# Developing Cross-Platform Web Apps With Blazor

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v1.0

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# Module 9: Progressive Web Applications (PWA)

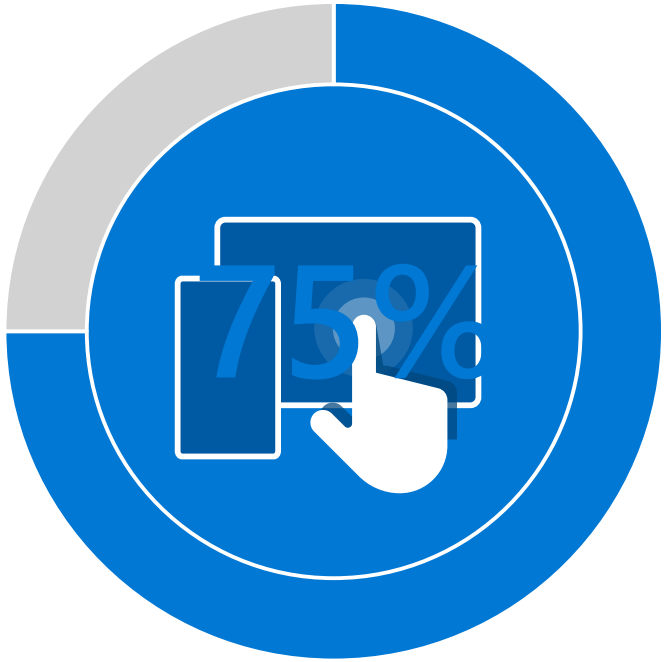
## Module Overview

# Module 9: Progressive Web Applications

## Section 1: PWA Fundamentals

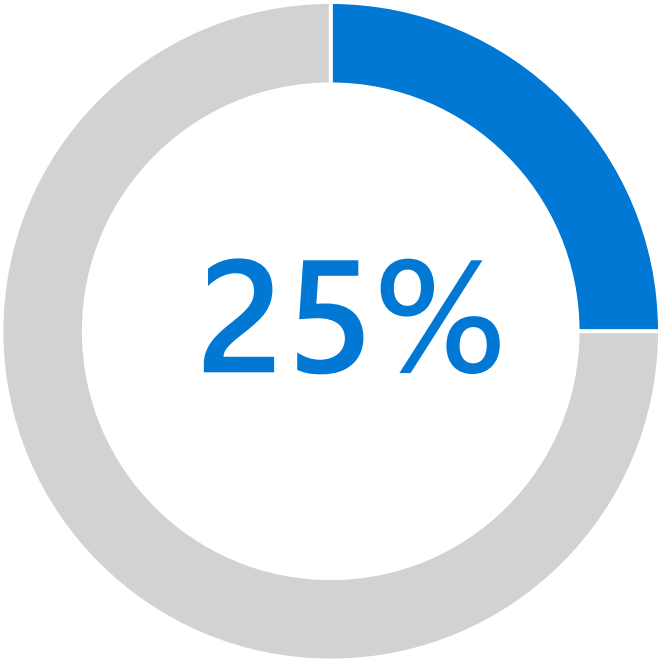
## Lesson: Introduction

# Native Apps - Today




More than 75% of time users spend on mobile devices are **spent on native apps**

# Mobile vs Desktop




More than 25% of users are **mobile only**

# Native Apps Usage

**Reasons people spend more time using their native apps rather than the mobile web:**

Apps are more predictable

They have some great engagement features like:

- Home screen icons
- Offline capabilities
- Push notifications

At this point you are tempted to say that building native apps is the obvious choice

# Native Apps Usage

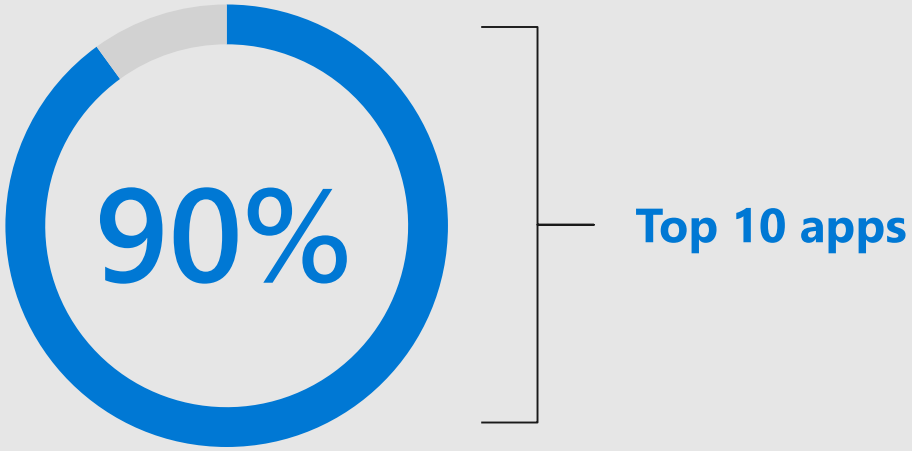
App usage is highly concentrated

Users tend to use few applications

Its kind of a “The winner takes it all” situation

Based on studies users see native apps as a big commitment in terms of time, space, and cost

Users request to constantly update the app even if they don't use it




Users spend over **90%** of their usage mobile time in their **top 10 apps**!

