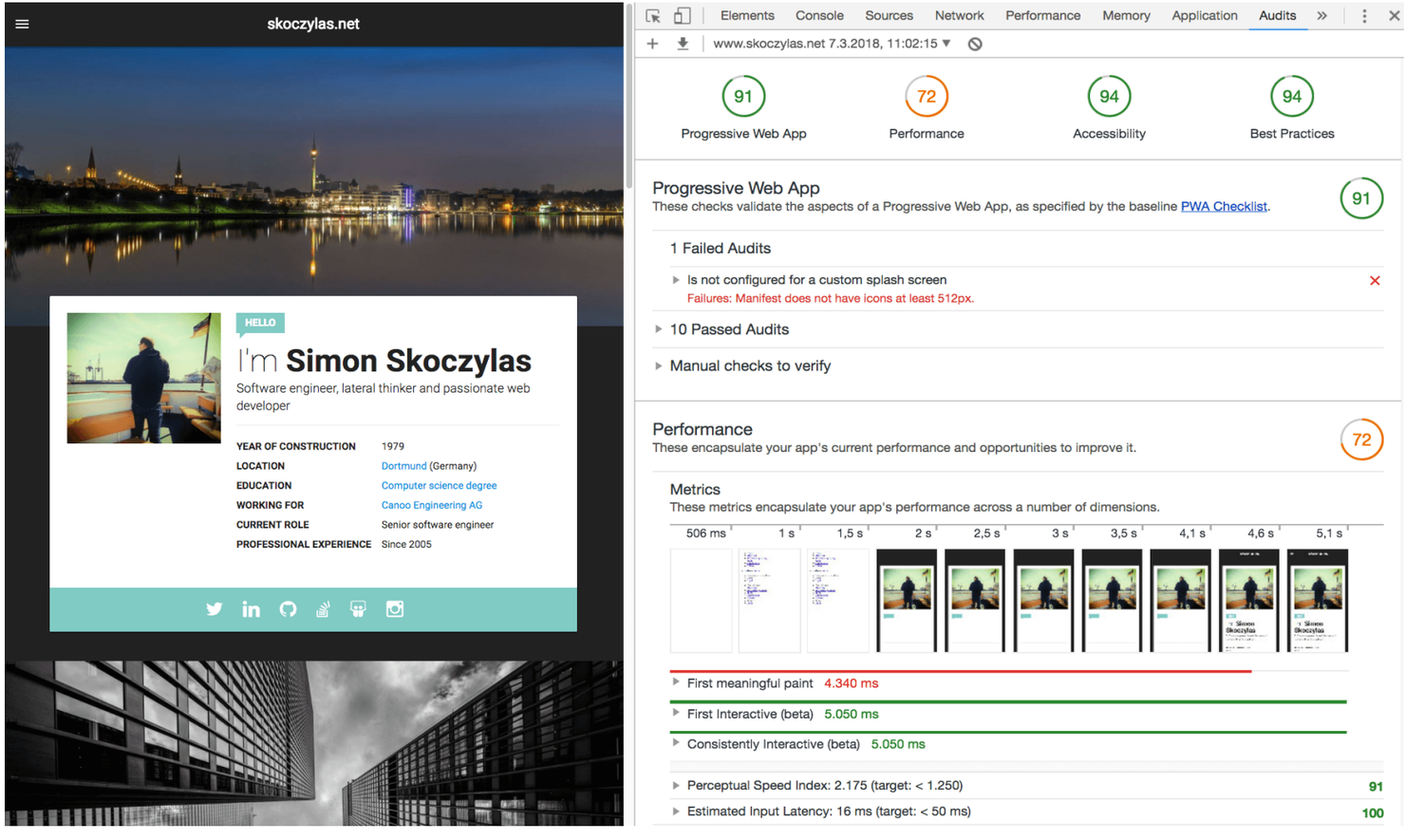
Create React App
https://github.com/facebook/create-react-app

Polymer App Toolbox
https://www.polymer-project.org/2.0/toolbox/

Vue.js PWA Template
https://github.com/vuejs-templates/pwa

Angular CLI
https://cli.angular.io/

Lighthouse analysis




Let's take a look at some code
SECURITY
QUIET
HTML
CSS
php
git
LARACON
NODE
node

PWA Checklists

https://developers.google.com/web/progressive-web-apps/checklist

Baseline Checklist
Indexability & social
User experience
Performance
Caching
Push notifications
Additional features

Web Fundamentals
https://developers.google.com/web/fundamentals/

Progressive Web Apps Training 💻 👍
https://developers.google.com/web/ilt/pwa/

Making A Service Worker: A Case Study
https://www.smashingmagazine.com/2016/02/making-a-service-worker/

ServiceWorker Cookbook by Mozilla
https://serviceworke.rs

Progressive Web Apps ILT - Codelabs
https://www.gitbook.com/book/google-developer-training/progressive-web-apps-ilt-codelabs/details

Caching best practices & max-age gotchas
https://jakearchibald.com/2016/caching-best-practices/

PWA are cool with at least those Web APIs

Service Worker API
Web App Manifest
Cache API
Fetch API
Promise API

Notification API
Indexed DB
BackroundSync API
Credentials API
Payment Request API
Web Share API