

Design patterns and practices for Progressive Web Apps

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“There’s An App For That”

How many mobile apps do you
use on a daily basis?

How many websites do you
browse on a daily basis?

Mobile web engagement

Average minutes per visitor

■ Apps ■ Mobile web

188.6

9.3

Mobile web reach

Monthly unique visitors (in millions)

■ Apps ■ Mobile web



Goal:
Provide engaging experience
like native apps to users
on the mobile web

Progressive Web Apps (*PWAs*)
are user experiences that have
the reach of the web, and are
reliable, fast, engaging.

A brief look at the state of the web in 2019

Football **Cricket** Rugby union Tennis Cycling F1 Golf US sports

The Observer
England in New Zealand 2019-20

Ali Martin at
Cobham Oval

@Cricket_Ali

Joe Denly proves fitness in England tour match and locks down No 3 role

- New Zealand A 302-6 dec; England 355-8
- Ollie Pope and Jos Buttler both score 88



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With just two simple charts, Chris Dixon has pointed out one of those things that is both totally obvious but — when expressed succinctly — slightly terrifying.

The Web as we
mobile apps. A
companies: Ap

They take a 30%
It's basically a

Dixon is a vent
has invested in
worries about s

Here is his first chart, showing the way mobile users are exceeding desktop users on the Web:

BUSINESS INSIDER PRIME

It looks like you're using an ad-blocker!

Business Insider is an advertising supported site and we noticed you have ad-blocking enabled. Here are two ways you can keep reading.

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10 Easy Steps to Better iPhone and iPad Security



TIM BROOKES [@timbrookes](#)

NOVEMBER 19, 2019, 6:40AM EDT



ymgerman/Shutterstock.com

There's a good chance you spend more time interacting with the online world on your smartphone than any other device. Let's take a look at how you can up your iPhone and iPad security game.

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TRENDING



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3 [What Does "TBH" Mean and How Do You Use It?](#)

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How-To Geek



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The End of Cookie Warnings Might Be Near

@boyanio

“Progressive Web Apps are just websites that took all the right vitamins.”

Alex Russell
Google

How are PWAs different?

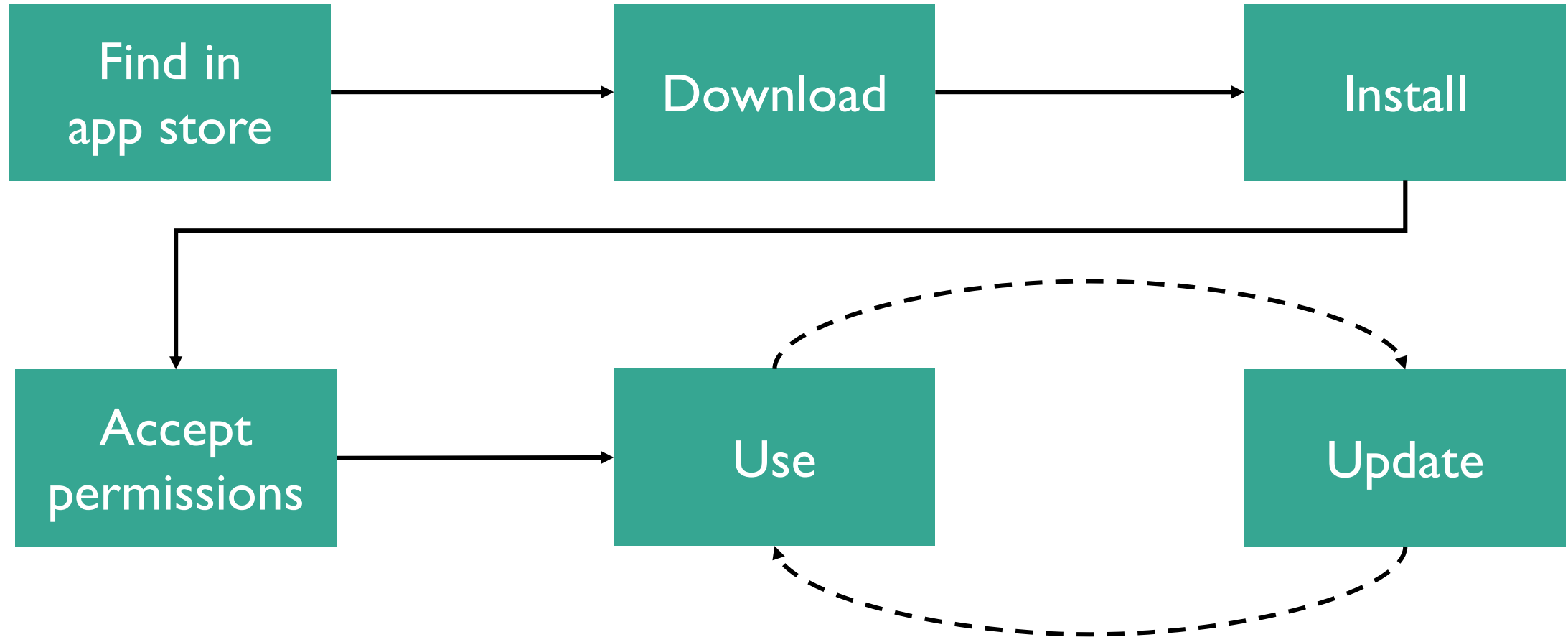
**53% of mobile users abandon
sites that take longer than
3 seconds to load**

PWAs are fast

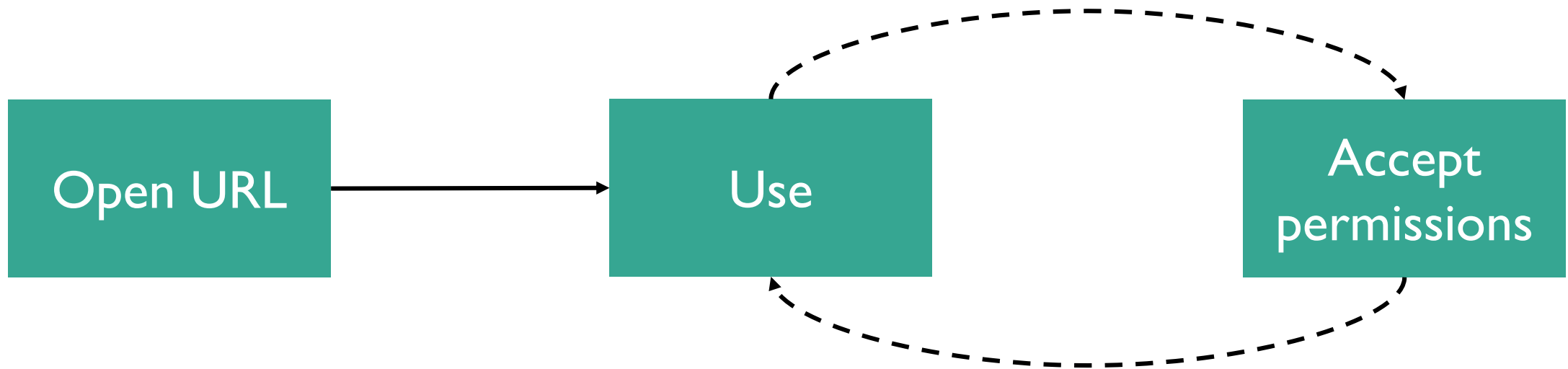
60% of the world's population
is still using **2G** internet

PWAs offer good experience
based on the connectivity

Using apps from app store



Using PWAs



How do we develop PWAs?