# Native Apps vs The Web

## Installing new native apps

More than 50% of users don't download new apps!

Only a minority of users download more than just one app

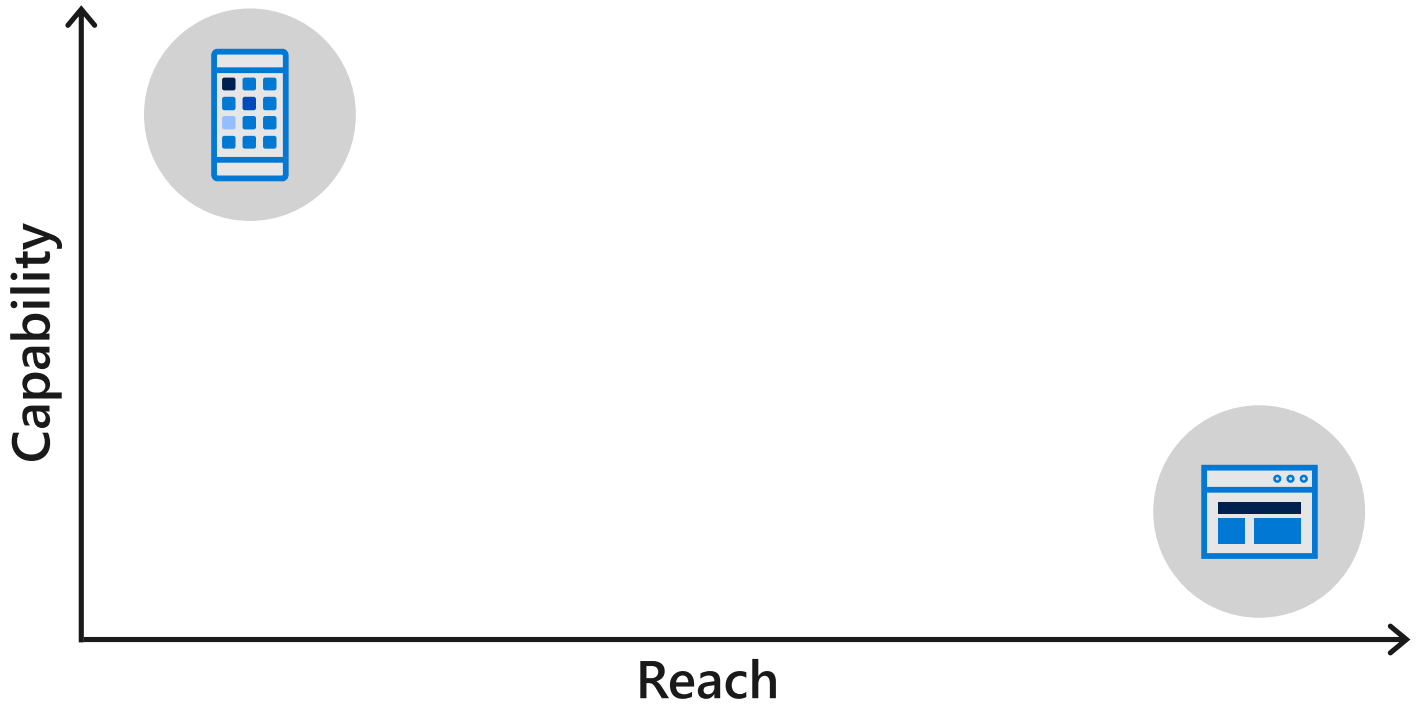
## By contrast

**>100**

Websites visited by an average user per month

# Native vs Web

One way to think about the difference between Native and Web has always been the capability Axis



