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Velocity

BUILD RESILIENT SYSTEMS AT SCALE

velocityconf.com
#velocityconf

Progressive Web Apps for a faster experience

Maximiliano Firtman

@firt - firt.mobi

mobile+web developer & trainer

training in 30+ countries


移动Web编程（影印版）
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O'REILLY
Mobile Web 程式設計
Programming the Mobile Web, 2nd Edition
Firtman
jQuery Mobile: Up and Running
Firtman
実践 jQuery Mobile
O'REILLY
М. Фиртман
jQuery Mobile: разработка приложений для смартфонов и планшетов
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Programmare per il Web Mobile
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HOPS
移动网络程序设计
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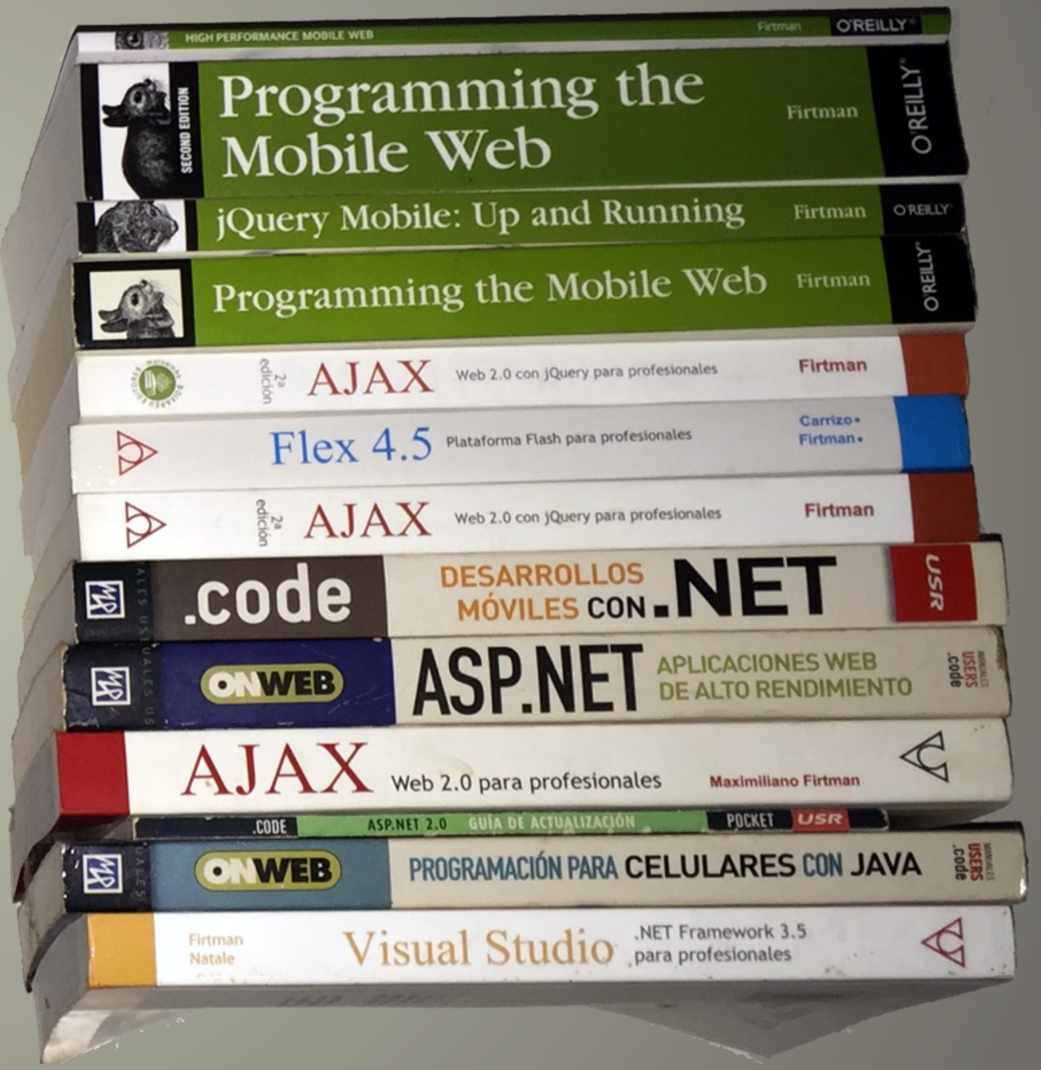
ЧИТАЙ
Веб-программирование
для мобильных устройств
PEARSON
DÉVELOPPER POUR LE WEB MOBILE
Référence
O'REILLY
Mobil Web Programlama
MAXIMILIANO FIRTMAN
PUSULA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SECOND EDITION
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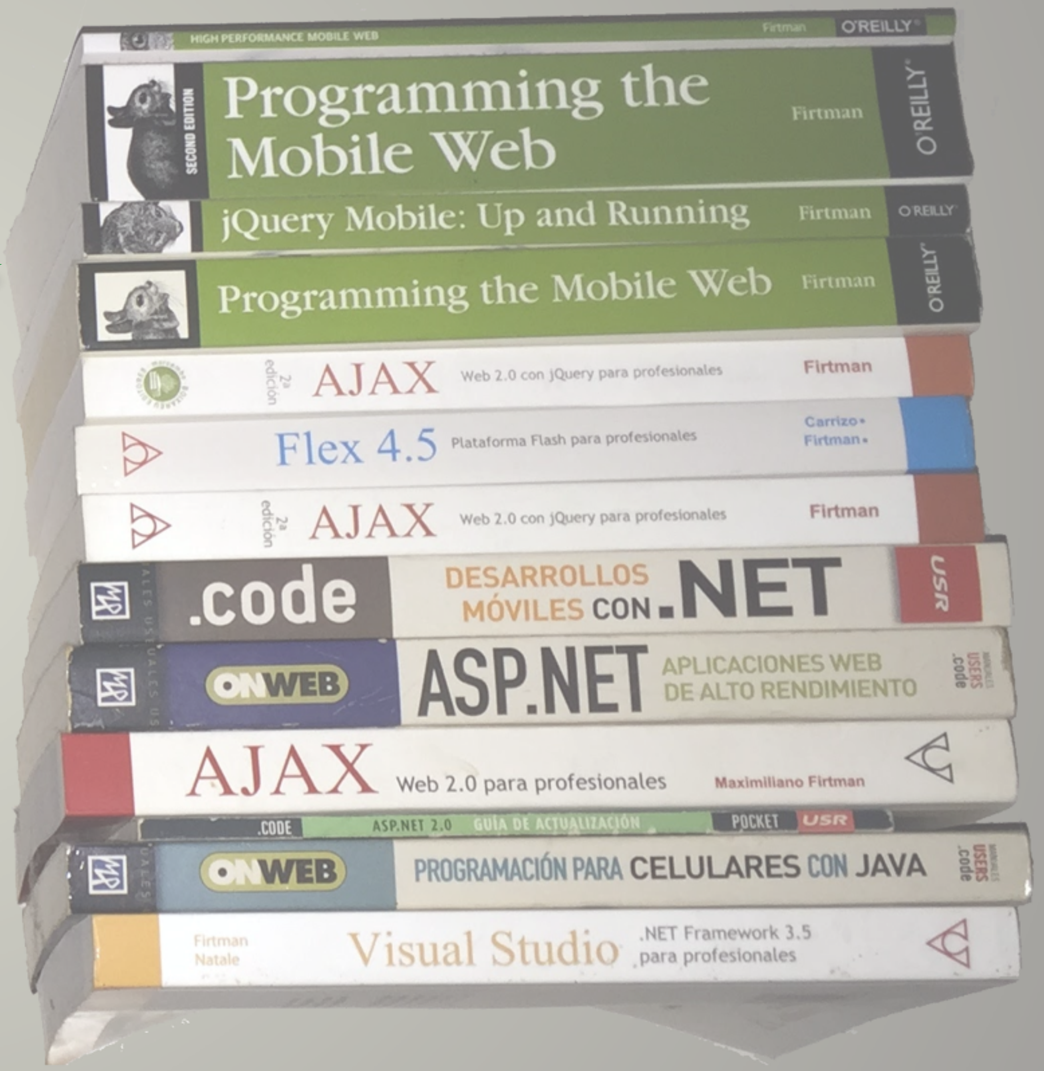
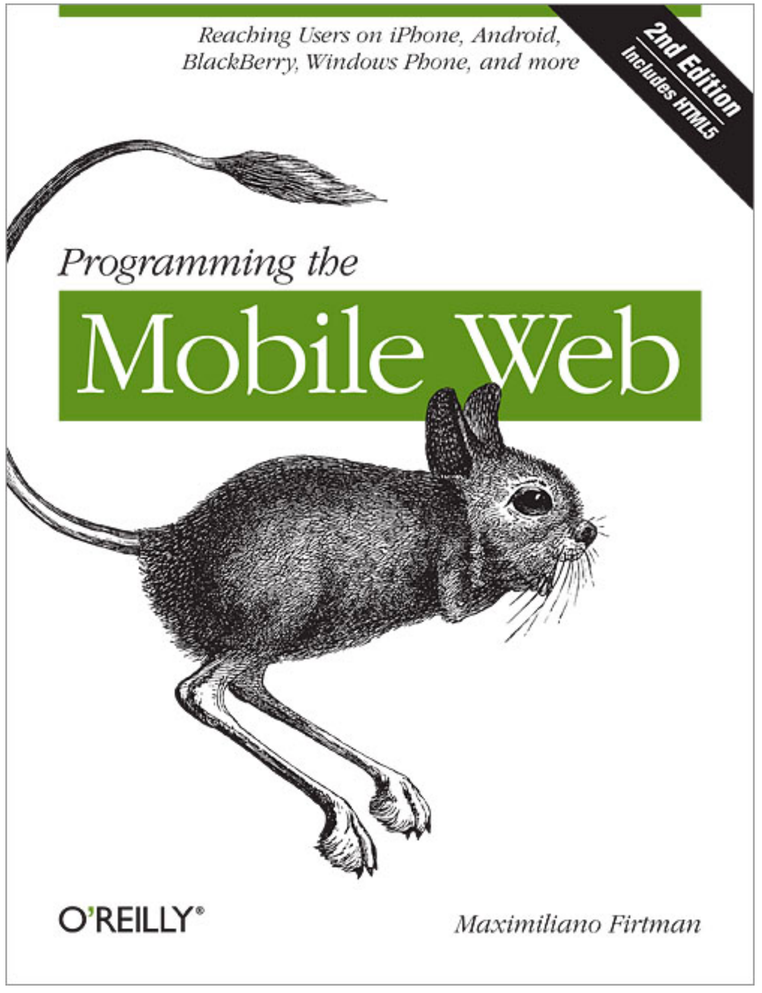
para profesionales

Books I've authored



Translations


Reaching Users on iPhone, Android, BlackBerry, Windows Phone, and more
2nd Edition
Includes HTML5
Programming the
Mobile Web
O'REILLY
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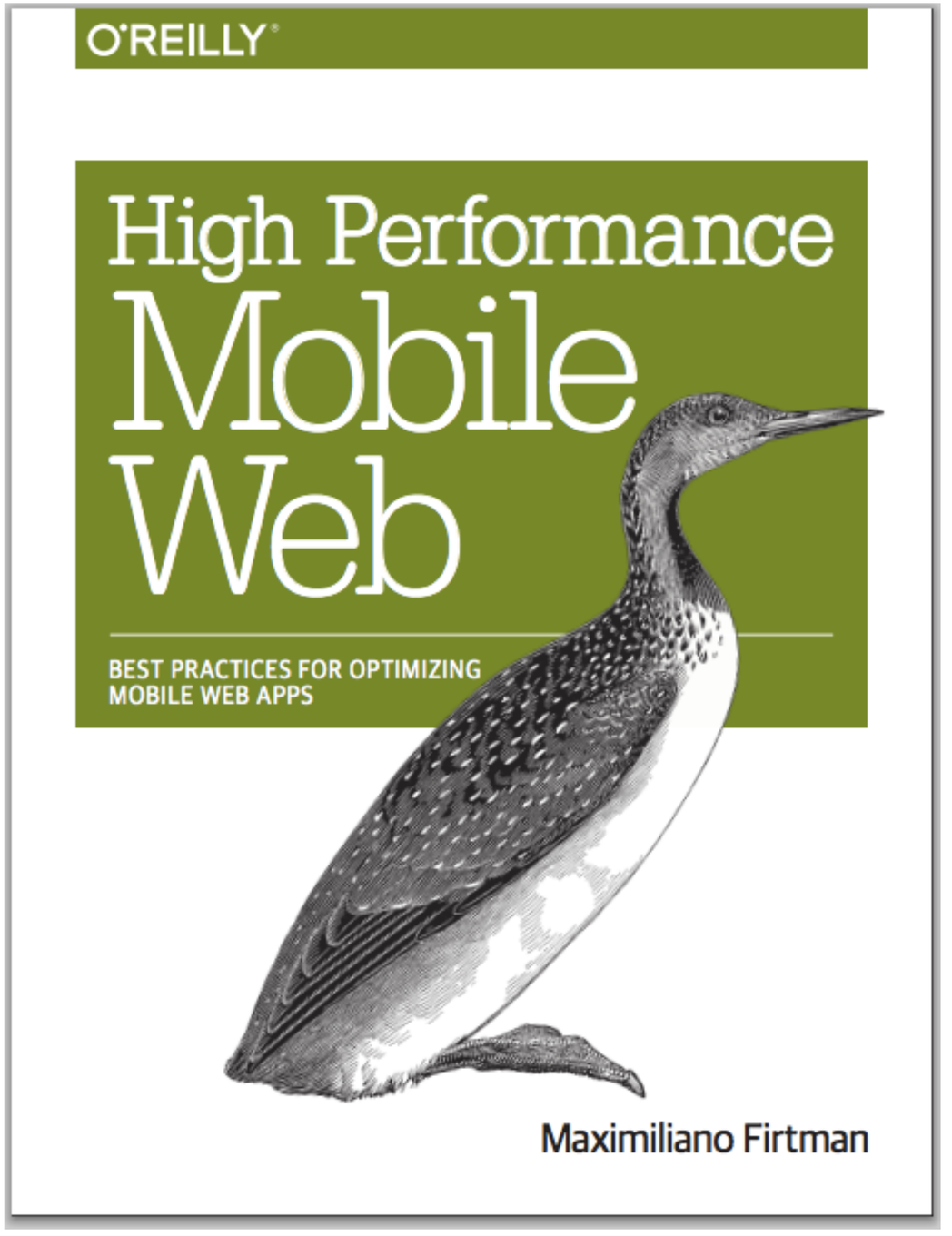
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Mobile
Web
BEST PRACTICES FOR OPTIMIZING
MOBILE WEB APPS
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Mobile HTML5

Maximiliano Firtman

VIDEO

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Apache Cordova and PhoneGap

Best Practices for Web Designers and Web Developers

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VIDEO

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Offline Web

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Mastering Web Views

questions

yes, please

anytime

Agenda

9.00~10.30: PWA and Service Workers

10.30~11.00: ☕ Break (Topaz Lounge & Ruby Lounge)

11.00~12.20: Notifications, AMP and More

12.20~12.30: Q&A

12.00~13.00: Lunch (Emerald Lounge)

Let’s Start!