Jay Phelps

@_jayphelps



Manager: I want our web app to feel more like a native app
You:

```
window.onerror = window.close;
```


Web App Manifest

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“The web app manifest provides information about a web application [...], necessary for the web app to be downloaded and be presented to the user similarly to a native app [...]

```
{  
  "name": "PWA Class",  
  "short_name": "PWA Class",  
  "start_url": "/",  
  "display": "standalone",  
  "background_color": "#3157A7",  
  "theme_color": "#3157A7",  
  "icons": [{  
    "src": "icons/192x192.png",  
    "sizes": "192x192",  
    "type": "image/png"  
  }]  
}
```

```
<head>
```

```
...
```

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

```
...
```

```
</head>
```



Welcome
to
PWA
Class

Application



Manifest



Service Workers



Clear storage

Storage



Local Storage



Session Storage



IndexedDB



Web SQL



Cookies

Cache



Cache Storage



Application Cache

Background Services



Background Fetch



Background Sync



Notifications



Payment Handler



Push Messaging

Frames



top

App Manifest

[manifest.json](#)

Identity

Name PWA Class

Short name PWA Class

Presentation

Start URL </pwa-class/>Theme color ■ #3157A7Background color ■ #3157A7

Orientation

Display standalone

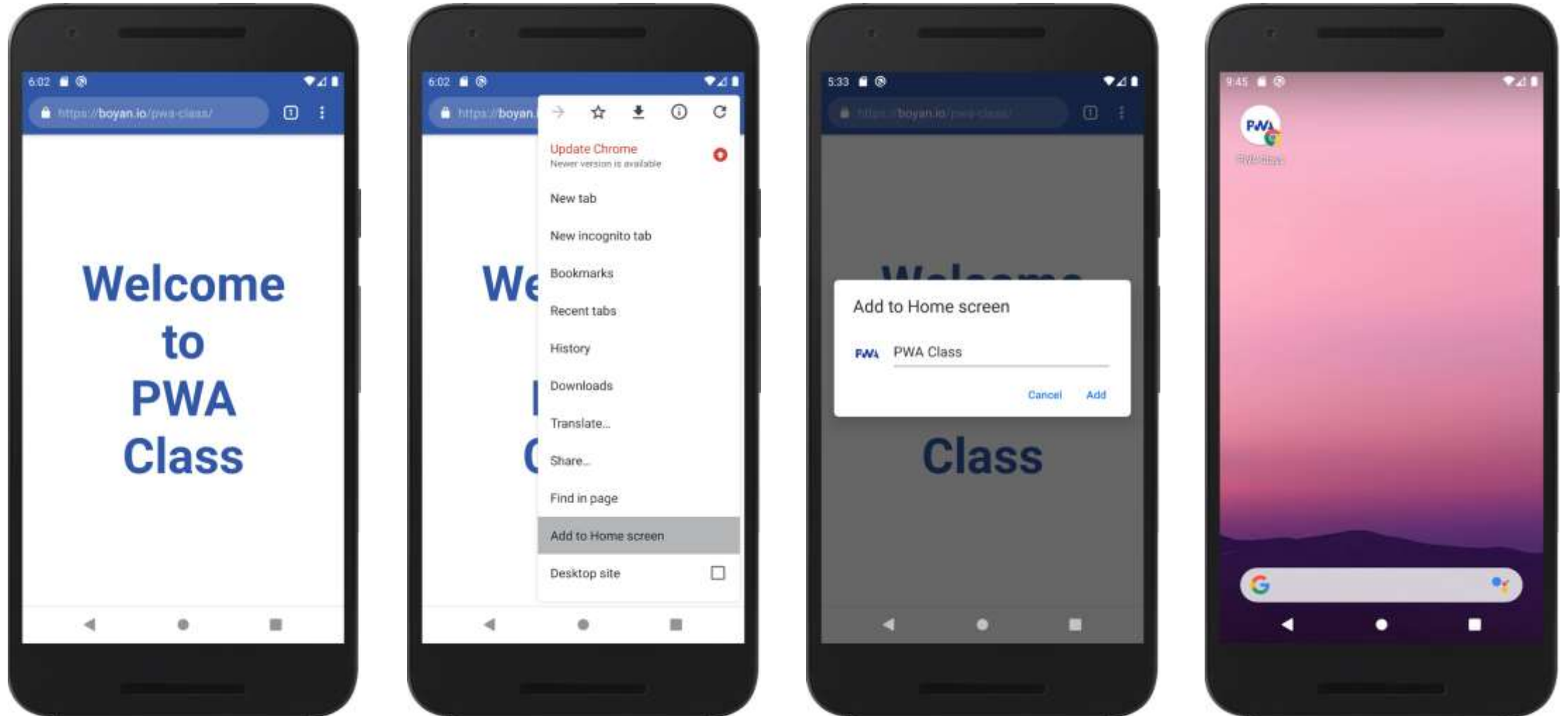
Icons

192x192

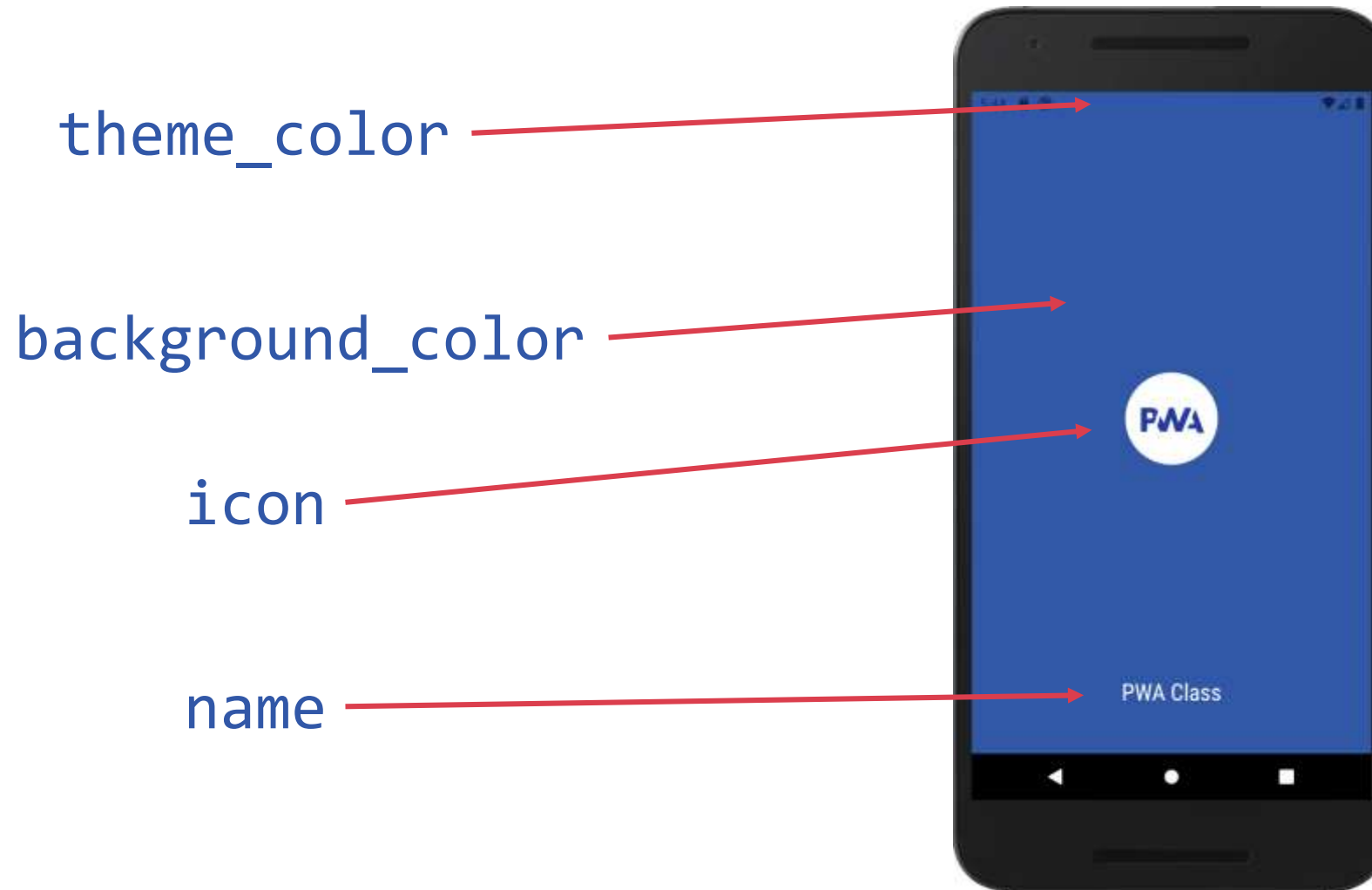
image/png

PWA

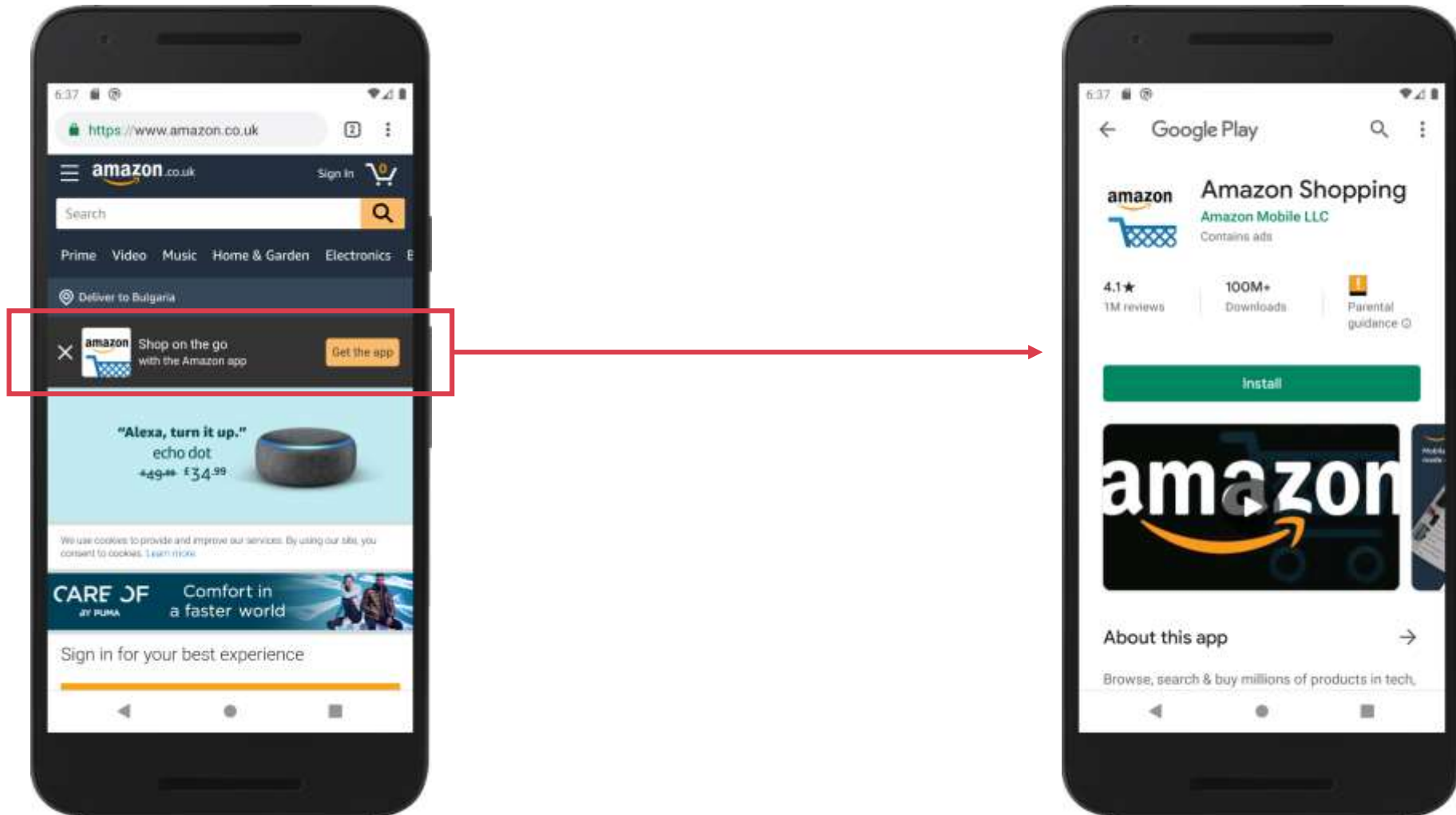
Add to Home screen



Splash screen



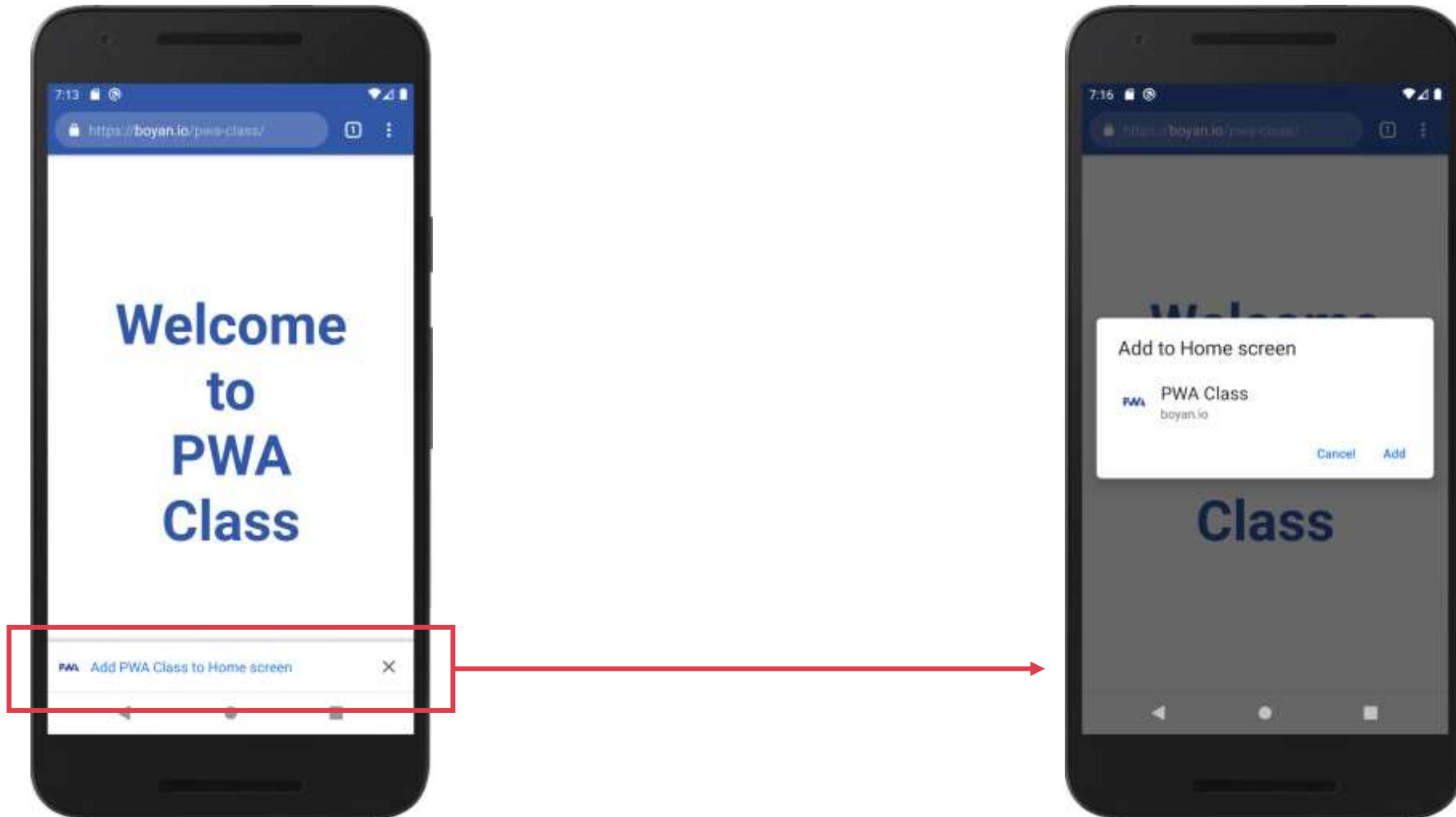
Install banner for native apps



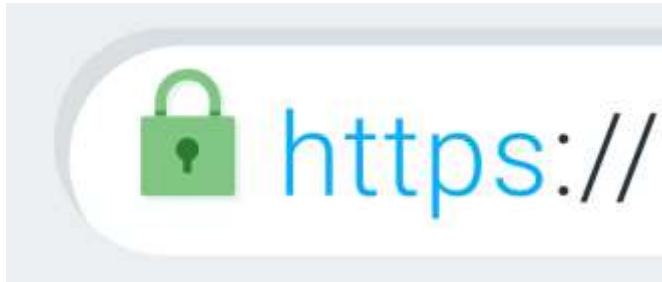
