



Microsoft Ignite

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Explore.



Progressive Web Apps: Where Do I Begin?

Aaron Gustafson
@AaronGustafson



Why I predict Progressive Web Apps will change the game for digital currencies

How Progressive Web Apps Could Change the Mobile Landscape

It's time retailers embrace progressive web apps

By L. Simmons
25,962 views | Mar 9, 2018, 07:30am

Why Progressive Web Apps Will Replace Native Mobile Apps

I'm sure you've heard the hype

circuit breaker

Web apps are only getting better

By Paul Miller | @futurepaul | Apr 11, 2018, 8:20am EDT



Andrew Gazdecki CommunityVoice
Forbes Technology Council

24% opt-in rate
and 42% open
rate for push
notifications



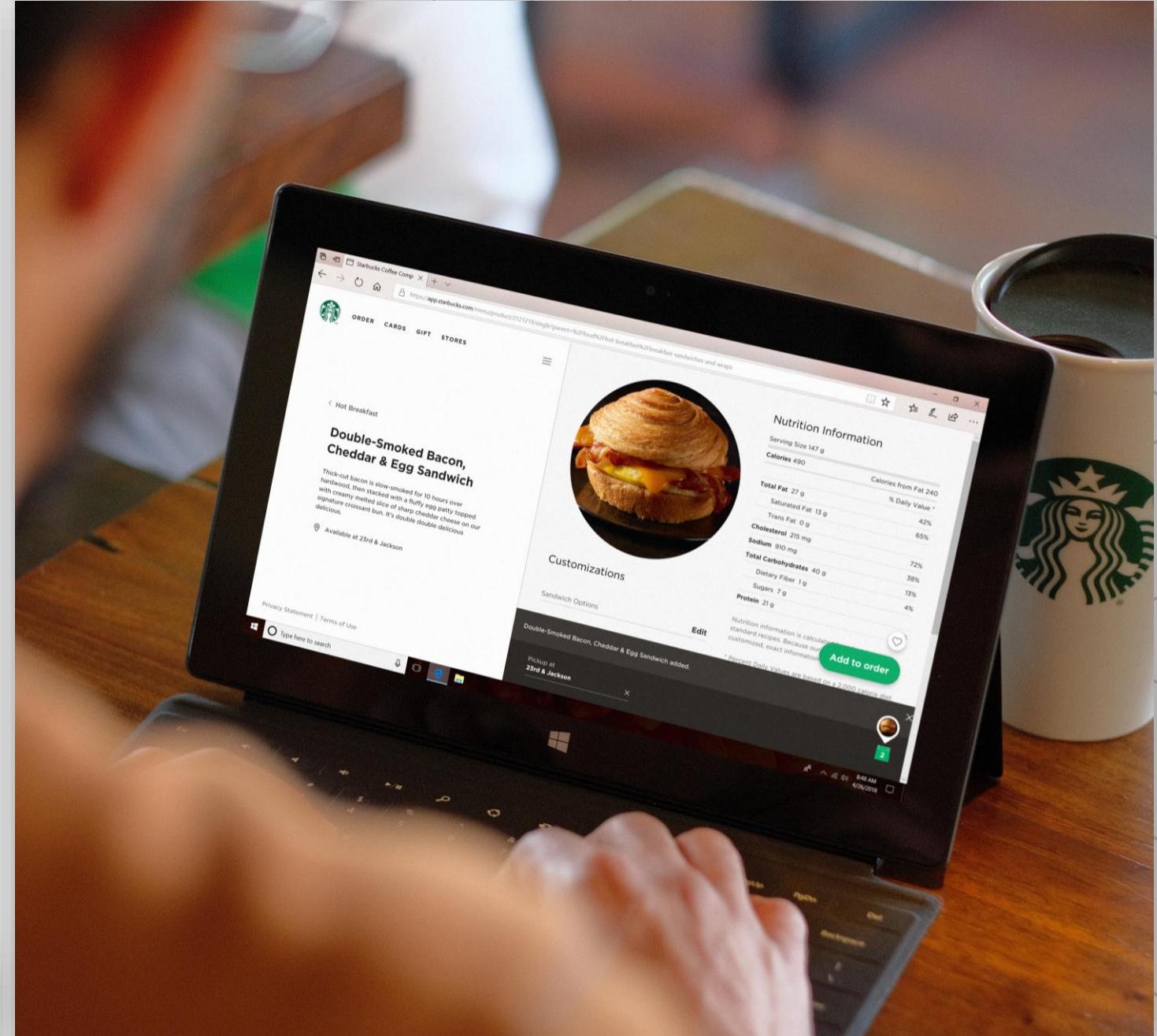
aka.ms/carnival-pwa



2x increase in daily active users