Pre-requisites

Prerequisites

Latest version of Google Chrome

A web server

A text editor (VS Code / Brackets.io)

Node.js (optional)

Downloads

github.com/firtman/velocity16

Outline

1- PWAs

2- Service Workers

3- Offline Detection

4- Background Sync

5- Web Push

6- AMP

Progressive Web Apps

Progressive Web Apps

1- Open Definition

2- Embraced by Google

3- Followed by Firefox, Opera, Samsung and Microsoft

a model for creating "app-like" experiences using latest Web technologies and best practices

Features

1- Instant Loading

2- Responsive

3- Installable

4- Secure

5- Re-engageable

6- Fast

Features

1- Instant Loading

2- Responsive

3- Installable

4- Secure

5- Re-engageable

6- Fast


progressive
enhancement

Progressive Enhancement

1- It’s a website!

2- Adds native installation

3- Adds Web Push Notifications

4- Adds hardware & platform access

PWAs and Hybrids

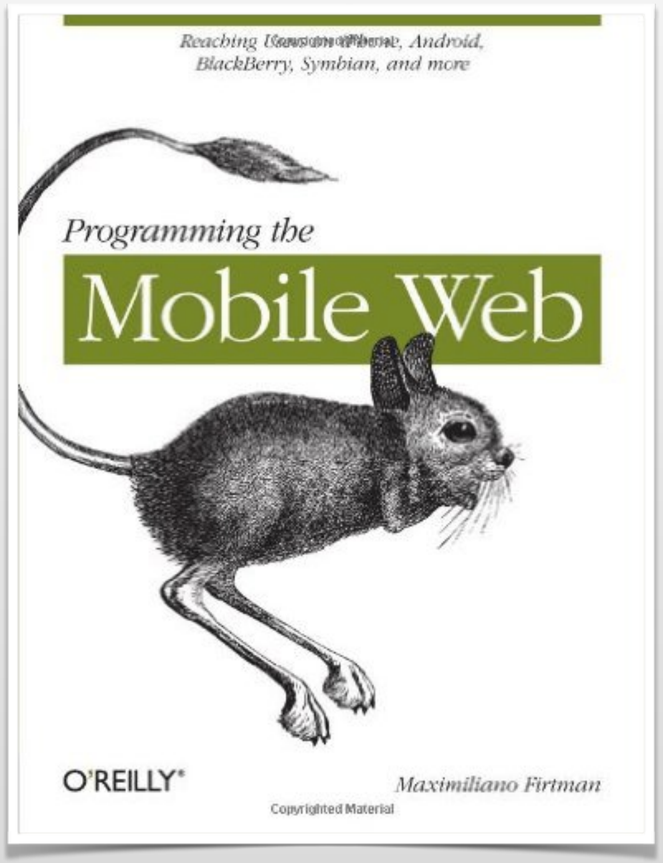
1- Web View vs. current browser

2- Store distribution

3- No packaging and signing

4- No native “plugins”

… not new



History

1- Nokia WRT

2- iOS Home Screen Web Apps

3- Firefox Open Web Apps

4- Chrome Home Screen Web Apps

“Full” Compatibility

1- Chrome on Android

2- Opera Mobile

3- Samsung Internet Browser

4- Firefox (future)

5- Edge (future)

Best of both worlds

Best of Web

1- Linkable

2- Discoverable

3- Easy to deploy

4- Easy to update

5- Standards

Best of Native

6- Offline Access

7- Installed Icon

8- Push Notifications

9- Full Screen Experience

10- Fast UI

Progressive Web Apps

1- Open Definition

2- Performance, Secure, App-like

3- Progressive Enhancement

4- Best of Web and Native

PWAs in Action

1- Experiences and Stats

2- Gallery

3- Examples

PWA Experiences

PWA.rocks


Progressive Web Apps
business
demo
event
game
news
other
reference
shopping
social
tool
かな
THE SESSION

PWAs in Action

DEMOs

3x more time spent on the Web

+40% re-engagement rate

+70% conversion rate for home screen users

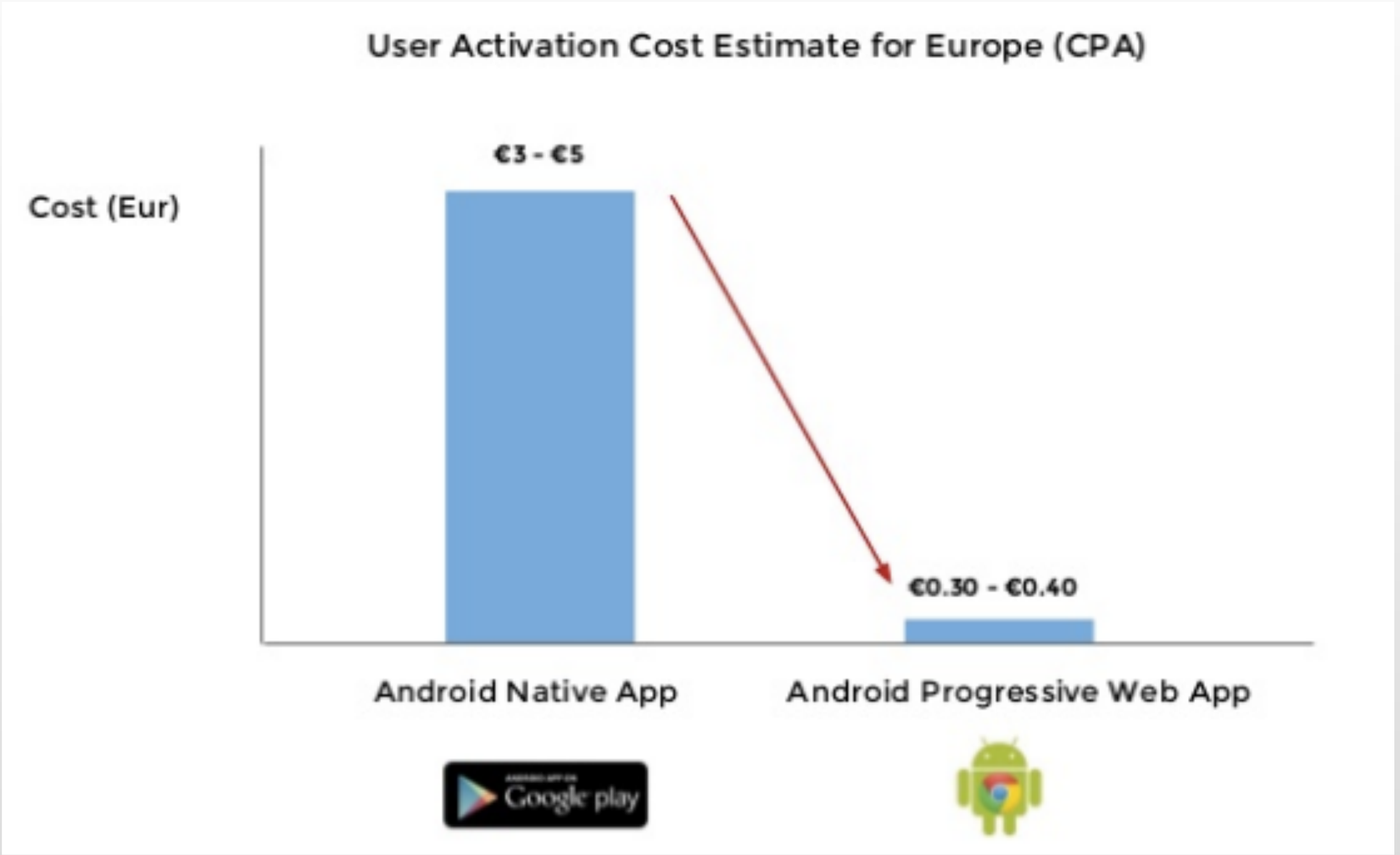
+104% users

2x visited pages

+74% time spent per session

Same time spent as in native

Selio


User Activation Cost Estimate for Europe (CPA)
Cost (Eur)
€3 - €5
€0.30 - €0.40
Android Native App
Android Progressive Web App
Google play

10x cheaper user acquisition

Be in touch even on uninstall

Abilities and Limitations

Abilities

Abilities

1- Work on every network situation

2- Sensors and hardware

3- Multimedia

4- Push Notifications

5- Sit on Home Screen (Android)

Limitations

1- Multiplatform support

2- Responsive Design

3- First Class Citizen

4- Intents

5- Distribution

Limitations

Vendors are working on this for the near future.

Web APK

1- Landed on Chromium in mid-2016

2- Will create an APK upon installation

3- Home Screen and App Launcher

4- Permissions and OS integration

5- Intent and App Link

6- Google Play Distribution?