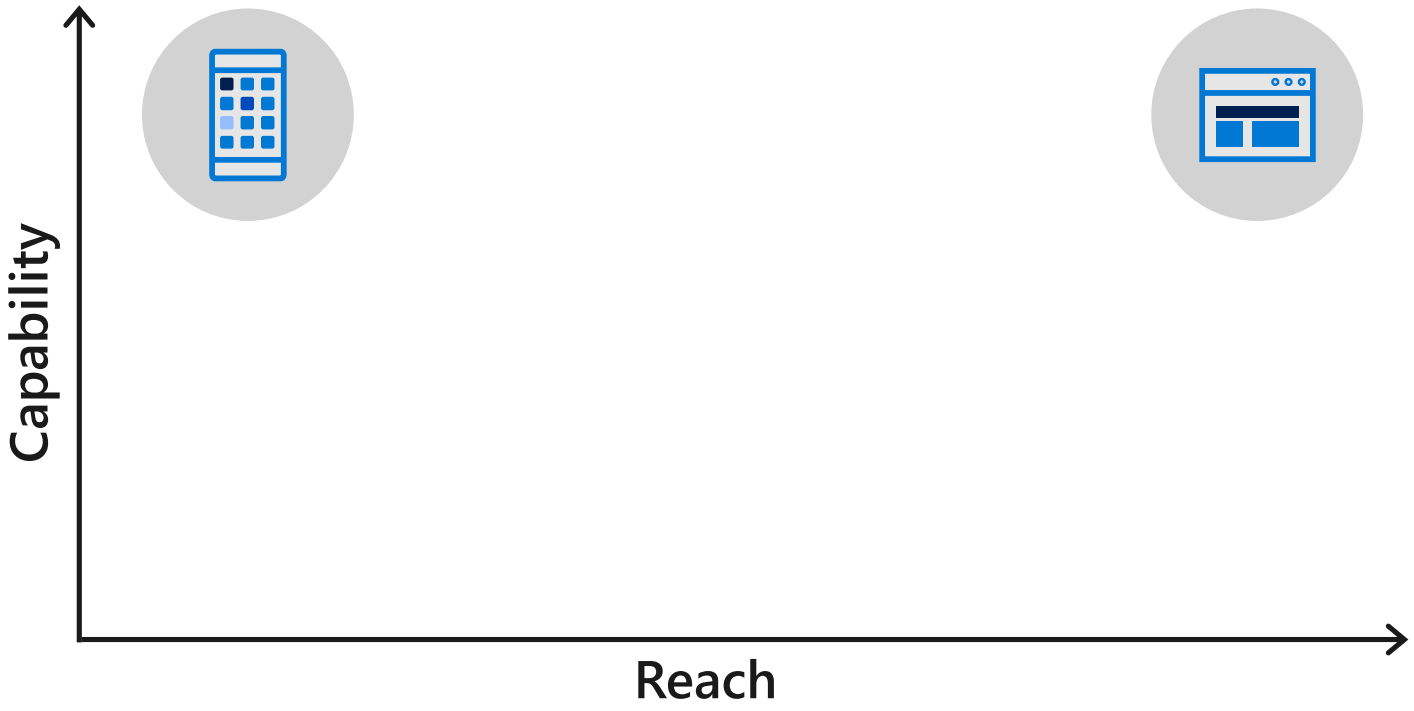

## Native Apps tend to

- Startup reliably when you hit their icon
- They boot up quickly
- Tend to work offline
- They can send notifications

# Native vs Web

What if we could add these set of capabilities to the web?

**We can have the best of two worlds**



# What are Progressive Web Apps (PWA)?

**What?**

**Why?**

**How**

# What are Progressive Web Apps (PWA)?

Progressive web apps **use modern web APIs** along with traditional progressive enhancement strategy to create **cross-platform web applications**

With PWA you can use open web technologies
for cross-platform interoperability
**while** providing your users with a native app-like experience
customized for their device

https://docs.microsoft.com/en-us/microsoft-edge/progressive-web-apps
https://developer.mozilla.org/en-US/Apps/Progressive

# What are Progressive Web Apps (PWA)?

**PWAs are just web applications that are progressively enhanced**

To perform better
on any browser

To perform like native apps
on mobile devices

**On supported platforms!**

# Supported Platforms

Browser:





Mobile:


Application store:

Desktop:


# What are Progressive Web Apps (PWA)?

The qualities of a PWA combine the best of the web and native apps.

**Discoverable**
From web search results and supporting app stores

**Installable**
Pin and launch from the home screen

**Re-engageable**
Send push notifications, even when the app isn't active

**Network independent**
Works offline and online in low-network conditions

https://docs.microsoft.com/en-us/microsoft-edge/progressive-web-apps

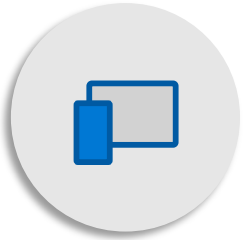
# What are Progressive Web Apps (PWA)?

## Progressive

Experience scales up (or down) with device capabilities

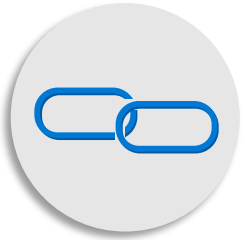
## Safe

Provides a secure HTTPS endpoint and other user safeguards



## Responsive

Adapts to the user's screen size/orientation and input method



## Linkable

Share and launch from a standard hyperlink

https://docs.microsoft.com/en-us/microsoft-edge/progressive-web-apps

# Why Develop Progressive Web Apps (PWA)?

**What?**

**Why?**

**How**

# Why Develop Progressive Web Apps (PWA)?

**Distribution (Initial and updates)**

With web apps its just a matter of pushing a new version to your server

No need to deploy to an app store

**Leverage your existing code and coding skills**

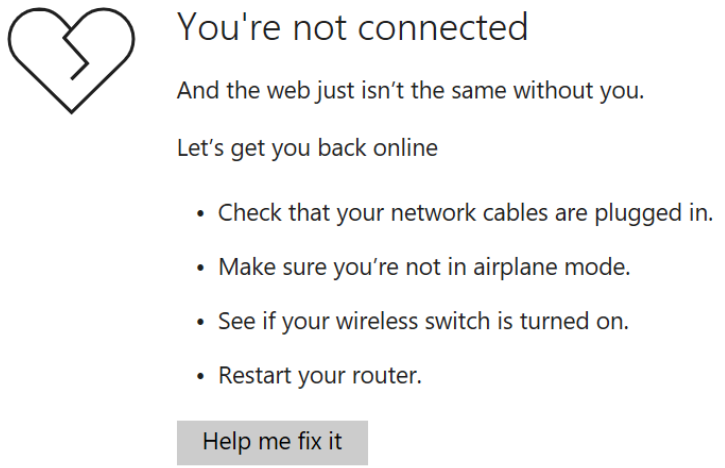
Have the same code for mobile **and** others (browser or desktop apps)