“Our internal metrics at Google show that for similar volume of prompting for PWA banners and native app banners [...] PWA banners convert **5–6x** more often.”

Alex Russell
Google

Install banner for PWAs



Criteria for automatic install prompt



Served over HTTPS



Web App Manifest



Service Worker

When to show install prompts?

Defer install prompt

```
let deferredPrompt;
```

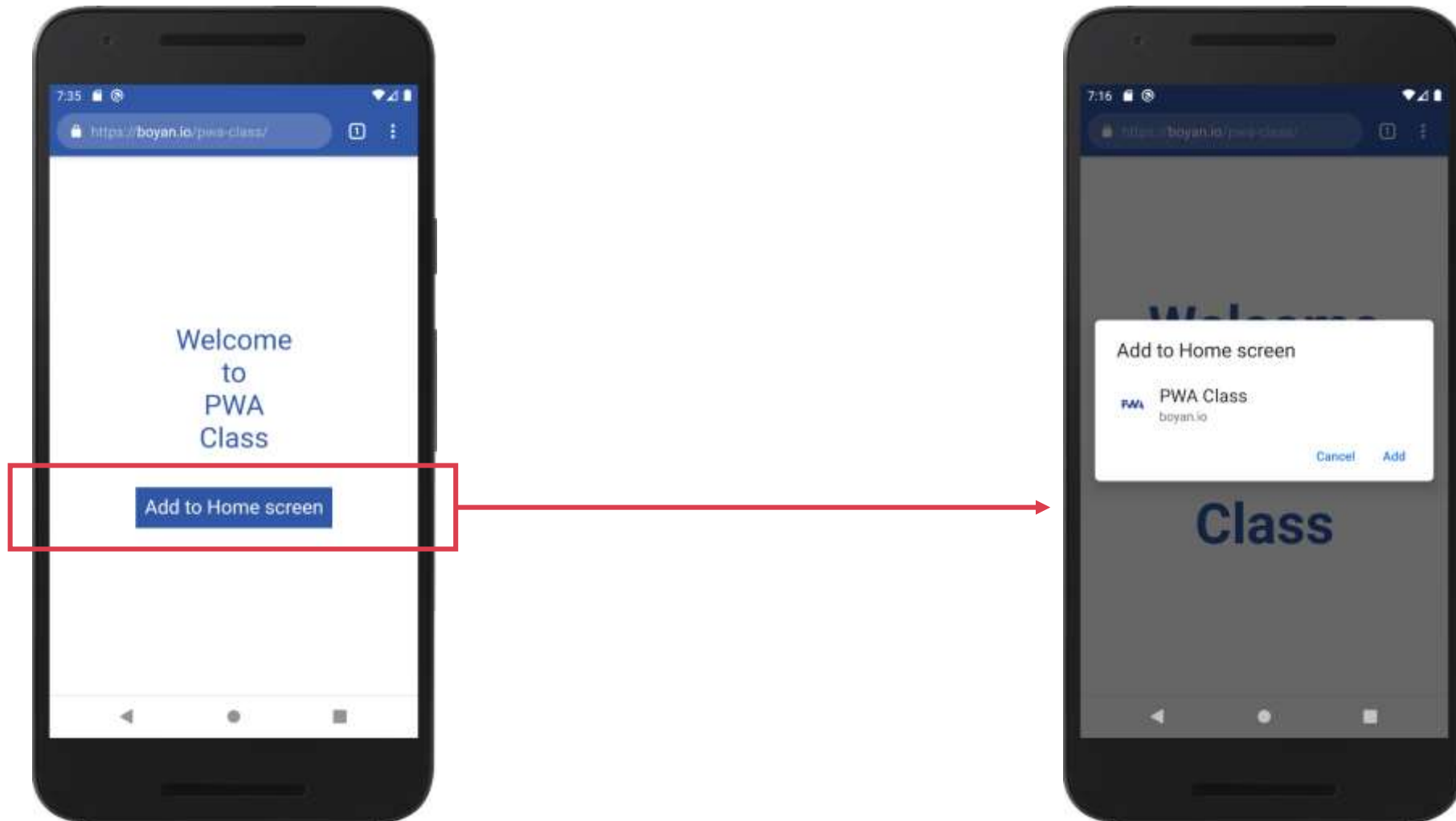
```
window.addEventListener('beforeinstallprompt', e =>
{
  // Prevent the mini-infobar from appearing
  e.preventDefault();

  // Stash the event so it can be triggered later
  deferredPrompt = e;
});
```

Trigger install prompt

```
addBtn.addEventListener('click', e => {  
  // Prompt the user  
  deferredPrompt.prompt();  
  
  // Inspect user's choice  
  deferredPrompt.userChoice.then(...);  
});
```