Architecture

Steps

1- Start as a fast website

Normal

Server-side rendering

AMP

Steps

2- Add Service Worker support

Steps

3- Offer Web Notifications

Steps

4- Offer device-specific experiences

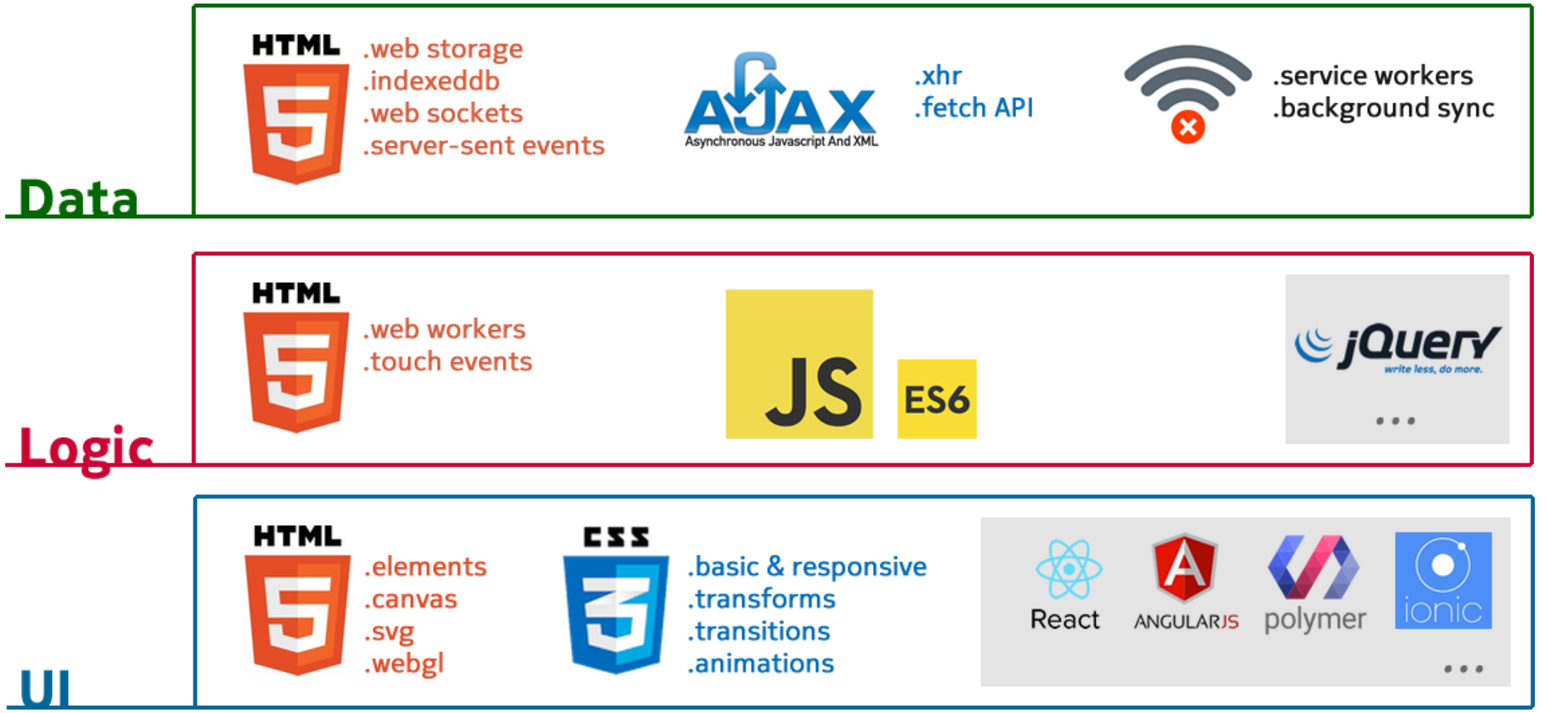
Architecture

Architecture

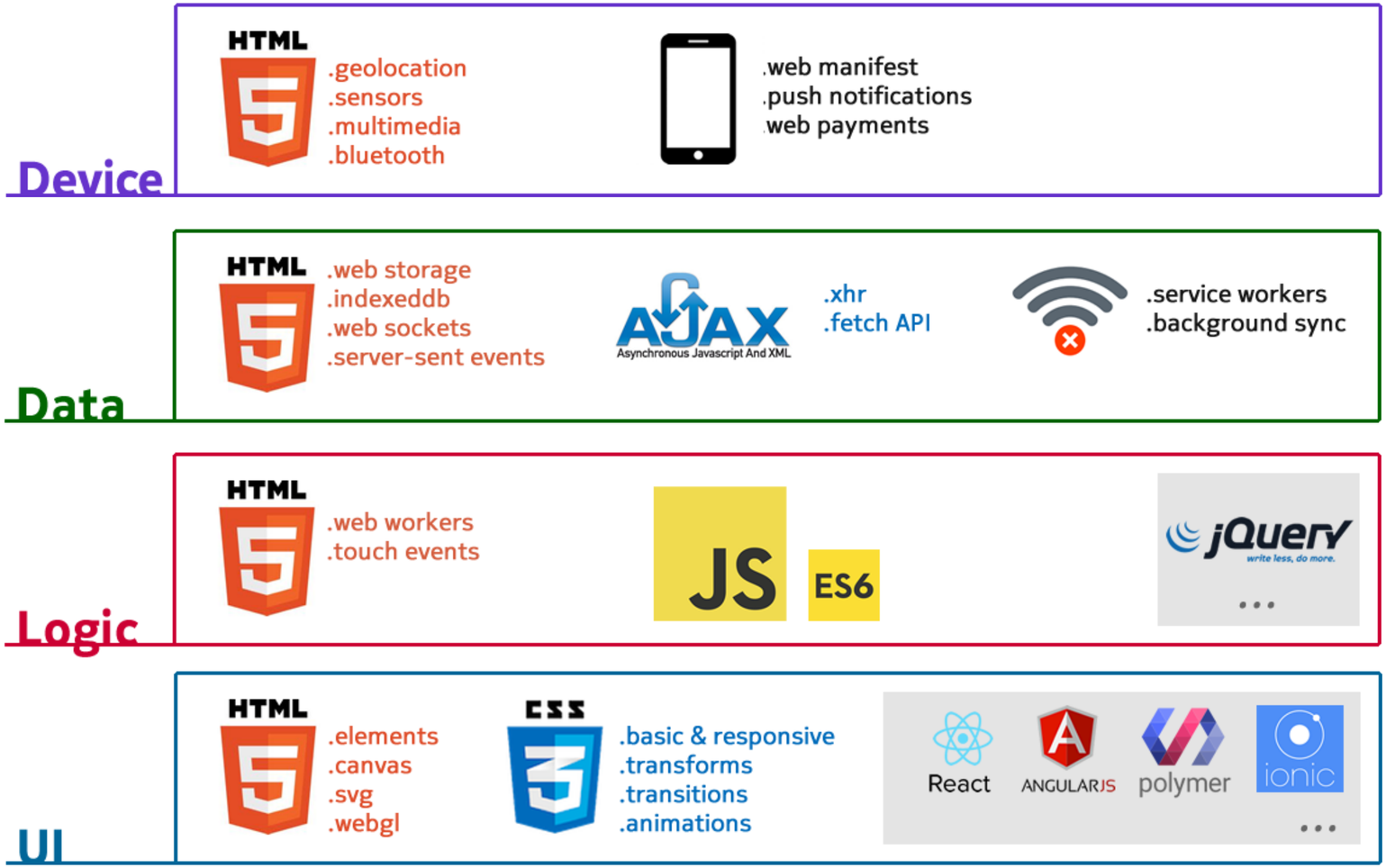
Architecture

Architecture

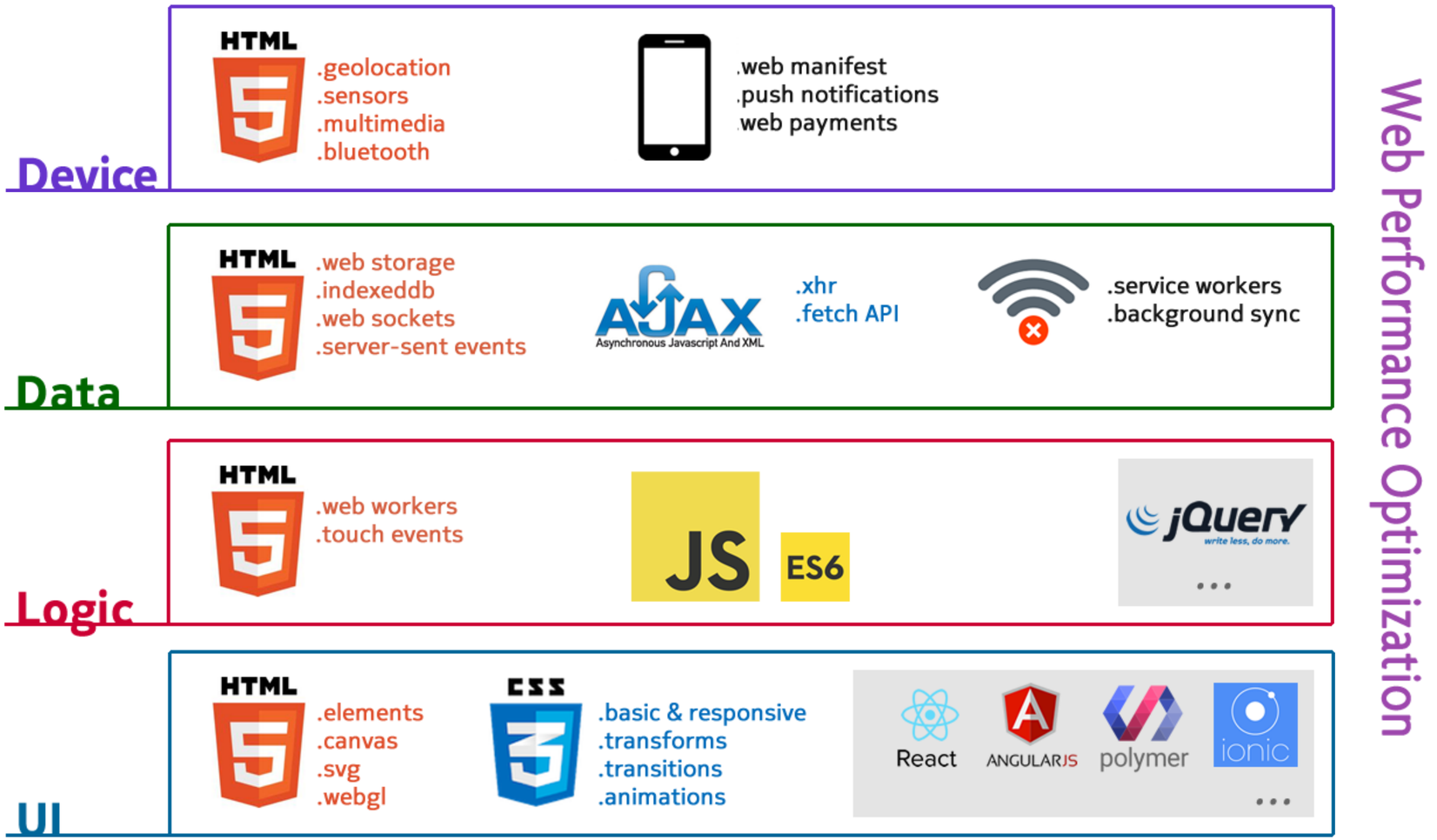
Architecture



Architecture

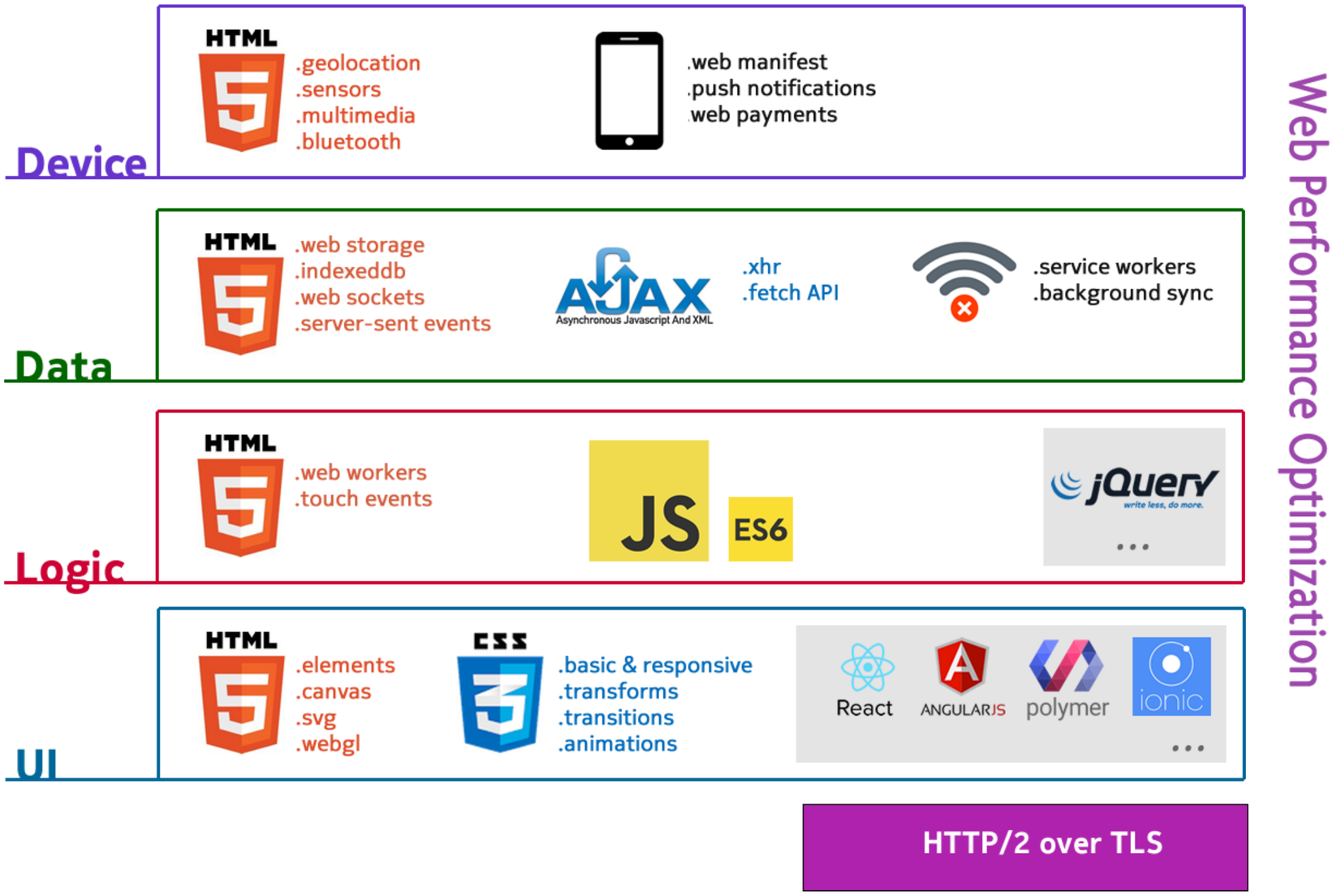


Architecture

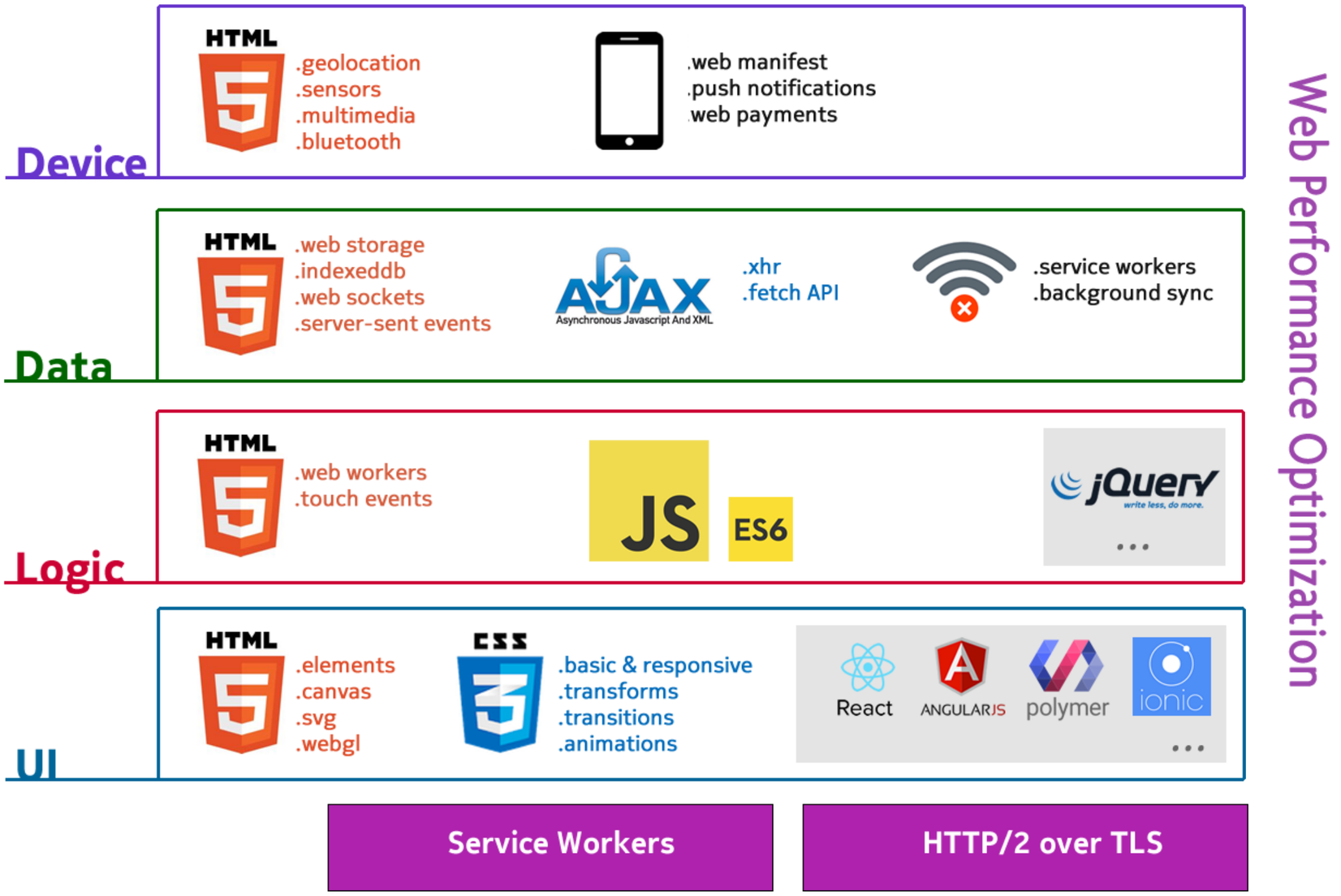


Web Performance Optimization

Architecture



Architecture



Web App Manifest

Web App Manifest

W3C Living Spec

JSON file

Served as **application/manifest+json**

Meta data for PWA

Web App Manifest Today

android /
chromeos

future

future

Web App Manifest Basics

Web App Manifest Basics

name

short_name

Web App Manifest Basics

start_url

Web App Manifest UI

lang

dir

- rtl
- ltr
- auto

Web App Manifest UI

Web App Manifest Basics

orientation

- any
- portrait [-primary | -secondary]
- landscape [-primary | -secondary]
- natural

Web App Manifest Basics

display

- browser
- minimal-ui
- standalone
- fullscreen

Web App Manifest Basics

background_color

Web App Manifest Basics

theme_color

Web App Manifest UI

icons: *array of icon objects*

- src
- sizes
- type

Advanced Techniques

Advanced Techniques

related_applications: array of app objects

- platform
- url
- id

Advanced Techniques

prefer_related_application

Advanced Techniques

scope

Advanced Techniques

install event on window object

Advanced Techniques

display-mode media query

Tools

Generators

manifest-json (NPM)

Generator-PWA (Yeoman)

Online Manifest Generators

app-manifest.firebaseapp.com

Validators

manifest-validator

Service Workers

Service Workers

- It’s a Web Worker
- It has a scope with abilities over it
- It works detached from tabs

And what is a web worker?