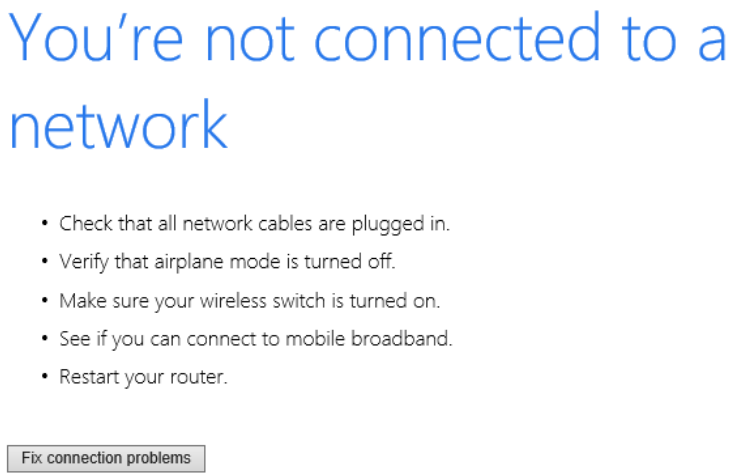
Easily add progressive feature to existing web applications, even not targeted for mobile usage

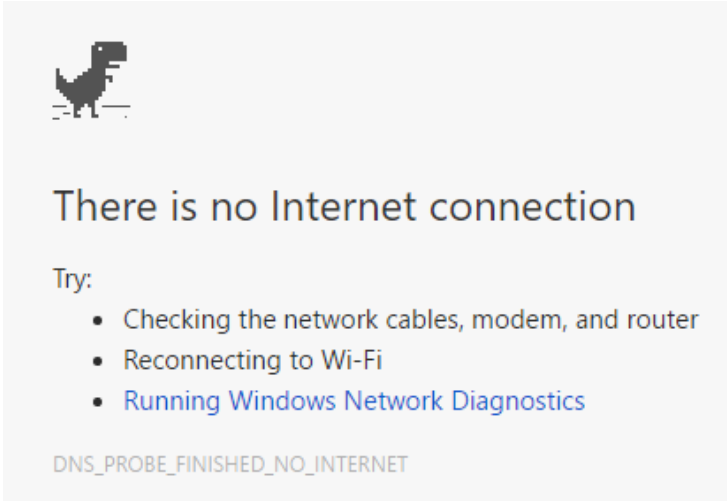
# Why develop Progressive Web Apps (PWA)?

**Improve user experience—**
**User experience needs to be reliable**

Need to support offline scenarios (during load and during execution)



# Why develop Progressive Web Apps (PWA)?

**Improve user experience—**
**User experience needs to be**
**fast**

Users don’t expect unresponsive scrolling

Users don’t expect slow loading

Loading a web app needs to feel instantaneous

**40%**

Of users abandon sites that take longer than **3 seconds** to load

# Why develop Progressive Web Apps (PWA)?

**Improve user experience—**
**User experience needs to be**

## engaging

Offering an integrated experience
Should feel like it belongs on the device and not inside a tab inside a browser application