Trigger install prompt



Offline-ready



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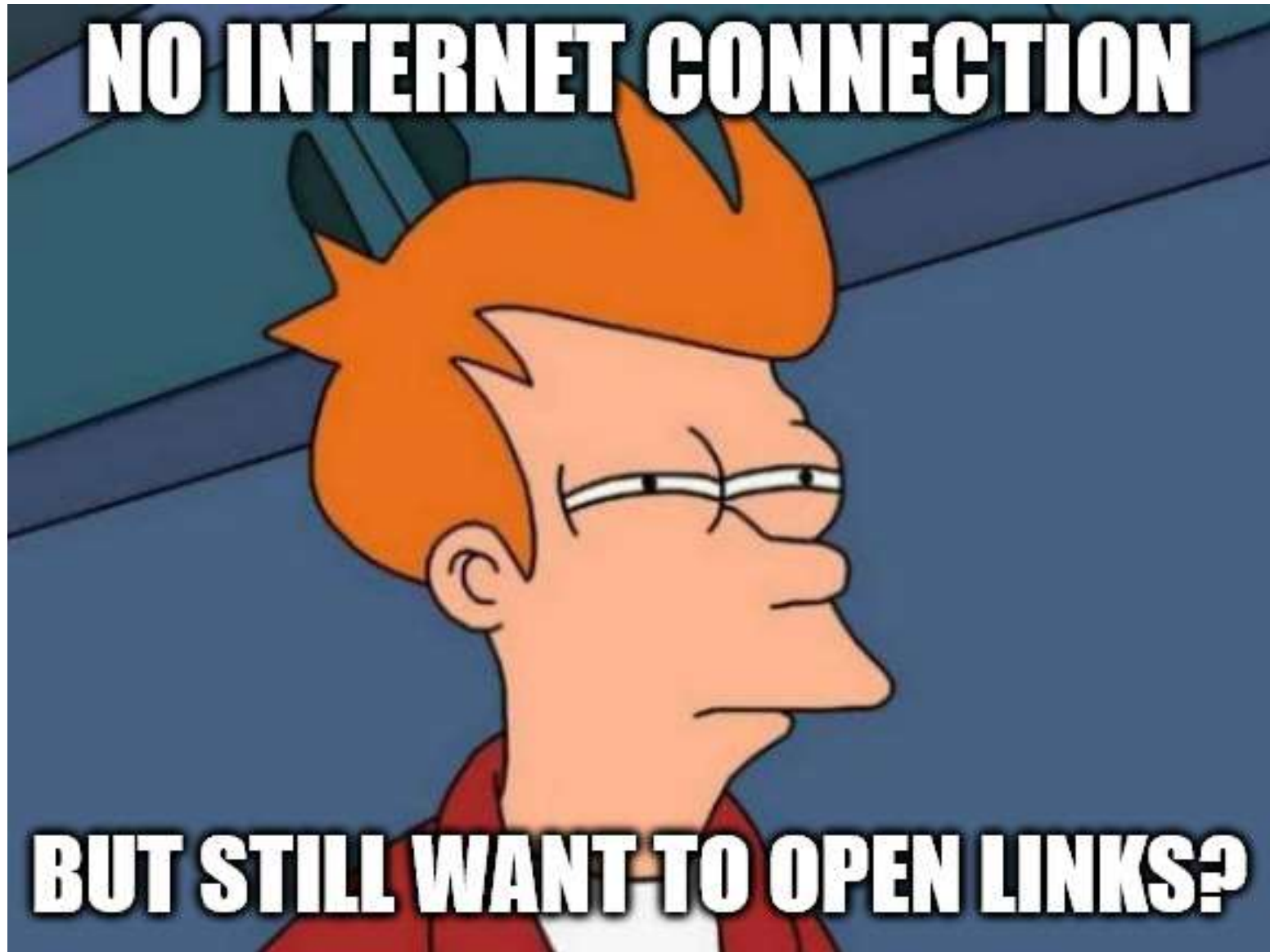
No internet

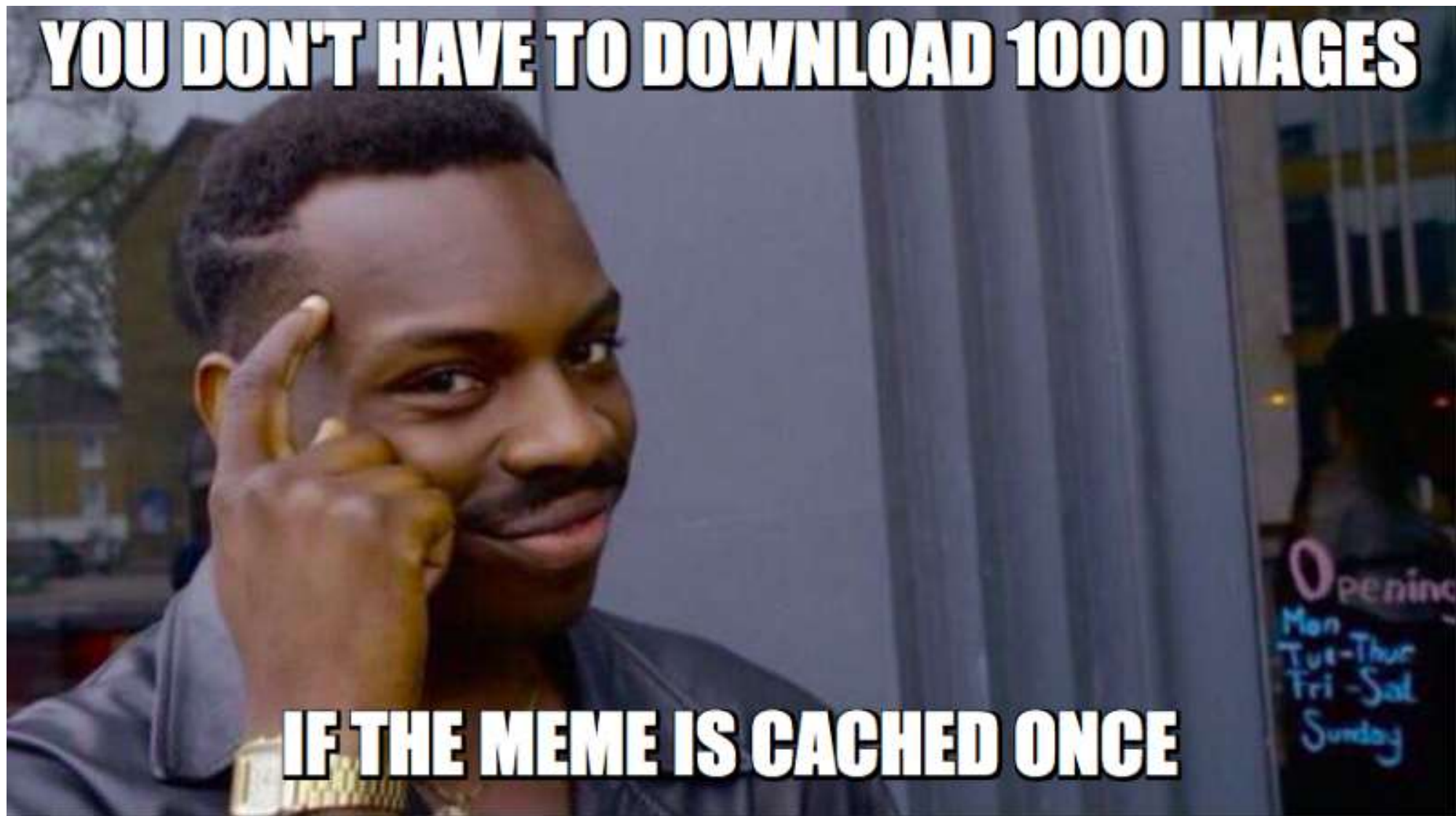
Try:

- Checking the network cables, modem, and router
- Reconnecting to Wi-Fi
- [Running Windows Network Diagnostics](#)