- A JavaScript thread
- No access to UI or DOM
- No document, no window
- Separate JS file
- It can import other scripts

And what is a scope?

- Just an origin and a path
- Such as

  https://mydomain.com/myapp

Abilities of a SW

See all the resources that pages on the scope request, even cross-domain

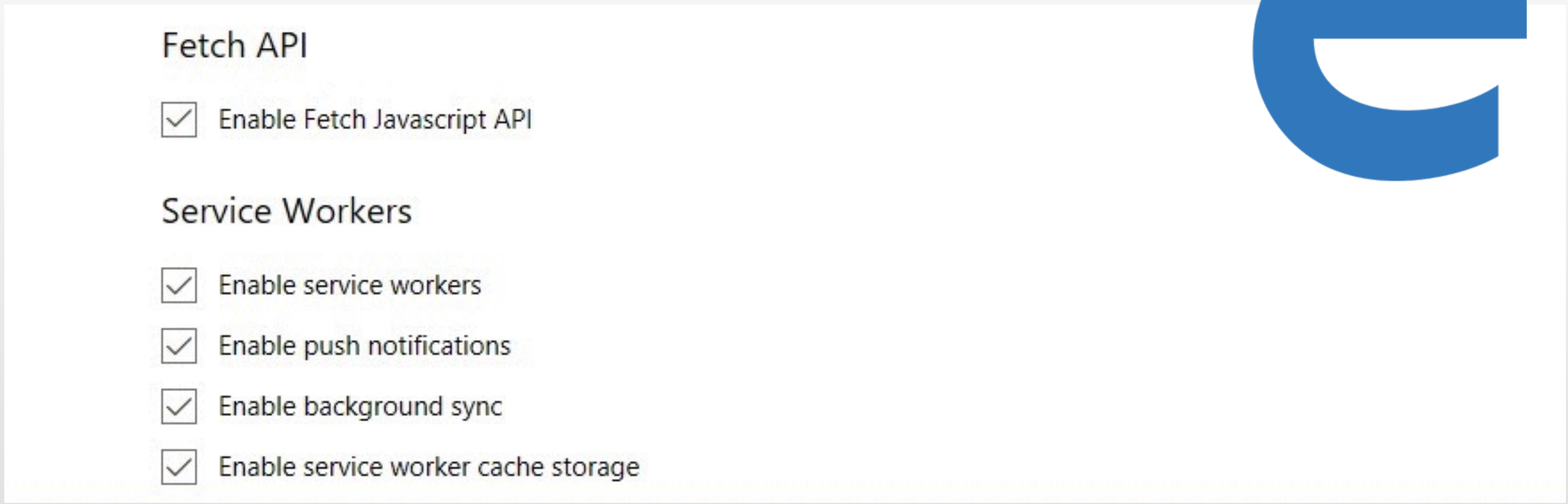
Abilities of a SW

It can respond for those resources, synthesizing responses or fetching them

Service Workers Today

flag

- about:flags


Fetch API
Enable Fetch Javascript API
Service Workers
Enable service workers
Enable push notifications
Enable background sync
Enable service worker cache storage

Who installs a SW?

Any web page on the scope

SW Installation today

```
navigator.serviceWorker.register(‘sw.js');
```

SW Installation tomorrow

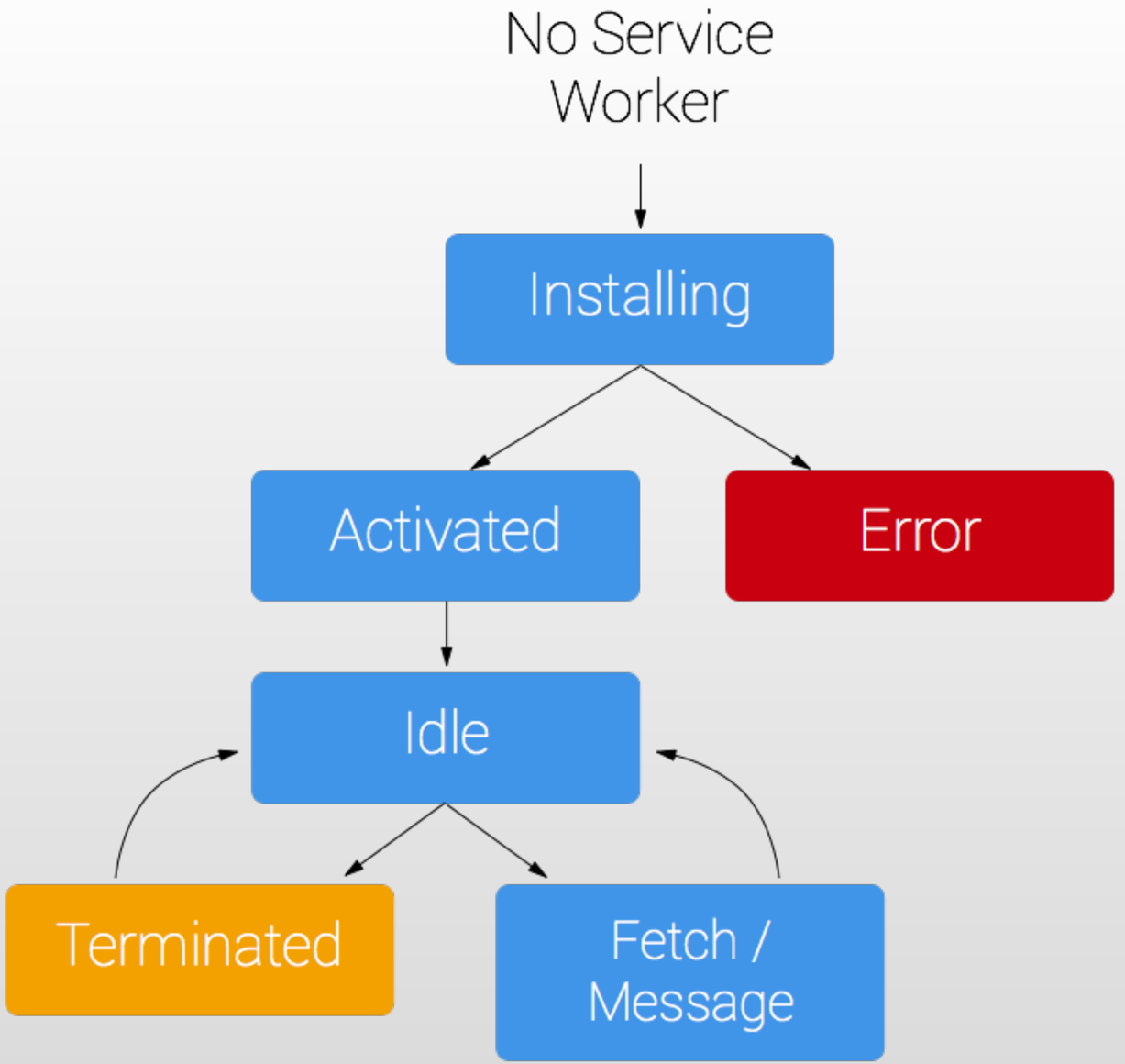
Origin Trial on Chrome

```
<link rel="serviceworker" href="sw.js"
      scope="/blog/">
```

SW Installation tomorrow

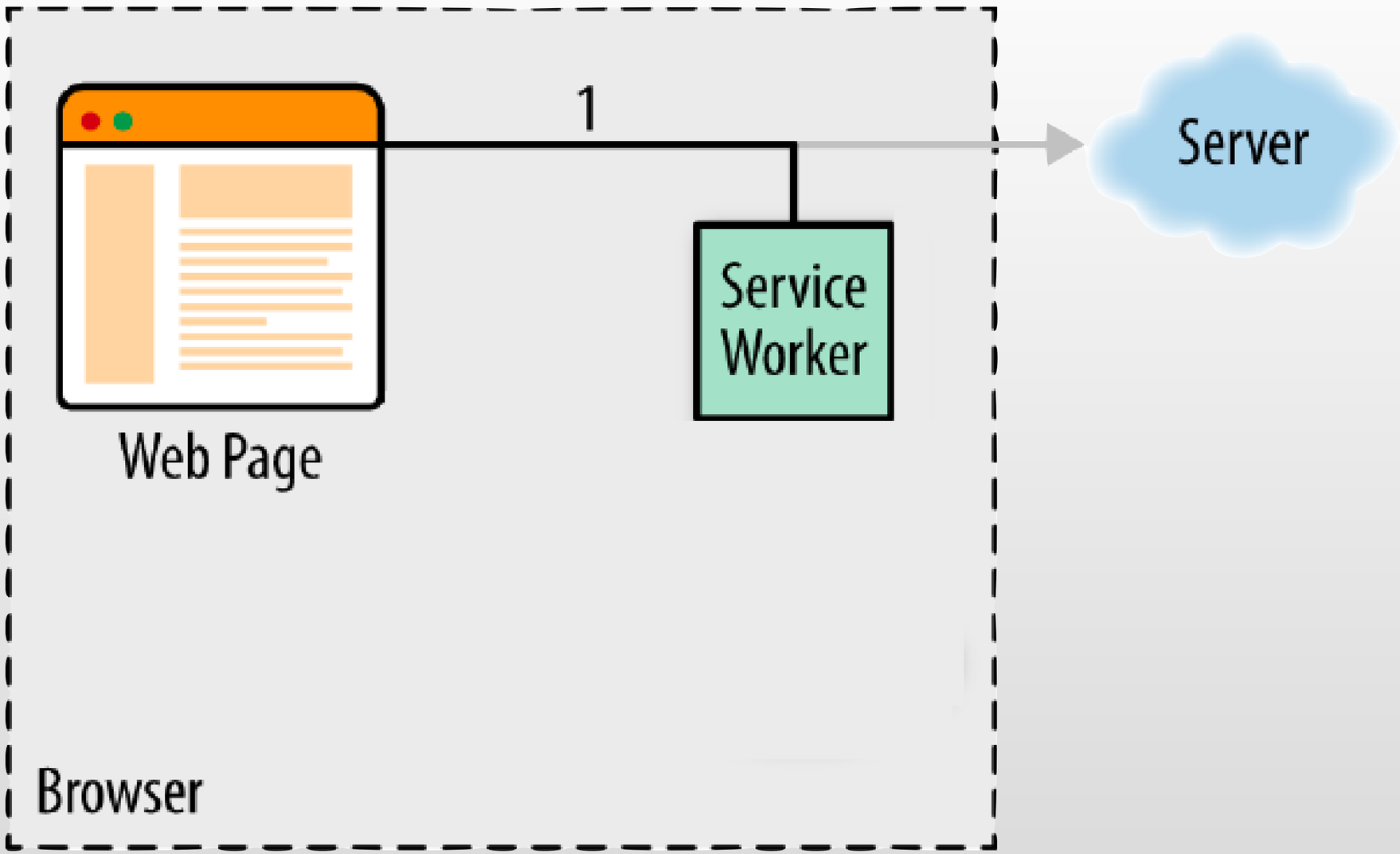
Origin Trial on Chrome

```
Link: </sw.js>; rel="serviceworker"; scope="/blog/"
```


No Service Worker
Installing
Activated
Error
Idle
Terminated
Fetch / Message

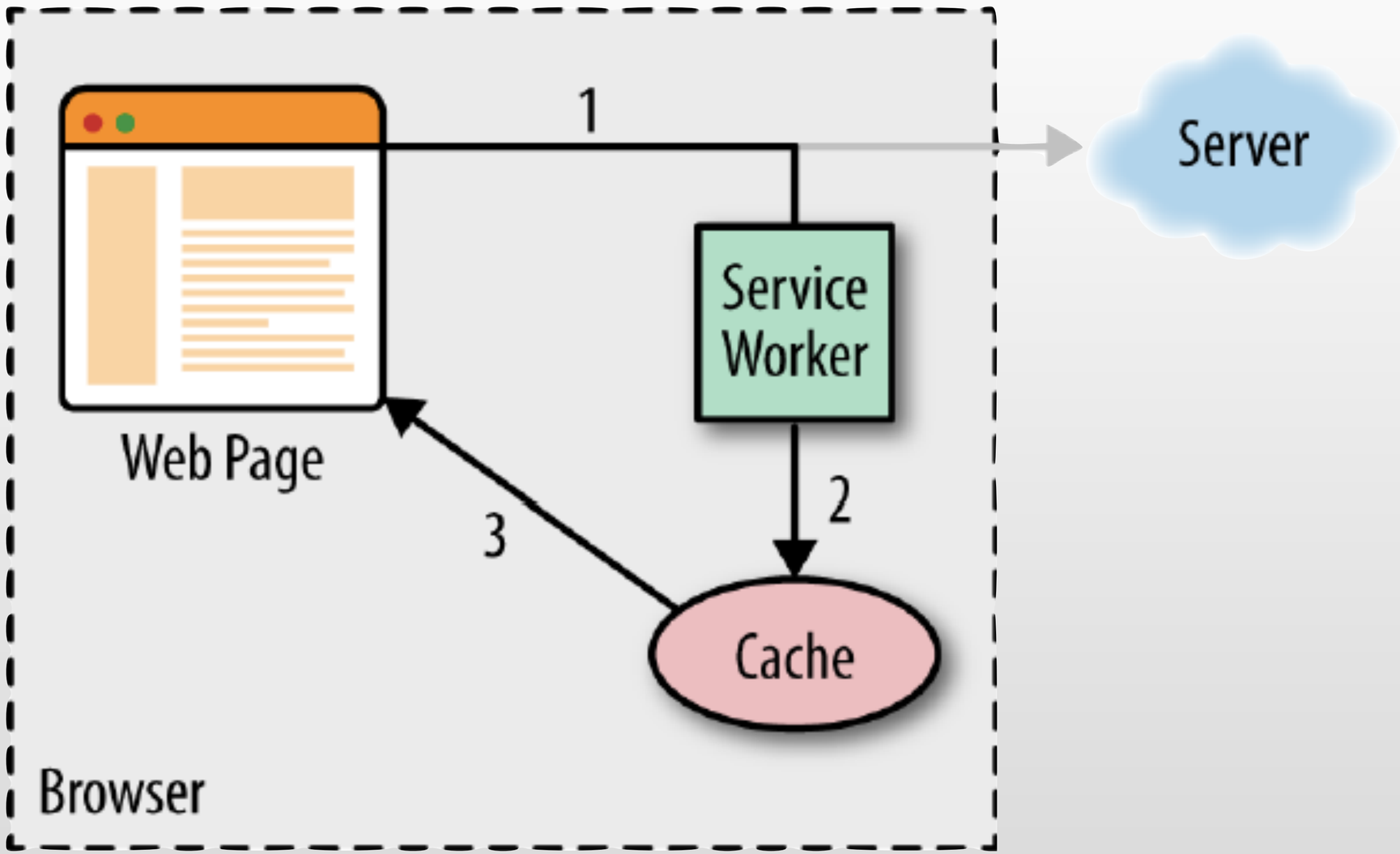
When it is activated?