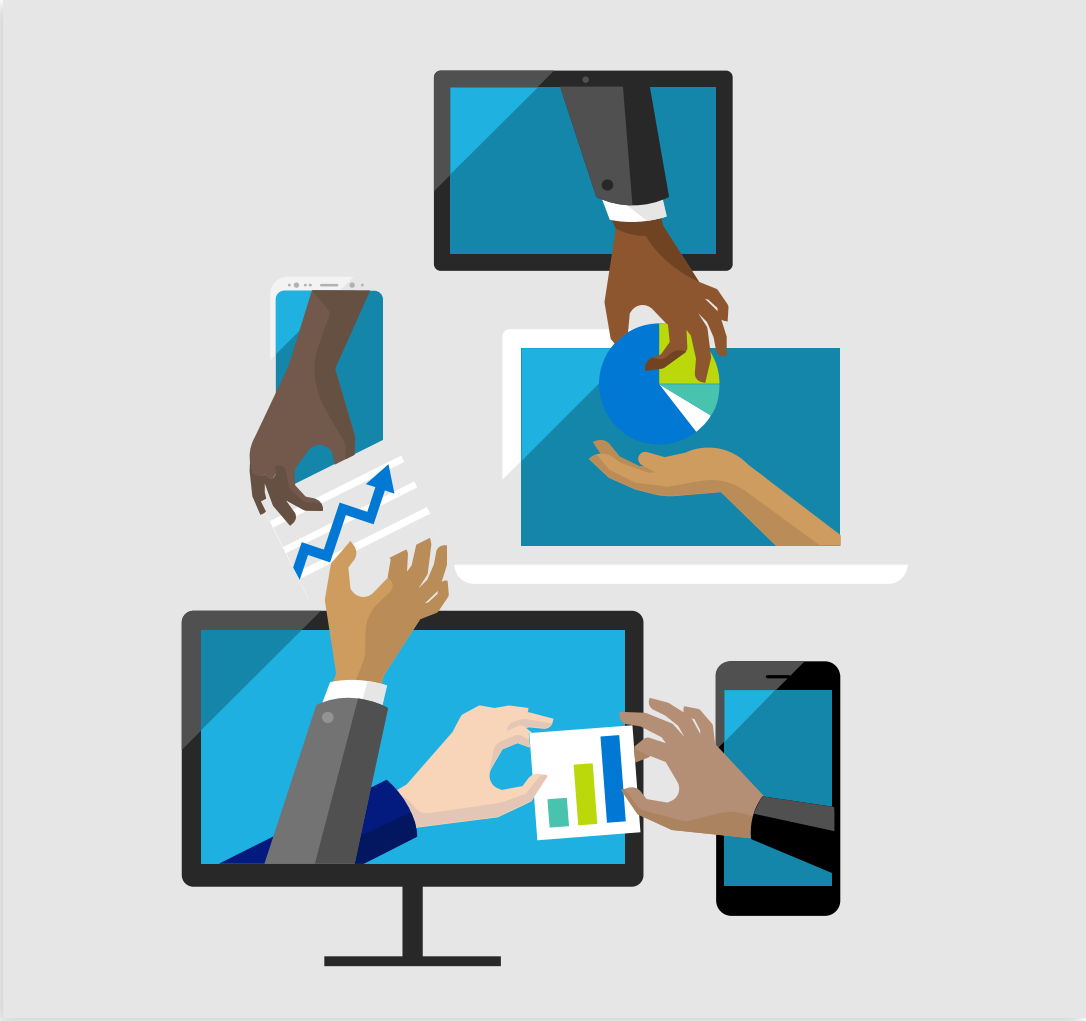
Need to feel immersive

- Full Screen
- Theming
- Orientation

Home Screen Integration—have an icon on your home screen

Notification—ability to push important notifications to the user, even if not currently using the application

# Why develop Progressive Web Apps (PWA)?



**PWA is not just for mobile!**

# PWA in action

! **Trivago** saw an increase of **150%** for people who add its PWA to the home screen. Increased engagement led to a **97%** increase in clickouts to hotel offers. Users who go offline while browsing can continue to access the site and **67%** continue to browse the site when they come back online.

# PWA in action

**AliExpress** improved conversion rate for new users by **104%** across all browsers, with **2×** more pages visited and **74%** more time spent per session.

# PWA in action

! **Twitter Lite** saw a **65%** increase in pages per session, **75%** in Tweets, and a **20%** decrease in bounce rate. Twitter Lite loads in under **3** seconds for repeat visits even on slow networks.

# How to Develop Progressive Web Apps (PWA)?

**What?**

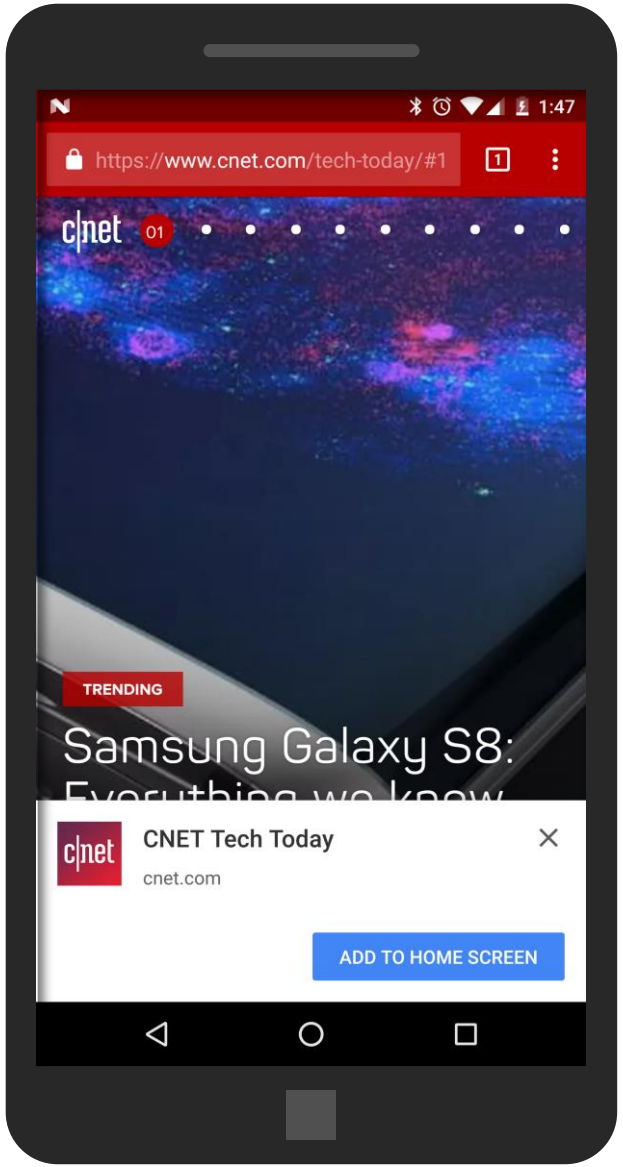
**Why?**

**How**

# PWA Implementation

## Web Application Manifest

- Makes your application installable
- Simple JSON file—holds information about the web application and how it should behave when 'installed' on the user's mobile device or desktop
- Having a manifest is required to show the Add to Home Screen prompt