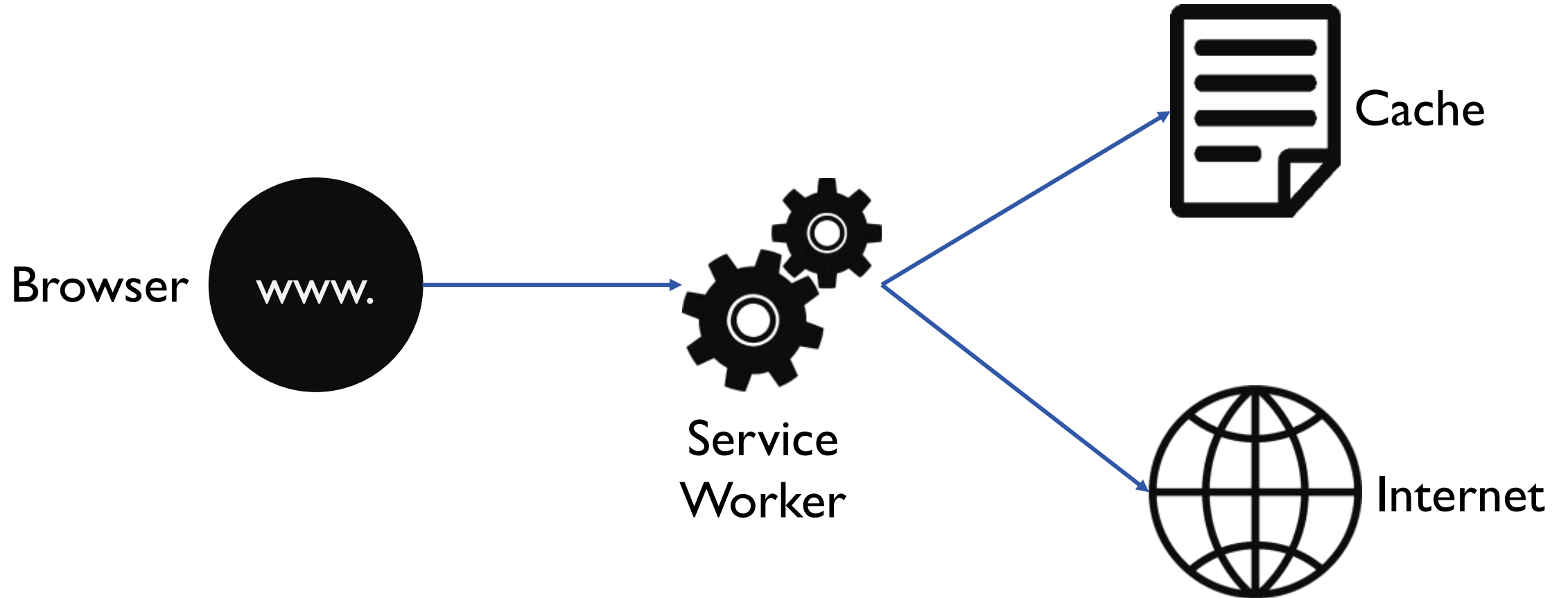
DNS_PROBE_FINISHED_NO_INTERNET

All links return HTTP 200





Using service worker (SW)



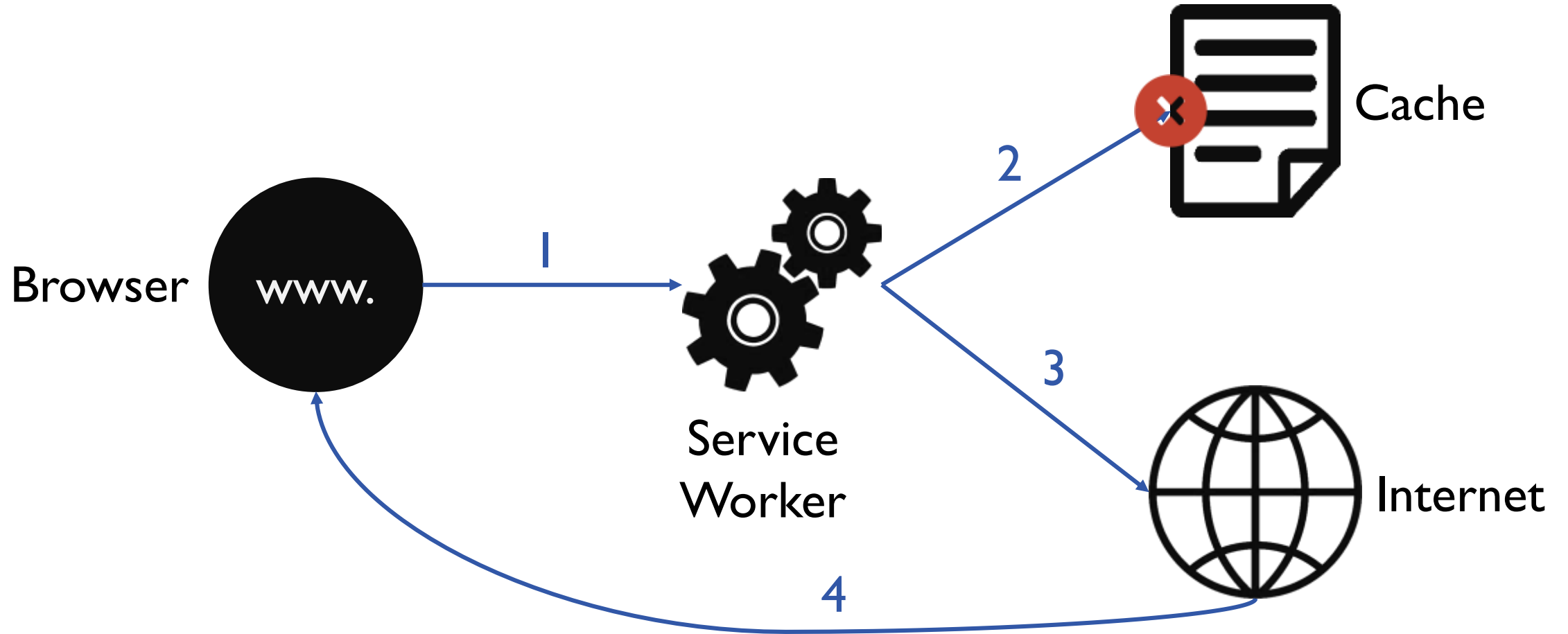
Register service worker

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

Cache request / response

```
const cache = await caches.open('my-cache-name');  
const isMatch = await cache.match(request);  
await cache.put(request, networkResponse.clone());  
await cache.delete(request);
```

Cache, falling back to network



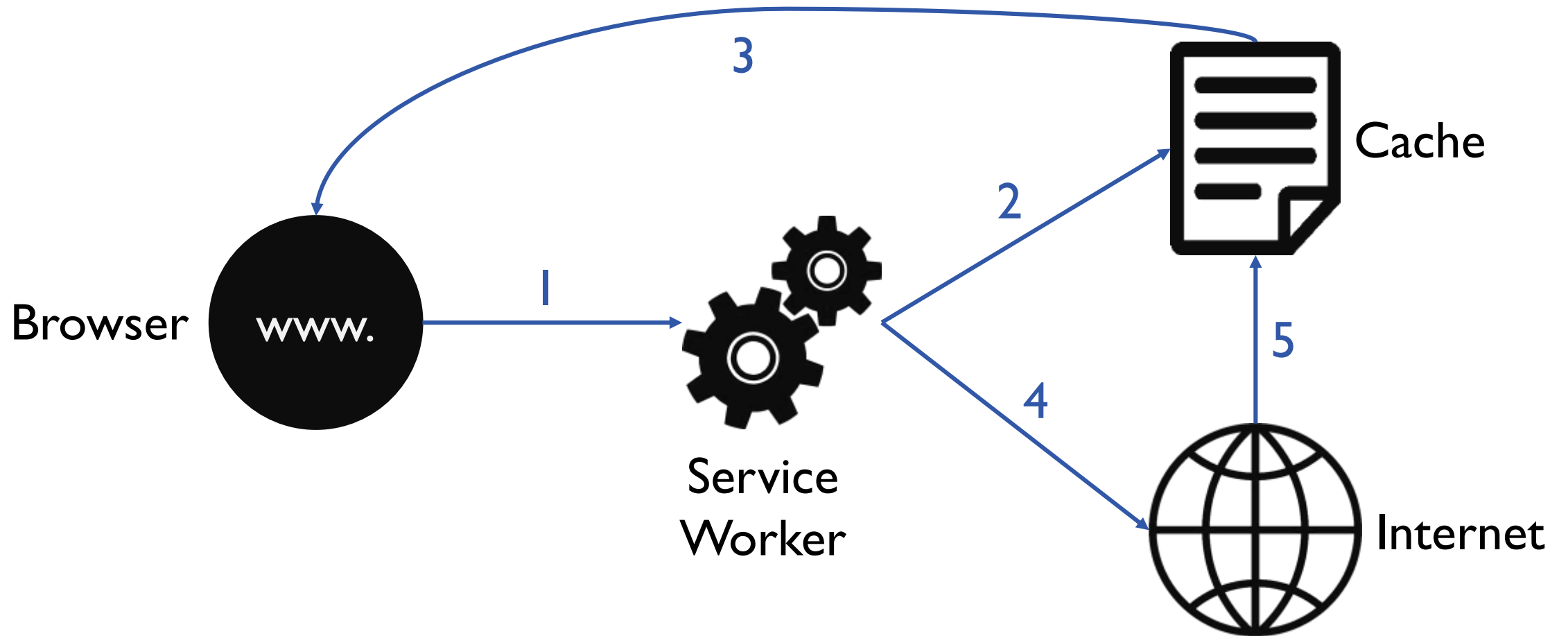
Precache general resources in SW

```
const CACHE_NAME = 'v1';  
const FILES_TO_CACHE = [  
  '/index.html',  
  '/styles/styles.css'  
];  
  
self.addEventListener('install', event => {  
  event.waitUntil(  
    caches.open(CACHE_NAME)  
      .then(cache => cache.addAll(FILES_TO_CACHE))  
  );  
});
```