Any time the browser is going to fetch a new resource from the scope


1
Server
Service Worker
Web Page
Browser

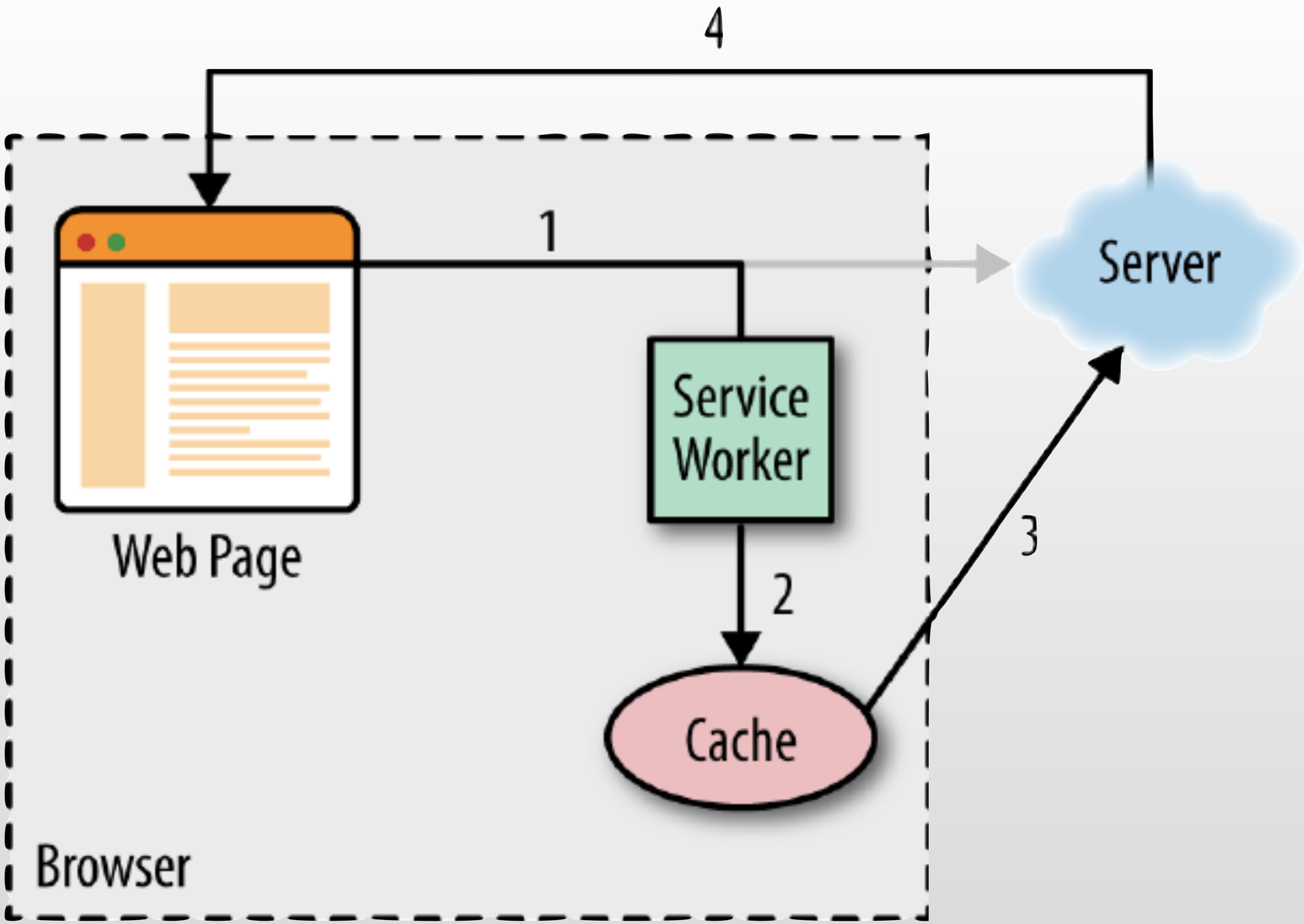
And what to do with the Request?

a- Deliver it from a Cache


Server
1
Service
Worker
Web Page
2
3
Cache
Browser

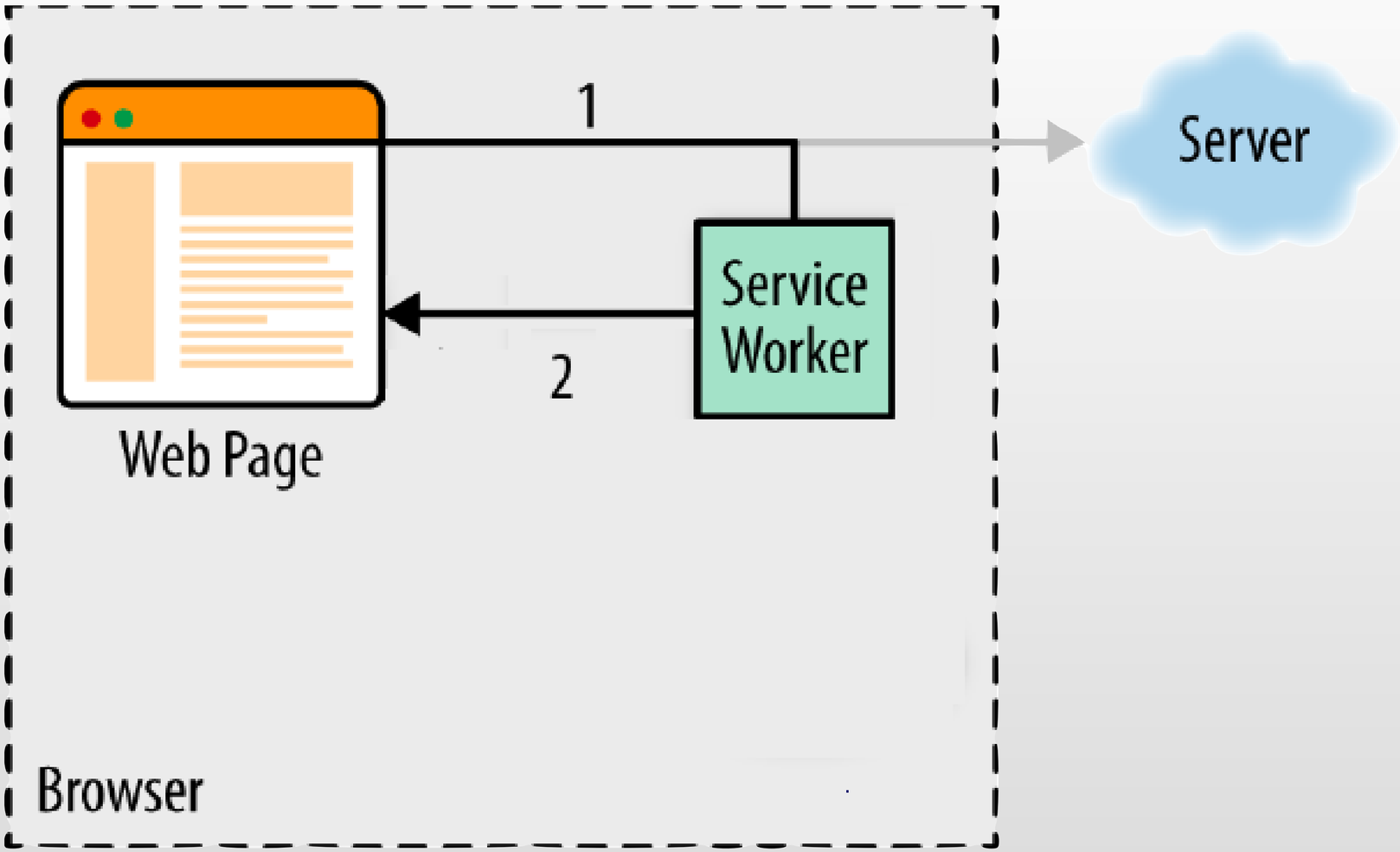
And what to do with the Request?

b- Fetch it from the network

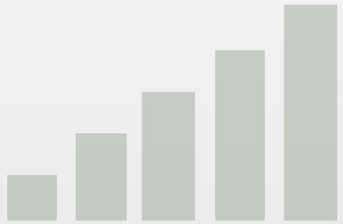

4
1
Server
Service
Worker
Web Page
2
3
Cache
Browser

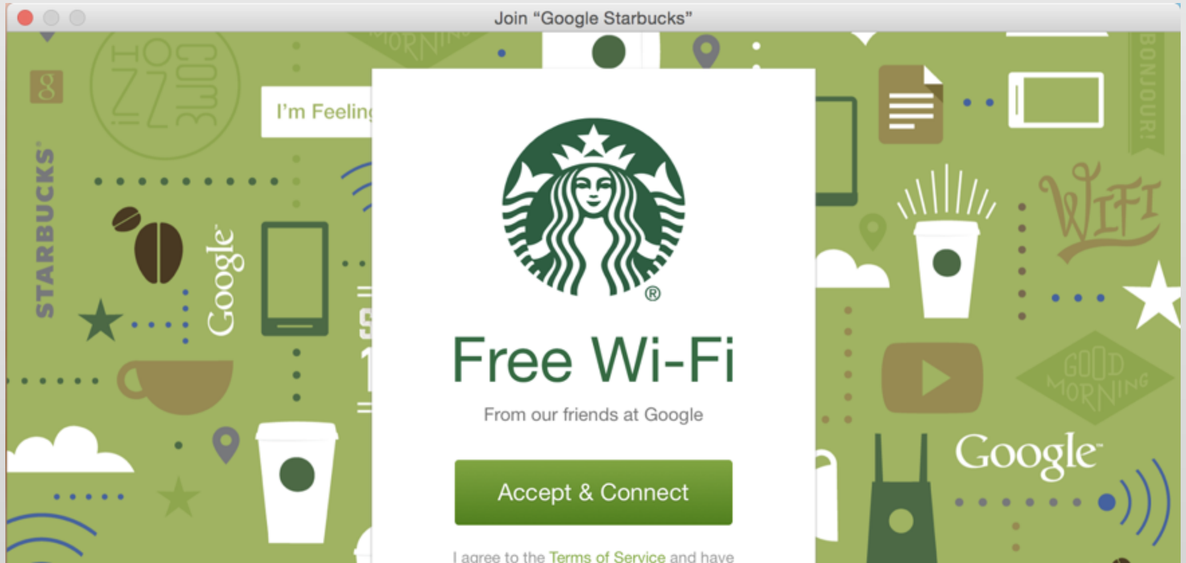
And what to do with the Request?

c- Create a local response


Server
1
Service
Worker
2
Web Page
Browser

Network detection





Network detection

1- online / offline navigator events

2- Network Information API

3- fetch and timeouts

Storage APIs available

IndexedDB

Cache Storage

~~Web Storage~~

Cache Storage API

```
caches.open("myAppCache").then(function(cache) {
    return cache.addAll(urls);
})
```

Limitations

- TLS only (HTTPS)
- Not helping first load
- Compatibility

Service Workers and Performance

Uses Cases

- Offline Web
- Progressive Web Apps (PWA)
- Deliver assets immediately
- Stale while Revalidate

Uses Cases

- React to bad connections
- React to non-200 responses
- Prefetching
- Local content generation

Detecting connections

- Android Browser, Silk (spec #1) *type*
- BlackBerry 10 (spec #2) *bandwidth*
- Firefox, Chrome 38-46 (spec #3) *type & events*
- Chrome 47+ Android only (spec #4)

  type & estimated bw

Detecting connections

- Android Browser, Silk (spec #1) *type*
- BlackBerry 10 (spec #2) *band*
- Firefox, Chrome 38 (spec #3) *type & events*
- Chrome 47 Android only (spec #4)

estimated bw

Mobile only

Let’s do some coding

Background Sync

Background Sync

- Optimistic Saves
- Save in the background

```
navigator.serviceWorker.ready.then(function(registration) {
  registration.sync.register('save').then(function() {
    // registration succeeded
  }, function() {
    // registration failed
  });
});
```

Service Workers - Sync

```
self.addEventListener('sync', function(event) {
  if (event.tag == 'save') {
    event.waitUntil(sendEverythingInTheOutbox());
  }
});
```

What we can do on iOS and Windows today?

1) Replacing SW

- We can replace just one use case: app shell caching

Application Cache

- It’s a deprecated API
- Available everywhere
- Challenging and buggy

Application Cache

- Google offers an AppCache implementation for SW

https://www.npmjs.com/package/sw-appcache-behavior

2) Replacing WAM

- Use iOS meta tags
- iWAM (experimental)

github.com/firtman/iWAM

Remember it’s progressive!