# JSON File

manifest.json

You, a few seconds ago | 1 author (You)

```
{
    "name": "PWA Workshop",
    "short_name": "PwaWs",
    "start_url": "/",
    "scope": ".",
    "display": "standalone",
    "orientation": "portrait-primary",
    "background_color": "#fff",
    "theme_color": "#3f51b5",
    "description": "Introdcutoin to PWA.",
    "dir": "ltr",
    "lang": "en-US",
    "icons": [
      {
```

# JSON File

```
"icons": [
  {
    "src": "/images/icons/app-icon-48x48.png",
    "type": "image/png",
    "sizes": "48x48"
  },
  {
    "src": "/images/icons/app-icon-96x96.png",
    "type": "image/png",
    "sizes": "96x96"
  },
  {
    "src": "/images/icons/app-icon-144x144.png",
    "type": "image/png",
    "sizes": "144x144"
  },
  {
    "src": "/images/icons/app-icon-192x192.png",
    "type": "image/png",
    "sizes": "192x192"
  },
  {
    "src": "/images/icons/app-icon-256x256.png",
    "type": "image/png",
    "sizes": "256x256"
  },
  {
    "src": "/images/icons/app-icon-384x384.png",
    "type": "image/png",
    "sizes": "384x384"
  },
  {
    "src": "/images/icons/app-icon-512x512.png",
    "type": "image/png",
    "sizes": "512x512"
  }
]
}
```

# Demo: Adding Web Application Manifest

# PWA Implementation

## Service worker

- JavaScript code that your browser runs in the background
- Can't access the DOM directly—communicates with the pages it controls by responding to messages sent via the postMessage interface
- Separated from the web page—
  it has it’s own lifecycle
- Attached to an application and not a page — registered for a specific origin and scope

# PWA Implementation

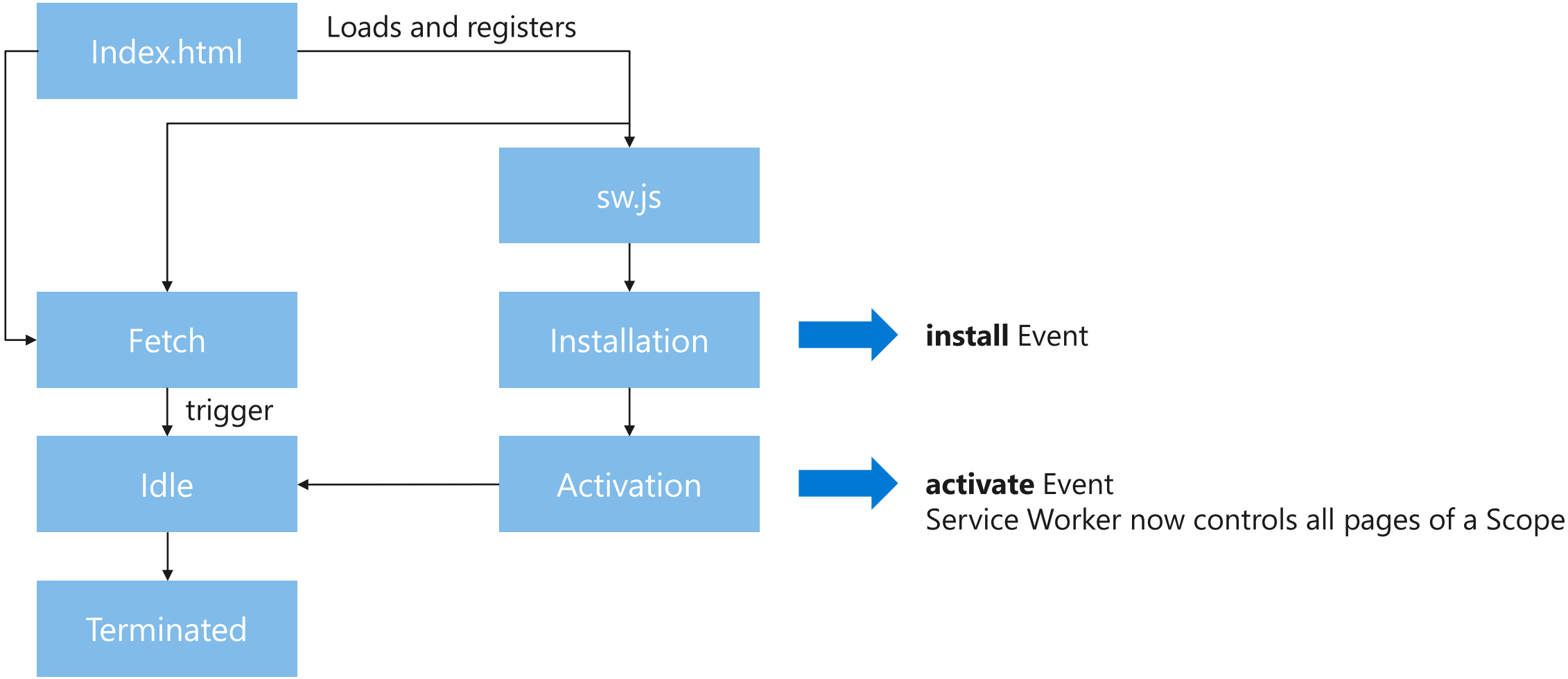
## HTTPS

- Service worker will only work on a secured channel
- Only exception: localhost

# Service Worker Listenable Events

| Event | Source |
| --- | --- |
| Fetch | Browser or Page-related JavaScript initiates a Fetch (Http request) |
| Push Notifications | Service Worker receives Web Push Notification (from Server) |
| Notification Interaction | User interacts with displayed Notification |
| Background Sync | Service Worker receives Background Sync Event (e.g. Internet Connection was restored) |
| Service Worker Lifecycle | Service Worker Phase |