Cache, falling back to network

```
self.addEventListener('fetch', event => {  
  event.respondWith(  
    caches.open(CACHE_NAME).then(cache => {  
      return cache.match(event.request).then(resp => {  
        return resp || fetch(event.request);  
      });  
    });  
  });  
});
```

Cache additional resources



Cache additional resources

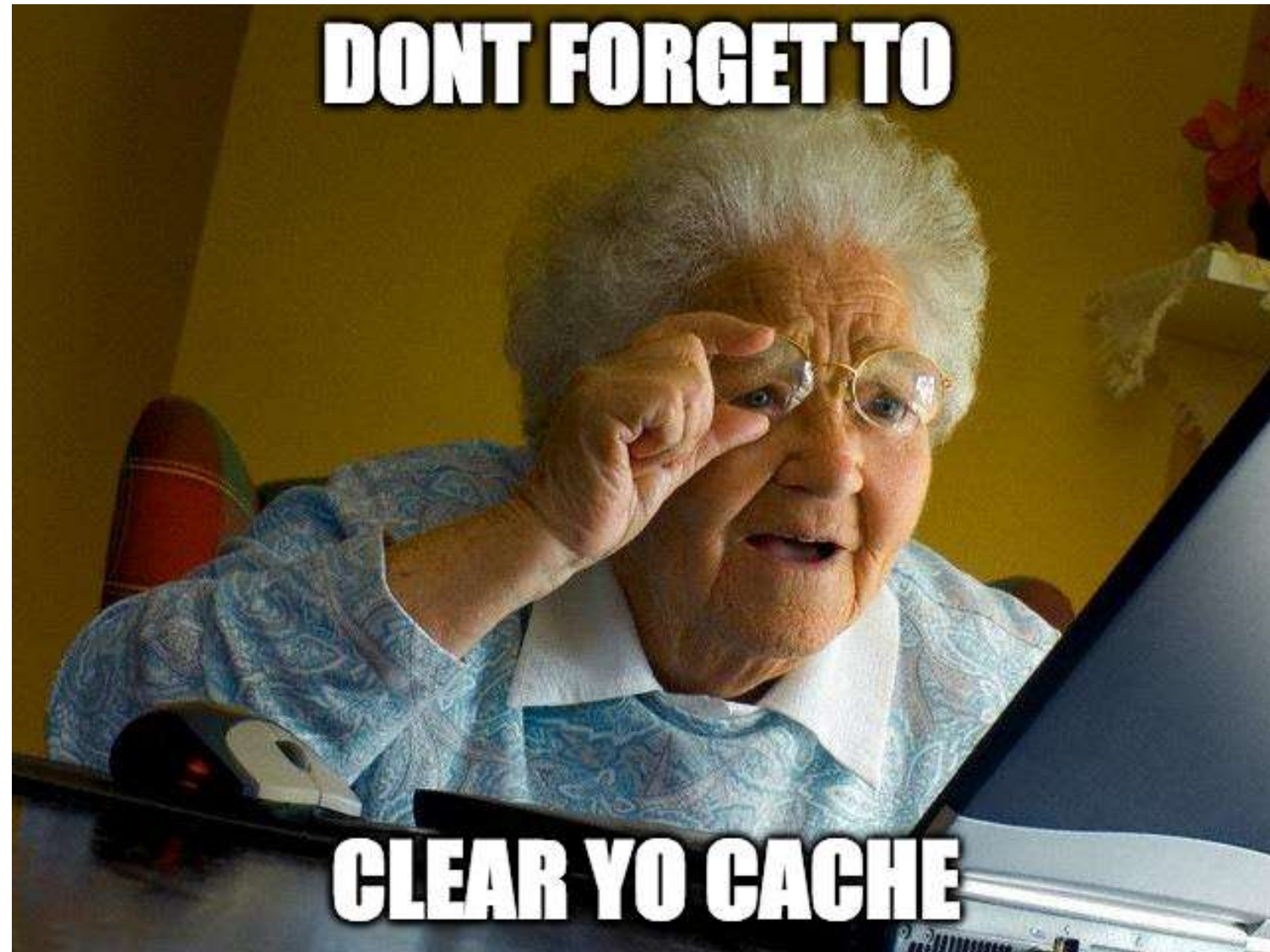
...

```
cache.match(event.request).then(resp => {  
  const fetchPromise = fetch(event.request)  
    .then(fetchResp => {  
      // Cache the network response  
      cache.put(event.request, fetchResp.clone());  
      return fetchResp;  
    });  
  return resp || fetchPromise;  
})
```

...

No Internet connection → offline.html

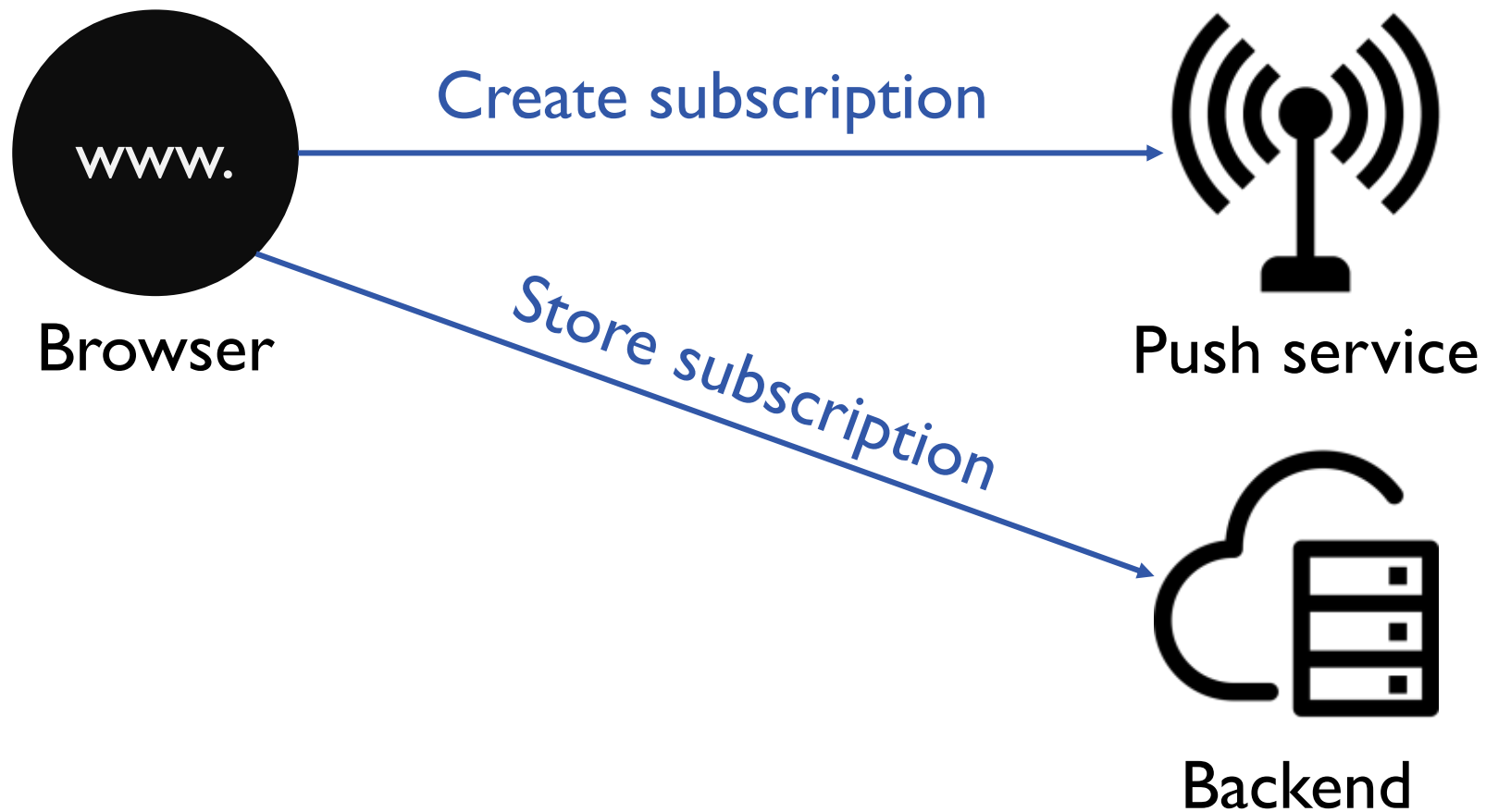
```
...
cache.match(event.request).then(response => {
  const fetchPromise = fetch(event.request)
    .then(fetchResponse => {
      cache.put(event.request, fetchResponse.clone());
      return fetchResponse;
    }).catch(() => {
      return cache.match('offline.html');
    });
  return response || fetchPromise;
})
...
```