What’s next

Service Workers - Coming

- periodic sync

Service Workers - Periodic Sync

```
navigator.serviceWorker.ready.then(function(registration) {
  registration.periodicSync.register({
    tag: 'get-latest-news',           // default: ''
    minPeriod: 12 * 60 * 60 * 1000, // default: 0
    powerState: 'avoid-draining',   // default: 'auto'
    networkState: 'avoid-cellular'  // default: 'online'
  }).then(function(periodicSyncReg) {
    // success
  }, function() {
    // failure
  })
});
```

https://github.com/WICG/BackgroundSync/blob/master/explainer.md

Service Workers - Coming

- periodic sync
- foreign fetch
- geofencing
- streams (Chrome 52+)

AMP Project and PWAs

Official Blog

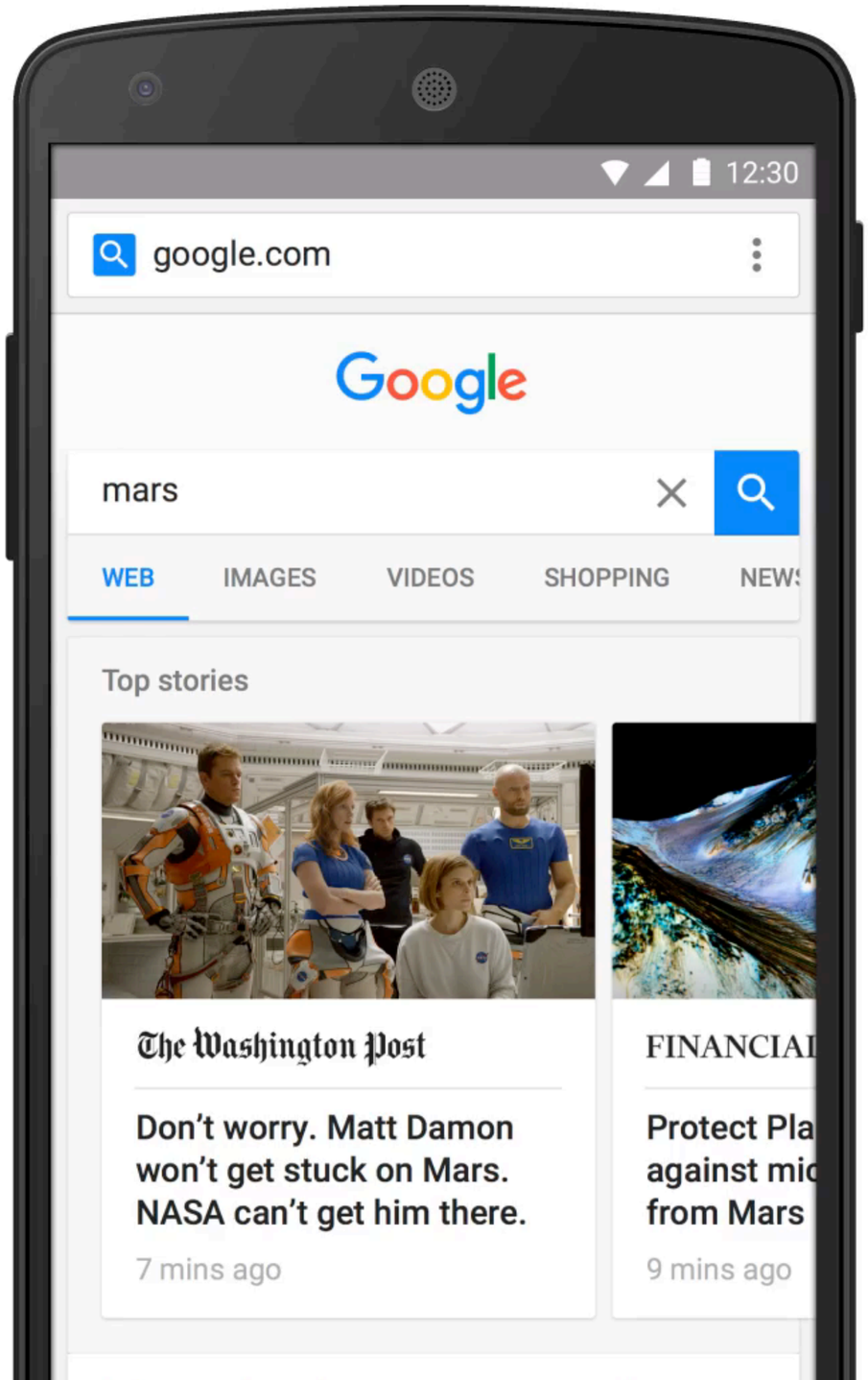
Insights from Googlers into our products, technology, and the Google culture

Introducing the Accelerated Mobile Pages Project, for a faster, open mobile web

October 7, 2015

AMP-HTML

```
<!doctype html>
<html ⚡>
  <head>
    <meta charset="utf-8">
    <link rel="canonical" href="hello-world.html" >
    <meta name="viewport" content="width=device-wid
    <style>body {opacity: 0}</style><noscript><styl
    <script async src="https://cdn.ampproject.org/v
```


12:30
google.com
Google
mars
WEB
IMAGES
VIDEOS
SHOPPING
NEWS
Top stories
The Washington Post
Don’t worry. Matt Damon won’t get stuck on Mars. NASA can’t get him there.
7 mins ago
FINANCIAL
Protect Pla
against mic
from Mars
9 mins ago

AMP Pages

- extremely fast initial loading
- served from a) server or b) cdn
- can prepare a PWA

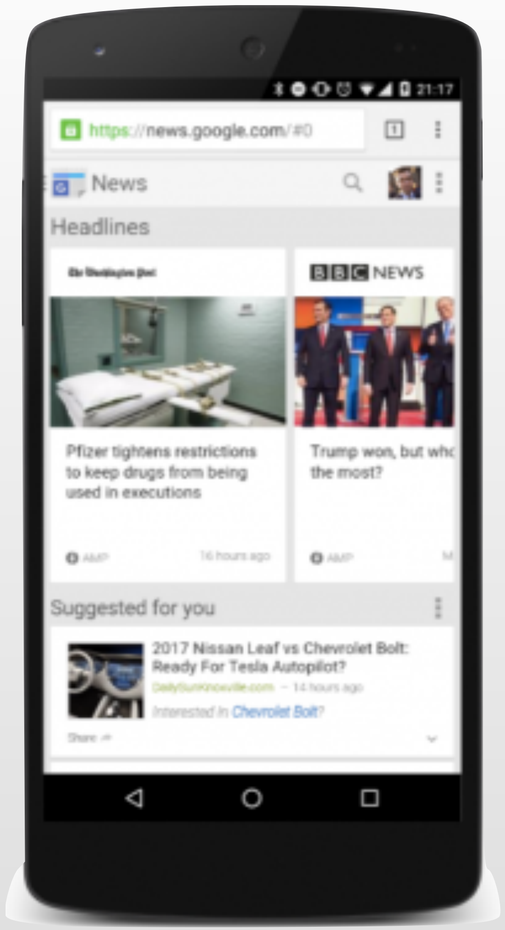
AMP Pages

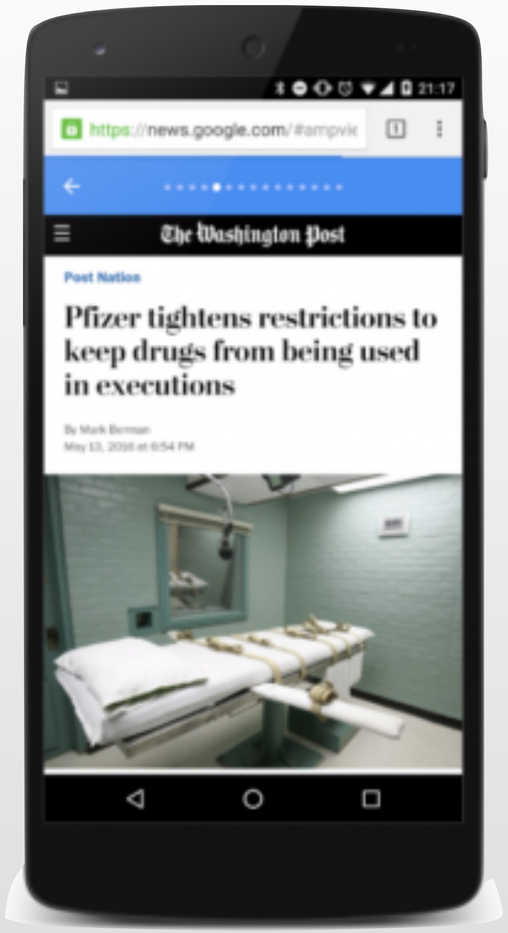
- extremely fast initial loading
- served from a) server or b) cdn
- can install a SW

amp-install-serviceworker

AMP Pages

```
<amp-install-serviceworker src="/sw.js"
      data-iframe-src="https://domain.com/sw.html"
      layout="nodisplay">
</amp-install-serviceworker>
```


https://news.google.com/#0
News
Headlines
BBC NEWS
Pfizer tightens restrictions to keep drugs from being used in executions
Trump won, but wh
the most?
Suggested for you
2017 Nissan Leaf vs Chevrolet Bolt: Ready For Tesla Autopilot?


https://news.google.com/#ampvie
The Washington Post
Post Nation
Pfizer tightens restrictions to keep drugs from being used in executions


https://www.washingtonpost.com/
The Washington Post
Top Stories
Opinion
Politics
World
Business
Inside the GOP effort to draft a third-party candidate to derail Trump
A cyber-city rises from the desert, embodying Israel's military.

<amp-install-serviceworker>

AMP

ABOUT DOCS CONTRIBUTE NEWS SUPPORT English

Roadmap

End-Q3 2016, updated September 30, 2016

- Provide initial support for live-updating content within AMP pages
- Make it easier to build well-styled AMP pages

Q3 Status

1 *Stage 1: In Planning and Design*

Out-of-box templates and styling

Interactive image gallery (large image + thumbnails)

amp-lightbox improvements

4 *Stage 4: Pull Request (Changelist) Created*

AMP-in-PWA support, including support for progressive enhancement of the AMP document by the Progressive Web App (PWA)

Extreme Use Cases for PWAs and Performance

CDN Race

- What if we do a race between 2 CDNs for a file?

Delta Updates

- What if we sent from the server just the part of a file that has changed only?

Removing cookies

- What if we remove cookies from static assets requests?

https://github.com/gmetais/sw-remove-cookies

Custom Headers

- What if we add more headers to the request to help the server?

For example: Client Hints

Delta Updates

- What if we sent content using new compression formats and encodings and decode them client-side?

Image Progressive Load

- What if we can receive first a very low resolution image and then use a SW to download more bytes and compose them?