# Service Worker Lifecycle



# Service Worker Browser Support

# Service Worker Browser Support

## Background Sync API - UNOFF

Usage % of all users ?

Global 72.31%

Provides one-off and periodic synchronization for Service Workers with an onsync event.

Current aligned | Usage relative | Date relative | Apply filters | Show all | ?

| 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 | Baid Brows |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 12-18 | | 4-48 | | 10-41 | | | | | | | | 4 | | |
| 6-10 | 79-81 | 2-77 | 49-81 | 3.1-13 | 42-68 | 3.2-13.3 | | 2.1-4.4.4 | 12-12.1 | | | | 5-11.2 | | |
| 11 | 83 | 78 | 83 | 13.1 | 69 | 13.5 | all | 81 | 46 | 81 | 68 | 12.12 | 12.0 | 10.4 | 7.1 |
| | | 79-80 | 84-86 | 14-TP | | 14.0 | | | | | | | | | |

# Demo: Adding The Service Worker

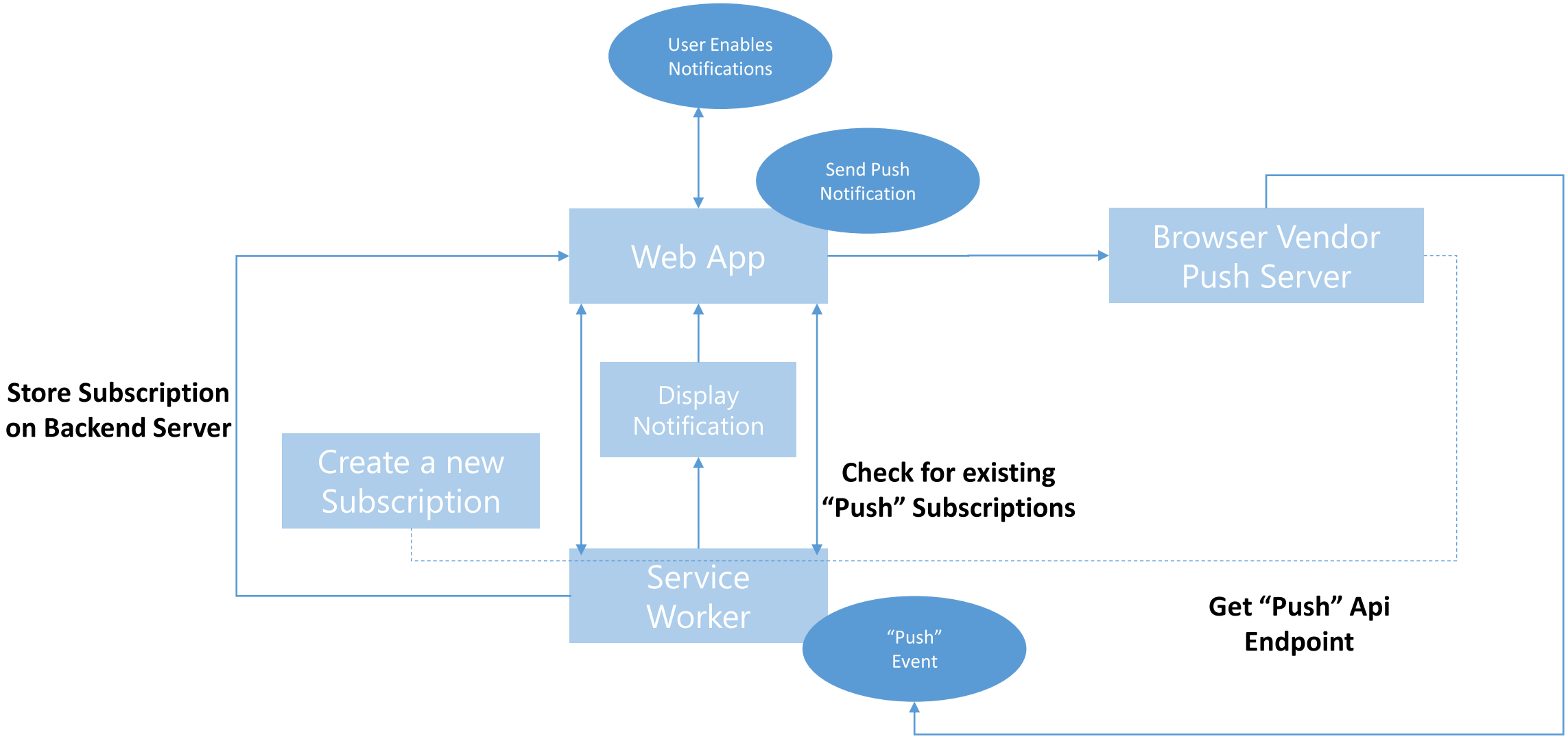
# Push Notifications

Shows up even if the browser is closed

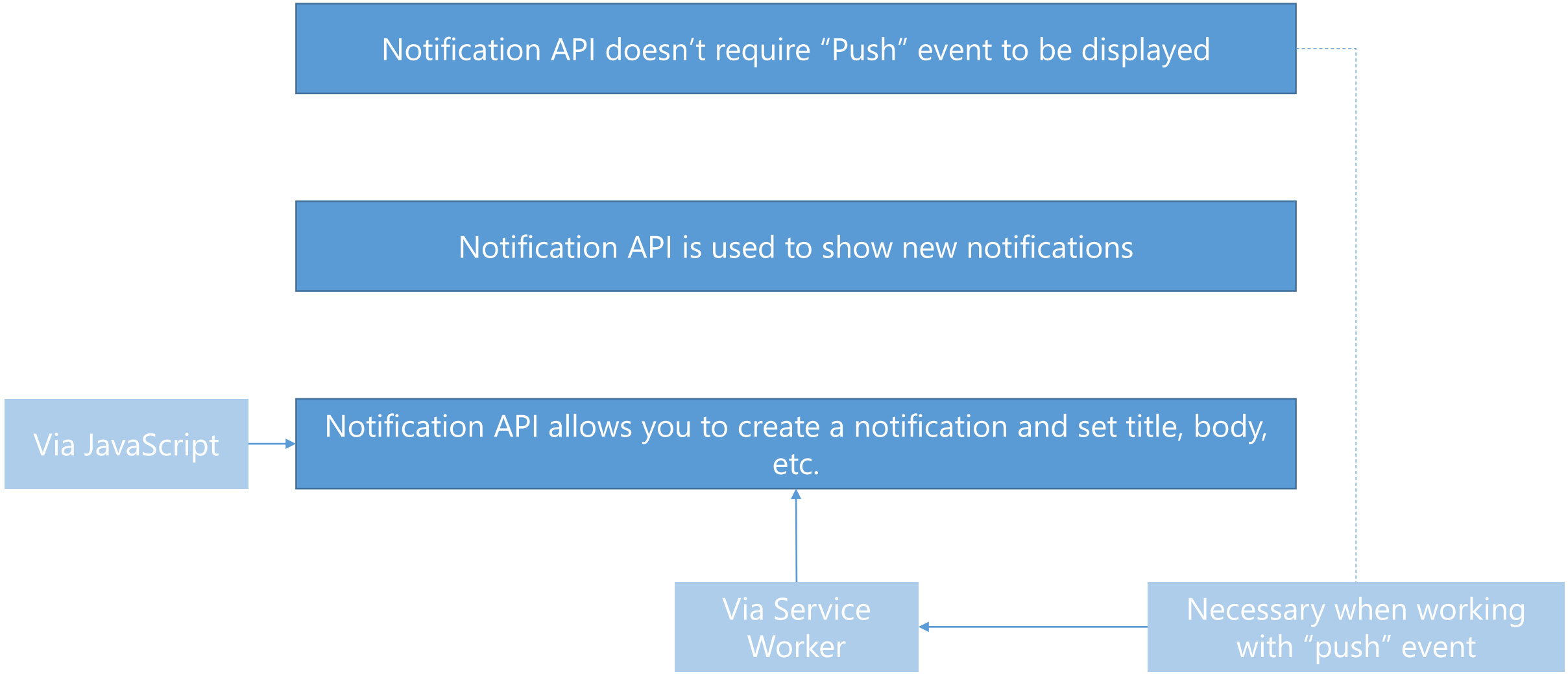
Drives user engagement

Mobile-App like experience