Push notifications

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Push notifications subscription



Subscribe for push notifications

```
const registration =  
  await navigator.serviceWorker.ready;  
  
const subscription =  
  await registration.pushManager.subscribe({  
    userVisibleOnly: true,  
    applicationServerKey: VAPID_KEY  
  });
```

Unique subscription endpoint

https://fcm.googleapis.com/fcm/send/e88An1i_LKA:APA91bHdPdRemwCch5duvwDTeR0JzA1s9_TPP5MJ8J3XUXY9fIfBBpJAw8xDpHLNHJe_SMSigGsT7La6YmmNRvBdcqQawr5SIyGf8JuB1VvrNVdfsfacqAZQJqwnCraFc-fb206FJ

Register subscription with your server

```
fetch('/register', {  
  method: 'POST',  
  headers: {  
    'Content-type': 'application/json'  
  },  
  body: JSON.stringify({ subscription })  
});
```

Push notifications trigger



Handle & show push notifications

```
// Register for push events in the service worker
self.addEventListener('push', event => {
  const options = {
    body: event.data.text(),
    icon: 'images/notification.png',
    ...
  };
  event.waitUntil(
    self.registration
      .showNotification('Hello world!', options);
  );
});
```



https://example.com



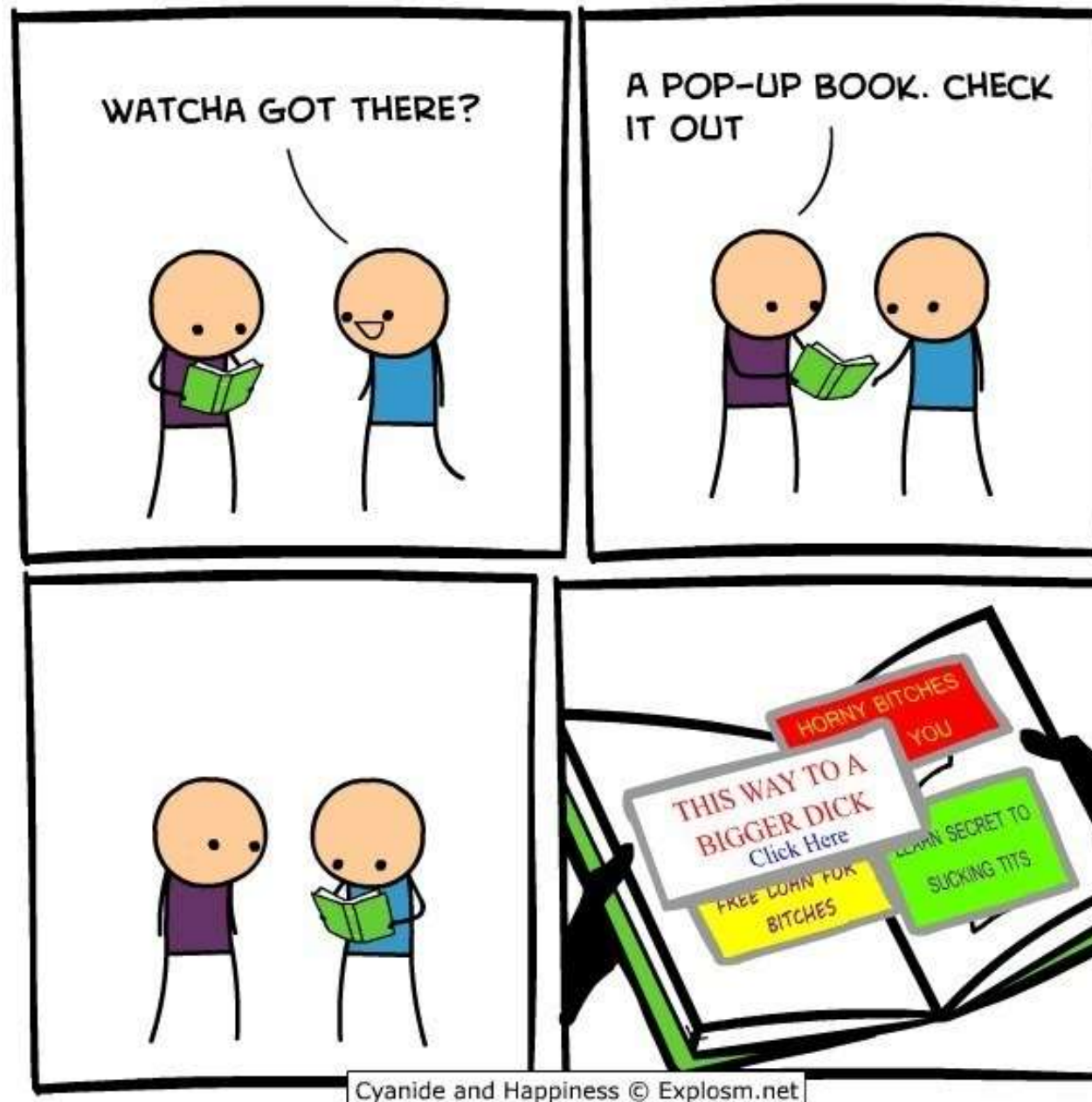
Will you allow **example.com** to send notifications?

[Learn more...](#)

Not Now



Allow Notifications



Cyanide and Happiness © Explosm.net

Once users have denied permission,
they can't be asked again



Provide context for the user

“[...] about **18 million** prompts shown on Firefox Beta in the month from Dec 25 2018 to Jan 24 2019. Not even **3%** of these prompts got accepted by users.”

Right timing?



Send notifications at a proper time
with a reasonable Time-To-Live



WITH
GREAT POWER COMES
GREAT RESPONSIBILITY



Be precise



Be timely



Be relevant

Gartner predicts that by 2020
Progressive Web Apps (PWA)
will replace **50%** of consumer-
facing apps

Join the mobile app revolution

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