BPG

- New lossy/lossless image format
- But no compatibility
- Let’s do a decoder

https://github.com/sandropaganotti/bpg-converter

BPG

```
<img src="image.bpg.png">
```

SW will fetch the request, it will load the BPG and return a decoded PNG version

https://github.com/sandropaganotti/bpg-converter

Web Push Notifications

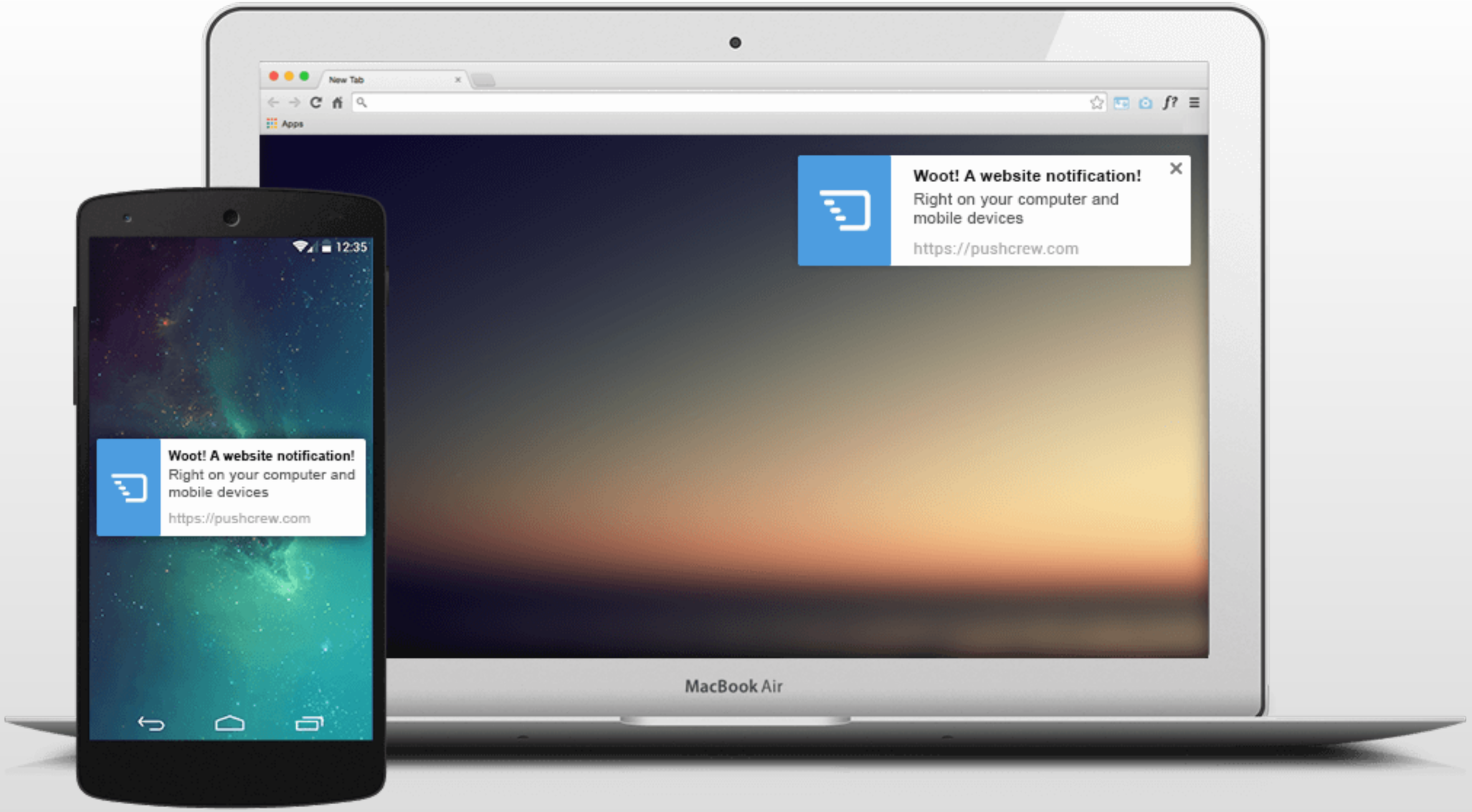


Image by www.pushcrew.com

Use Cases for Web Push

- Keep the user updated
- Notify important messages
- Increase conversion

Push Today


mac only



flag

Stages

- 1- Web Push Subscription
- 2- Web Push Delivery


Firebase

Push Subscription

1- Push API

2- Safari Proprietary API

Extra- iOS Hack: Passbooks

Push Delivery

1- GCM

2- Web Push

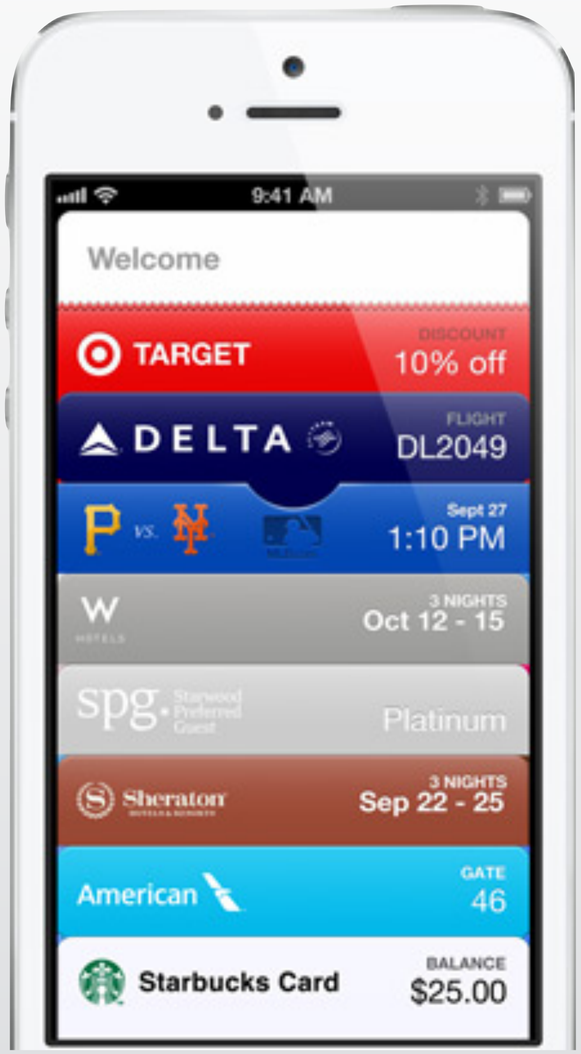
2- Safari Proprietary API

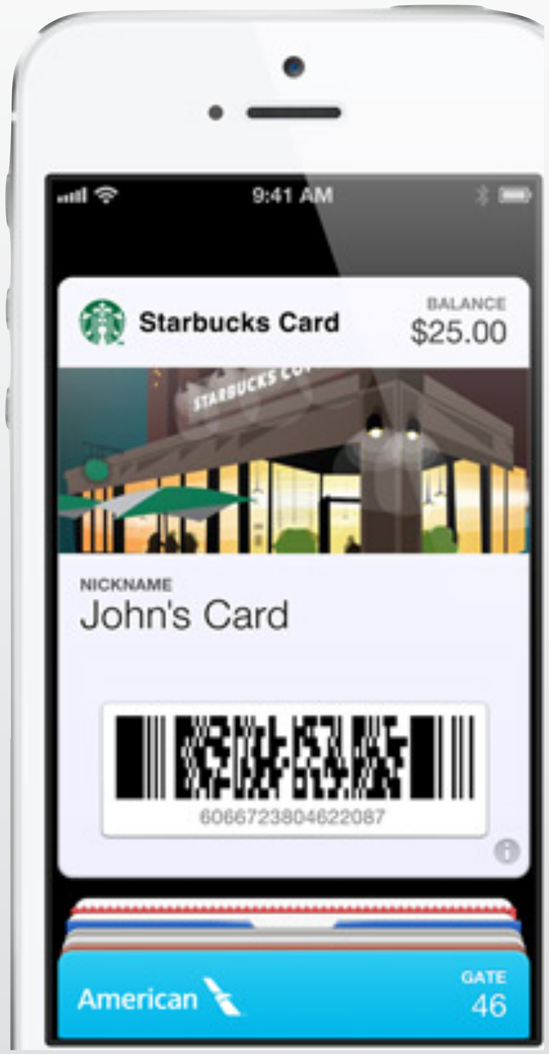
Hack for iOS

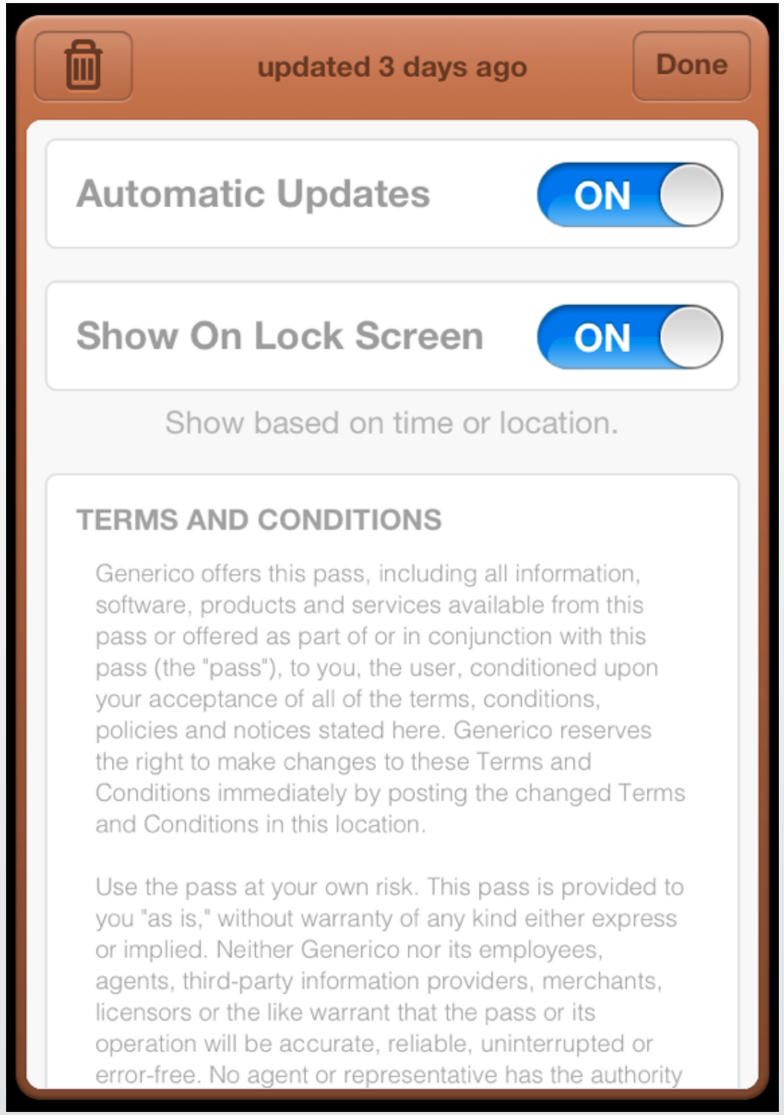
push

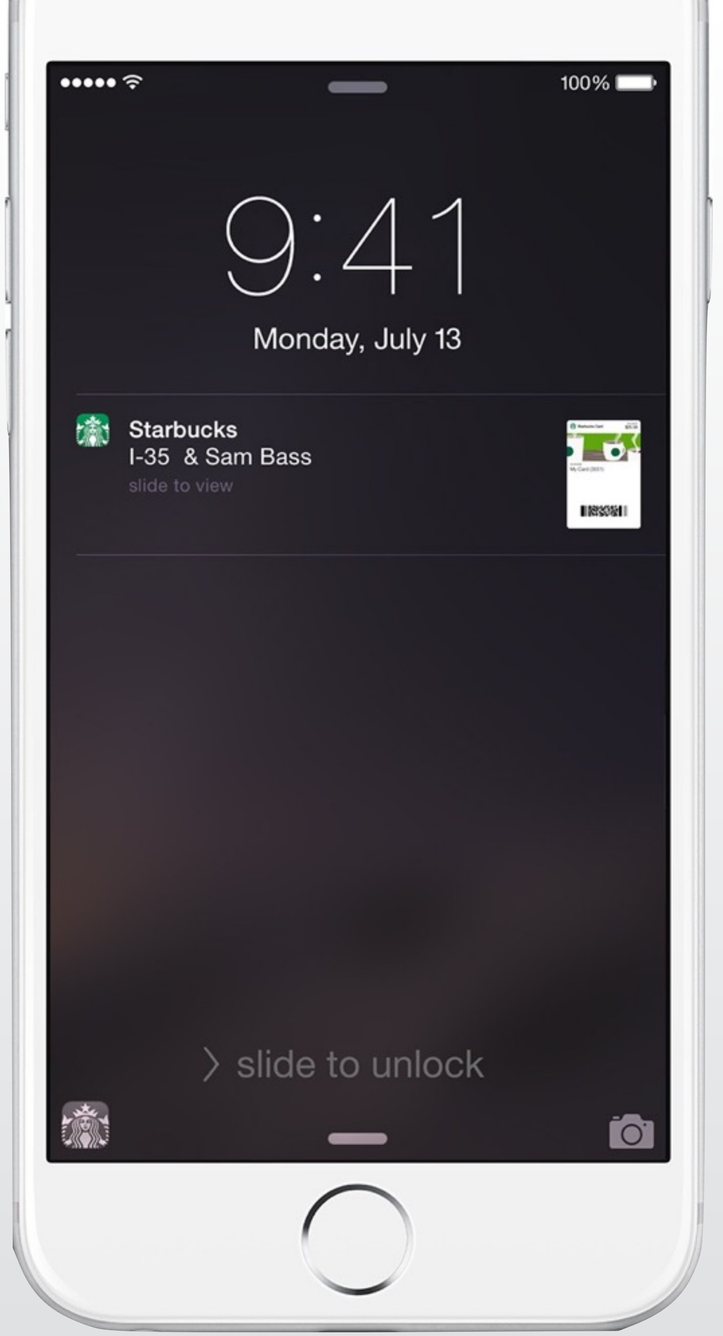
```
<a href="suscription.passbook">
   Subscribe to this site
</a>
```

push

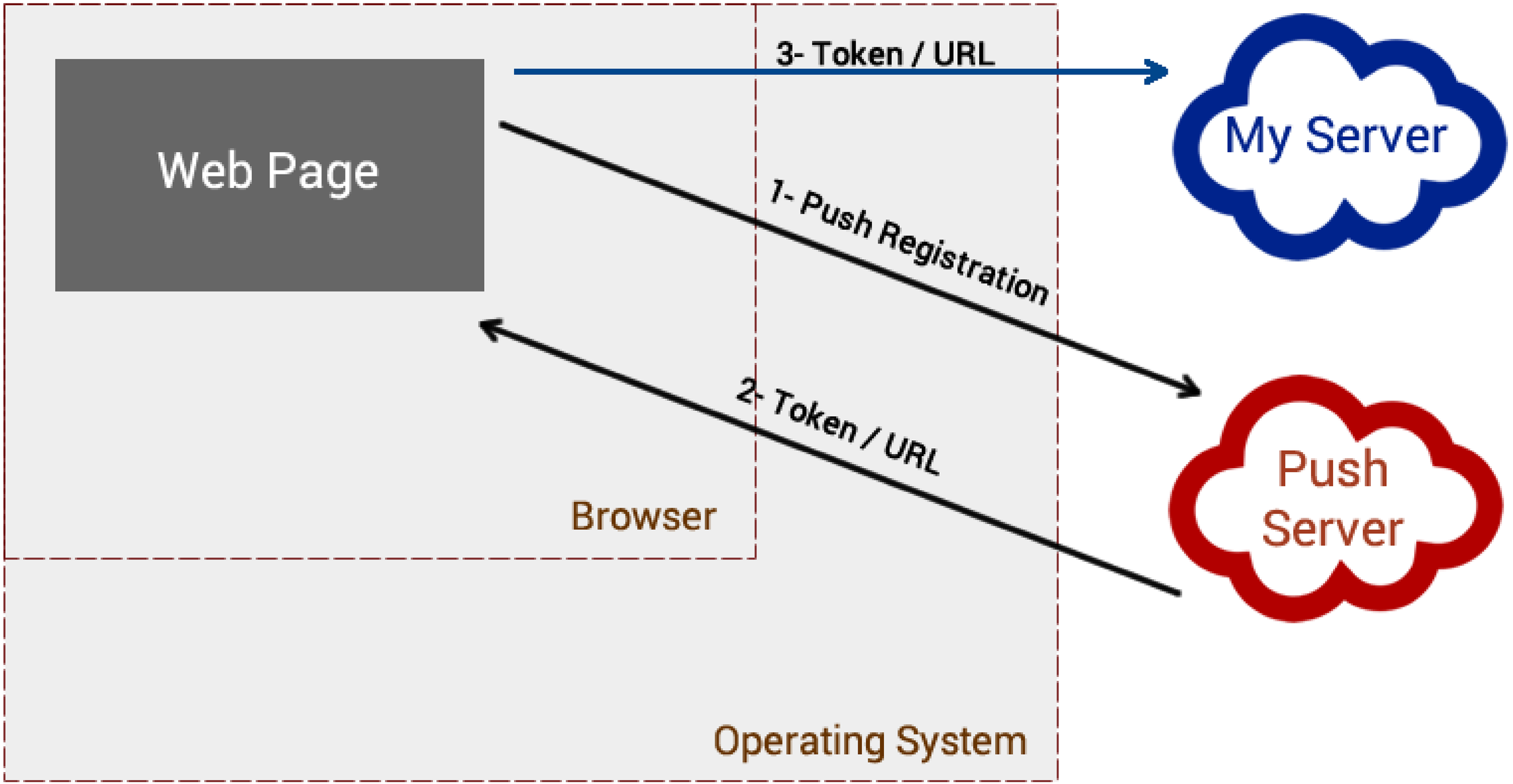

9:41 AM
Welcome
TARGET
DISCOUNT
10% off
DELTA
FLIGHT
DL2049
Sept 27
1:10 PM
3 NIGHTS
Oct 12 - 15
Platinum
3 NIGHTS
Sep 22 - 25
American
GATE
46
Starbucks Card
BALANCE
$25.00


9:41 AM
Starbucks Card
BALANCE
$25.00
NICKNAME
John's Card
6066723804622087
American
GATE
46


updated 3 days ago
Done
Automatic Updates
ON
Show On Lock Screen
ON
Show based on time or location.
TERMS AND CONDITIONS
Generico offers this pass, including all information, software, products and services available from this pass or offered as part of or in conjunction with this pass (the "pass"), to you, the user, conditioned upon your acceptance of all of the terms, conditions, policies and notices stated here. Generico reserves the right to make changes to these Terms and Conditions immediately by posting the changed Terms and Conditions in this location.
Use the pass at your own risk. This pass is provided to you "as is," without warranty of any kind either express or implied. Neither Generico nor its employees, agents, third-party information providers, merchants, licensors or the like warrant that the pass or its operation will be accurate, reliable, uninterrupted or error-free. No agent or representative has the authority


100%
9:41
Monday, July 13
Starbucks
I-35 & Sam Bass
slide to view
slide to unlock

Subscribing


Web Page
3- Token / URL
My Server
1- Push Registration
2- Token / URL
Push Server
Browser
Operating System

Push API

(registering)

Push API

1- Service Workers (HTTPS)