# How Does It Work?



# Displaying Notifications



# Service Worker Browser Support

## Web Notifications - LS

Method of alerting the user outside of a web page by displaying notifications (that do not require interaction by the user).

Usage % of all users ?

Global 77.39% + 0.53% = 77.92%

unprefixed: 77.39%

Current aligned | Usage relative | Date relative | Apply filters | Show all | ?

| 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 | Baid Brows |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 4 | | | | | | | | | | | | |
| | 12-13 | 2-21 | 5-21 | 3.1-5.1 | 10-24 | | | 2.1-4.3 | | | | | 4 | | |
| 6-10 | 14-81 | 22-77 | 22-81 | 6-13 | 25-68 | 3.2-13.3 | | 4.4-4.4.4 | 12-12.1 | | | | 2 5-11.2 | | |
| 11 | 83 | 78 | 83 | 13.1 | 69 | 13.5 | all | 81 | 46 | 3 81 | 68 | 12.12 | 2 12.0 | 10.4 | 2 7.1 |
| | | 79-80 | 84-86 | 14-TP | | 14.0 | | | | | | | | | |

# Demo: Push Notifications

# Module Summary

- In this module, you learned about:
  - Progressive Web Applications
  - Adding Web Application Manifest
  - Adding The Service Worker
  - Push Notifications

# Lab 9: Progressive Web Applications

# References

- Microsoft Docs

- Blazor University


Microsoft