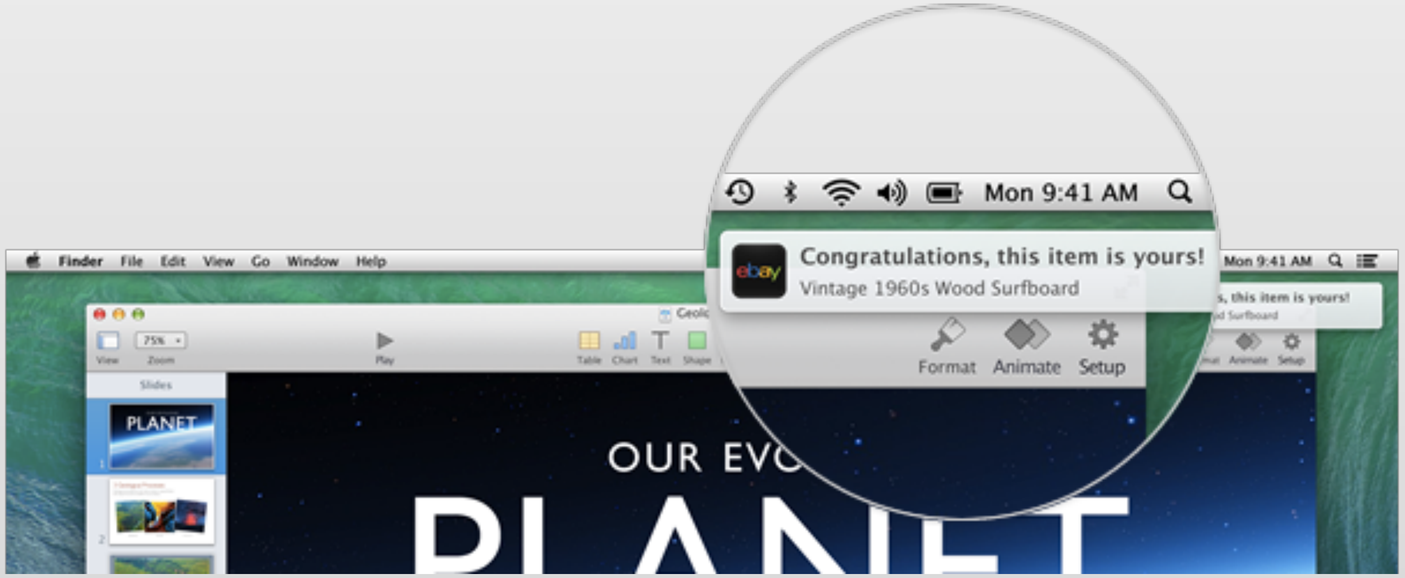
2- Visible Notifications only

3- Endpoint & optional key

4- Web Manifest for Chrome

Safari on the Mac is using a private API

Safari Push


Mon 9:41 AM
Congratulations, this item is yours!
Vintage 1960s Wood Surfboard
Format
Animate
Setup
Finder File Edit View Go Window Help
Mon 9:41 AM
PLANET

Safari Push Notifications for Websites

1- Apple Dev Account ($99/year)

2- HTTPS

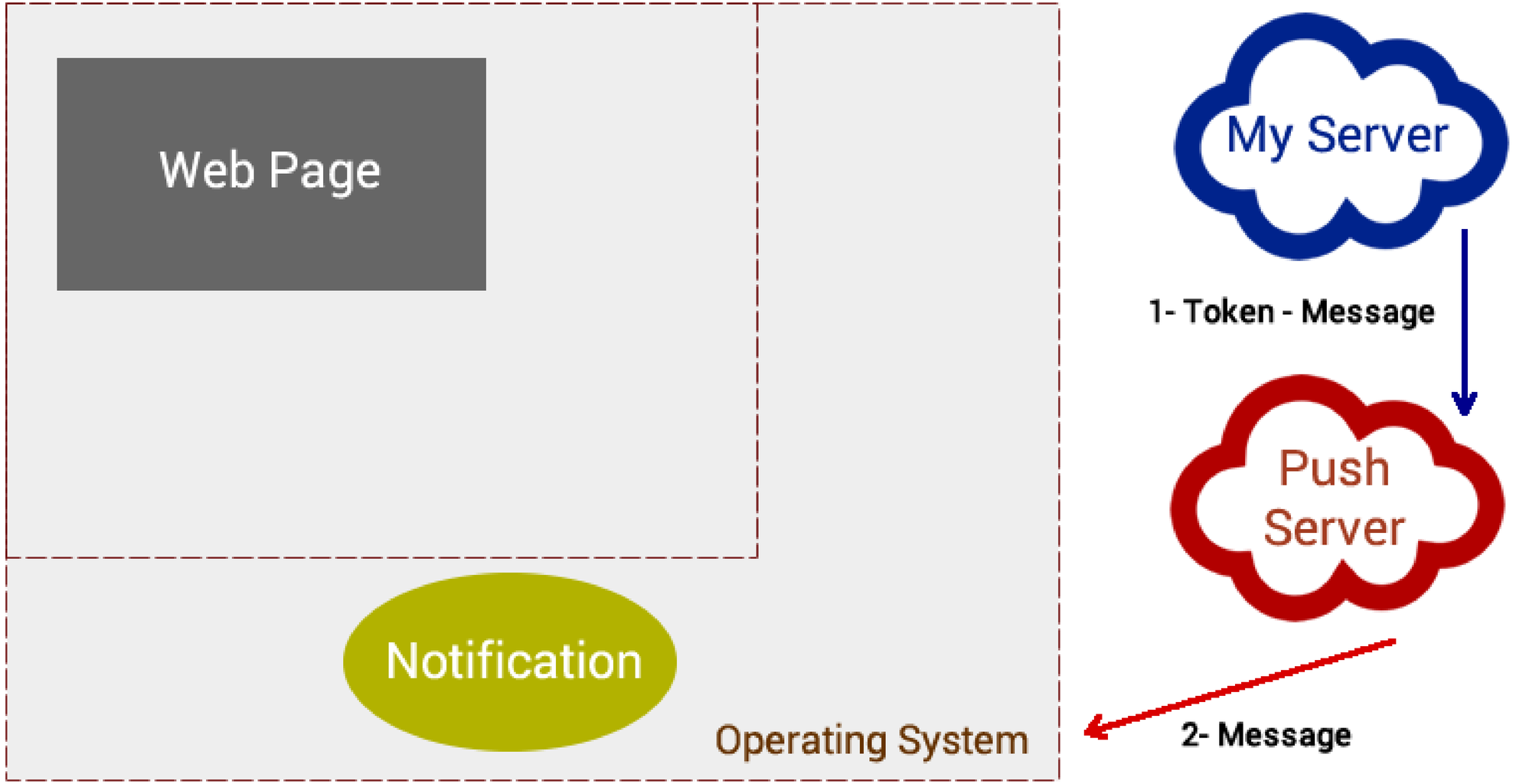
3- Generate Certificate

4- Listen for specific URLs

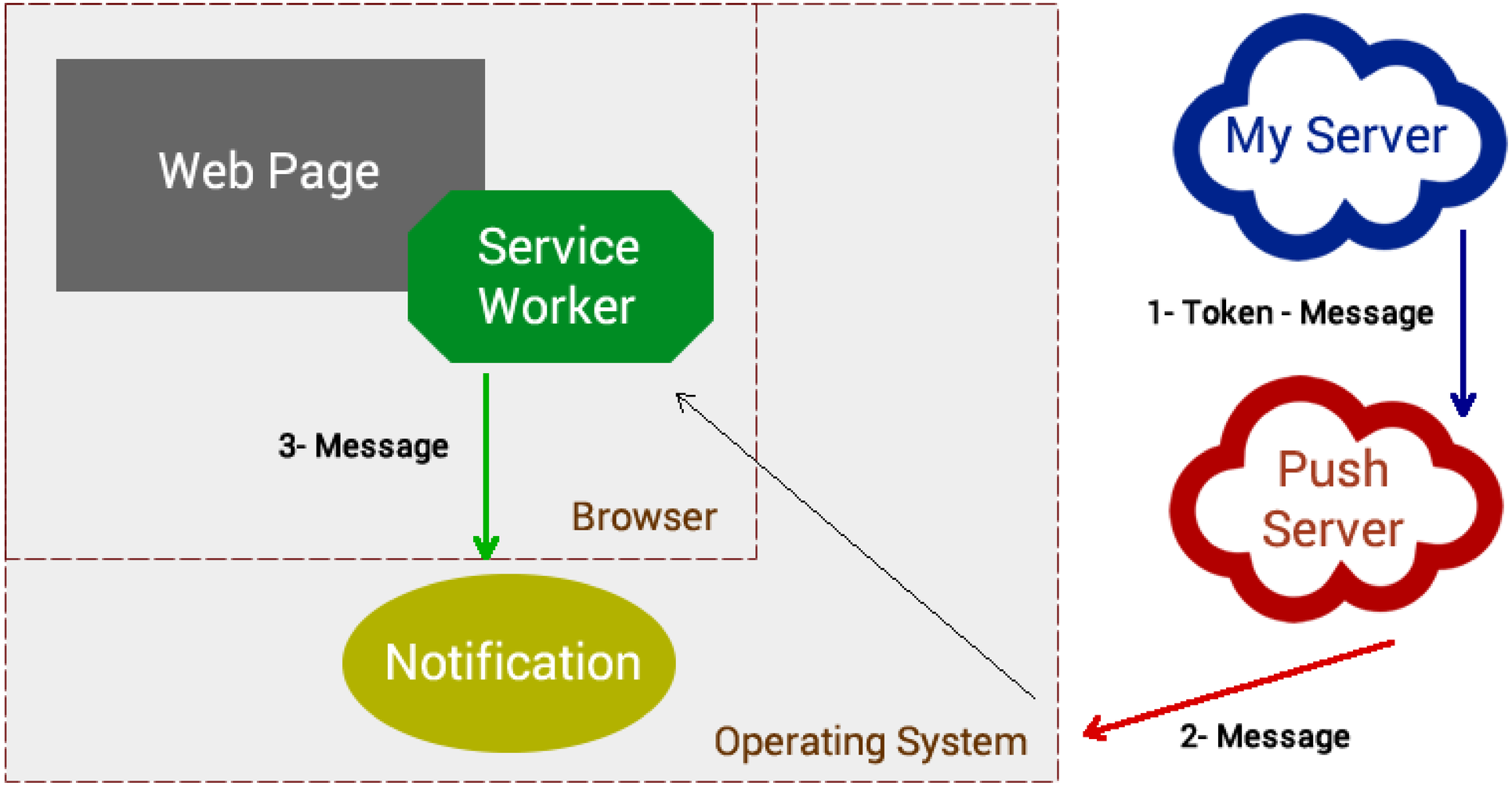
Let’s see some code

Delivering Messages

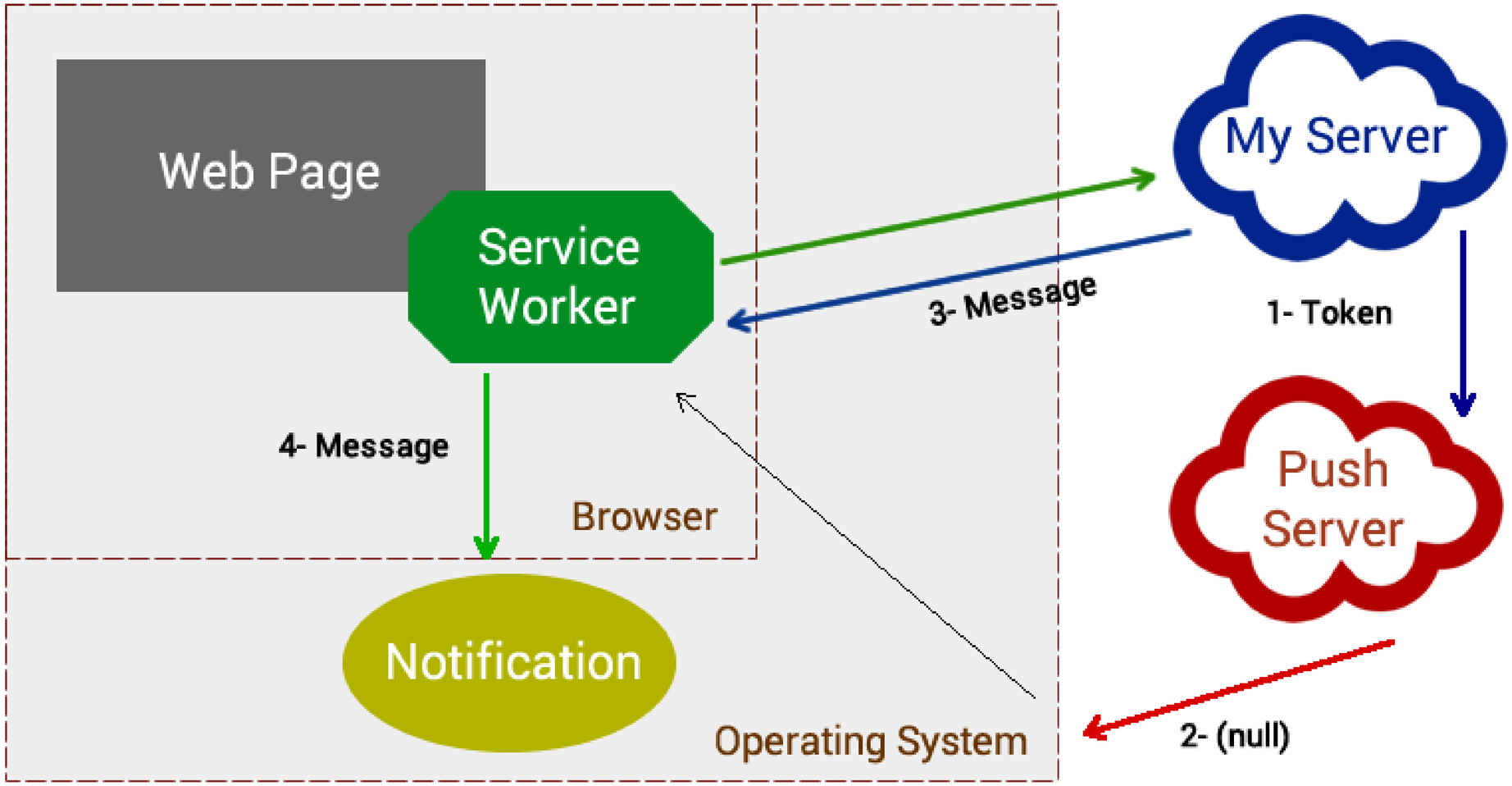
General


Web Page
Notification
Operating System
My Server
1- Token - Message
Push Server
2- Message

Web Push


Web Page
Service Worker
3- Message
Browser
Notification
Operating System
My Server
1- Token - Message
Push Server
2- Message

Some browsers without payload



Let’s see some code

Validating our PWA

PWA Validation

lighthouse (npm)

lighthouse (Chrome addon)

Closing notes

Features

1- Instant Loading
2- Discoverable
3- Network independent
4- Responsive
5- Installable
6- Secure
7- Linkable
8- Re-engageable
9- Works everywhere
10- Fast

Progressive Web Apps

1- Web App Manifest

2- Service Workers

3- Tools

Progressive Web Apps

Remember: be fast and with instant loading

Check Mobile Perf Checklist

oreilly.com/ideas/mobile-web-performance-checklist

firt.mobi/hpmw

firtman@gmail.com
@firt