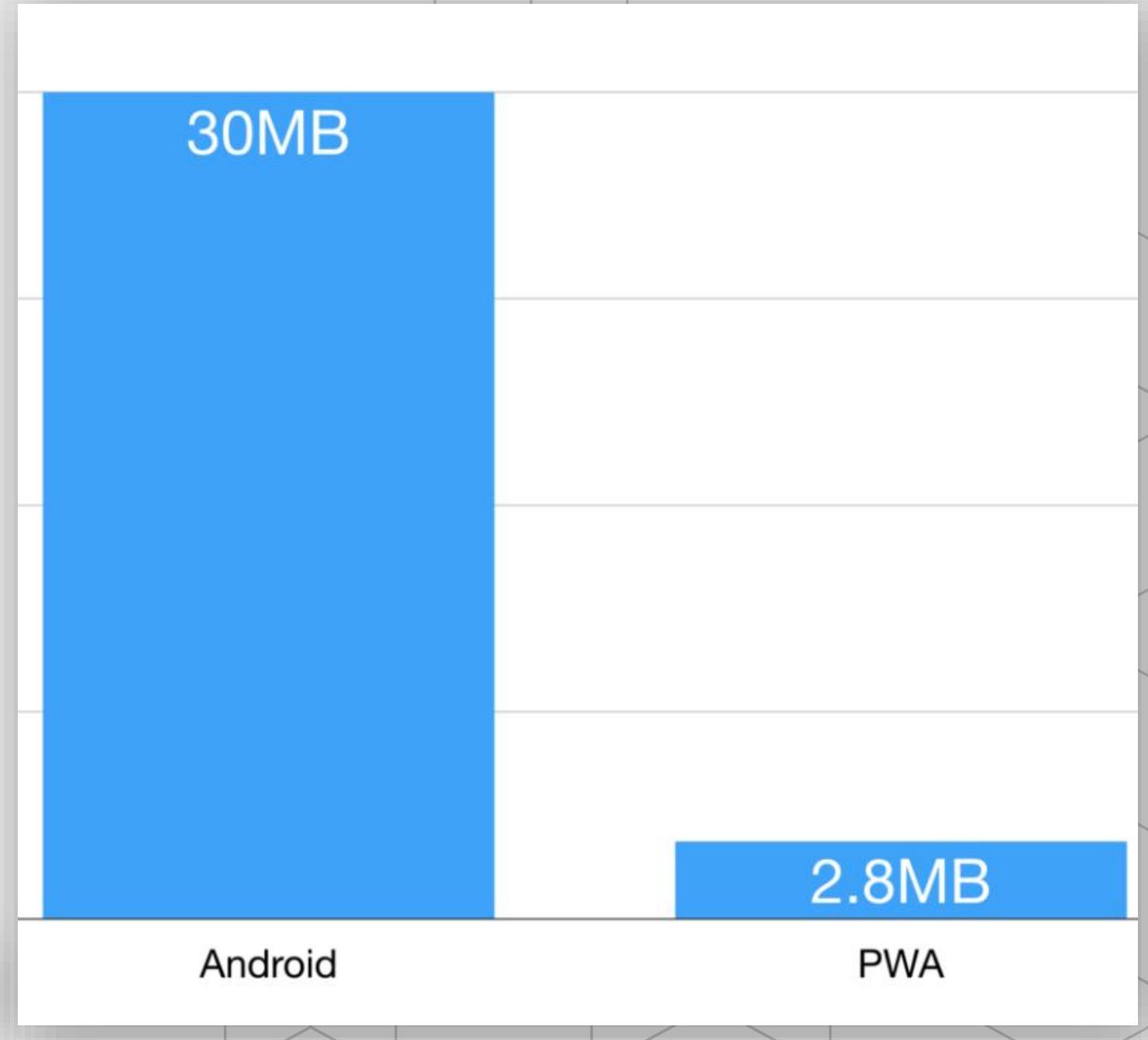
aka.ms/google-io-2018



Tinder:
Core experience
with 90% less code



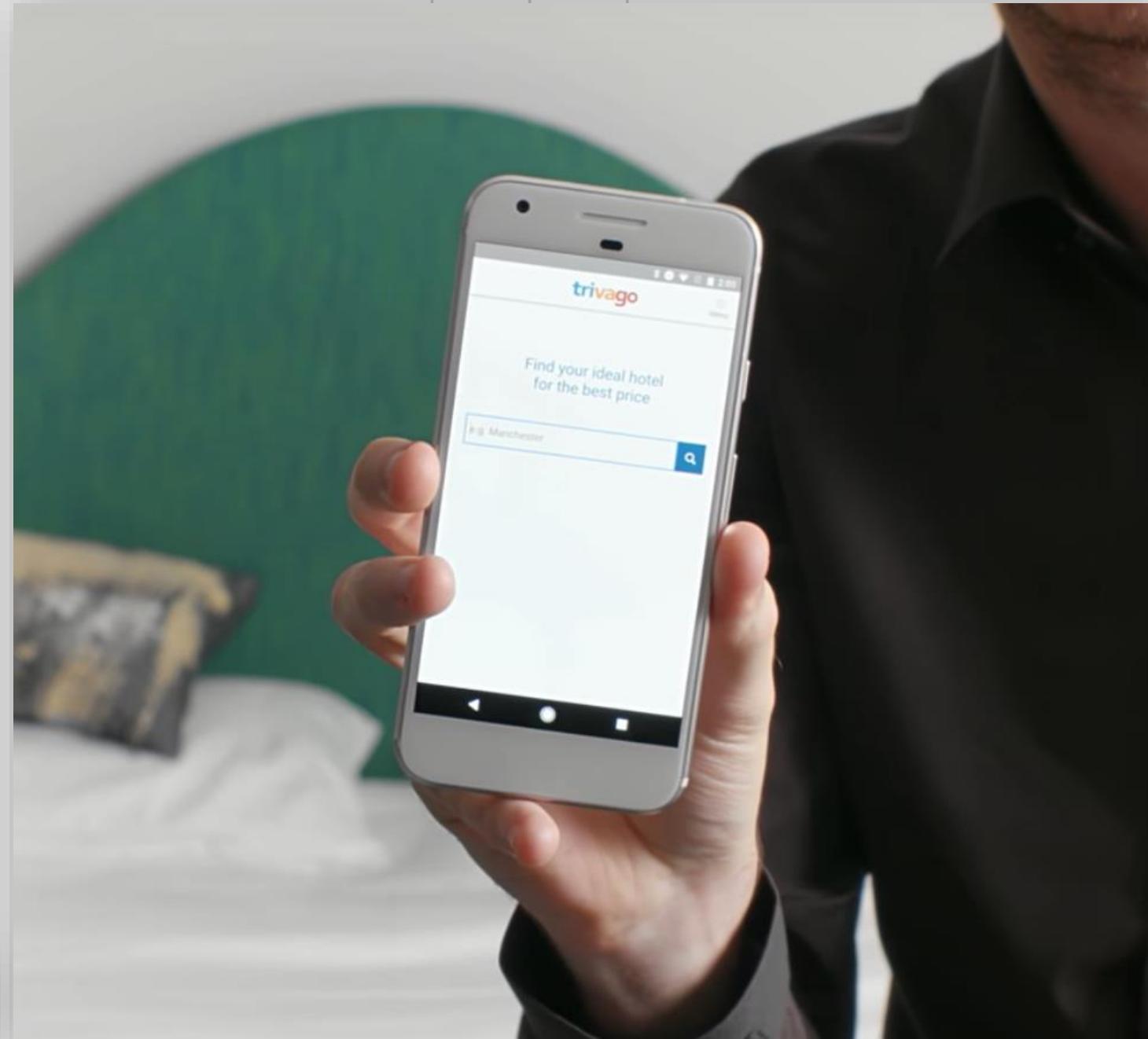
aka.ms/tinder-pwa-2017



97% increase in
click-outs to
hotel offers



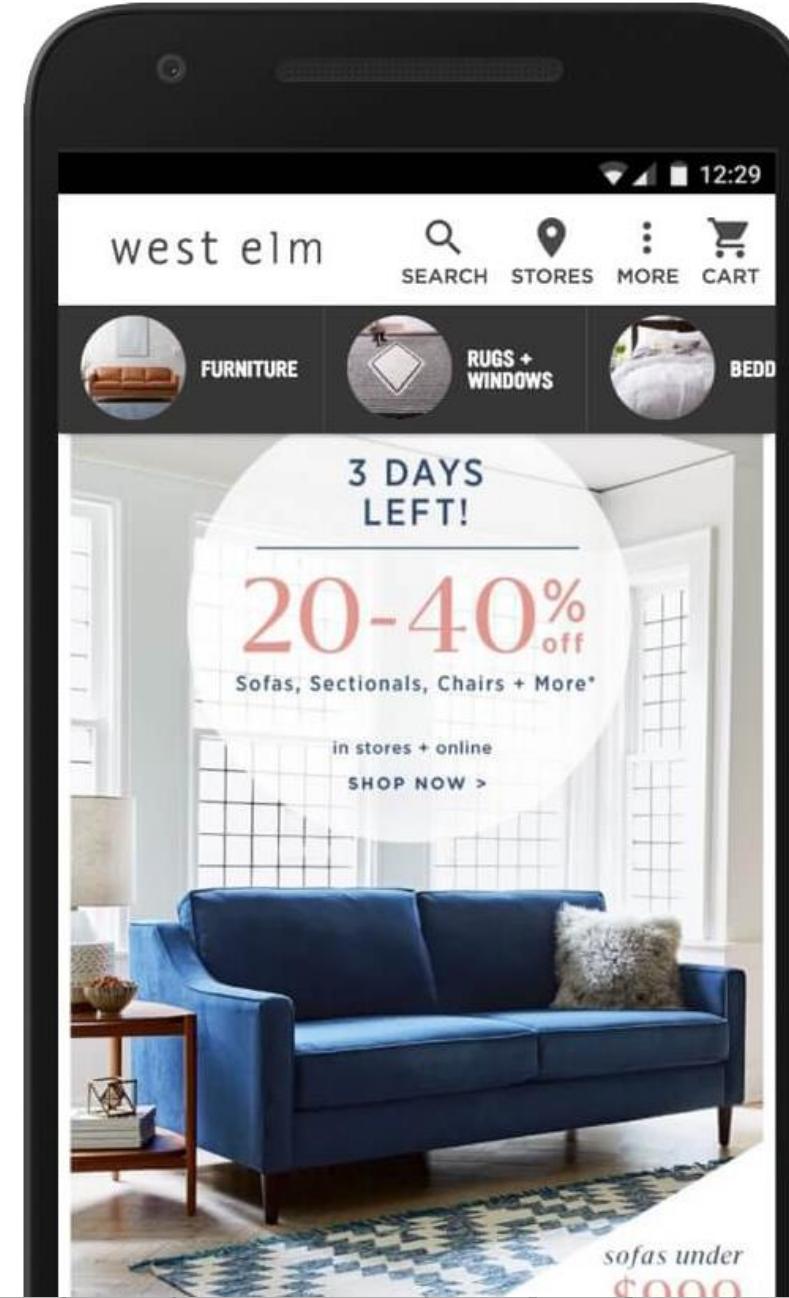
aka.ms/trivago-pwa-2017

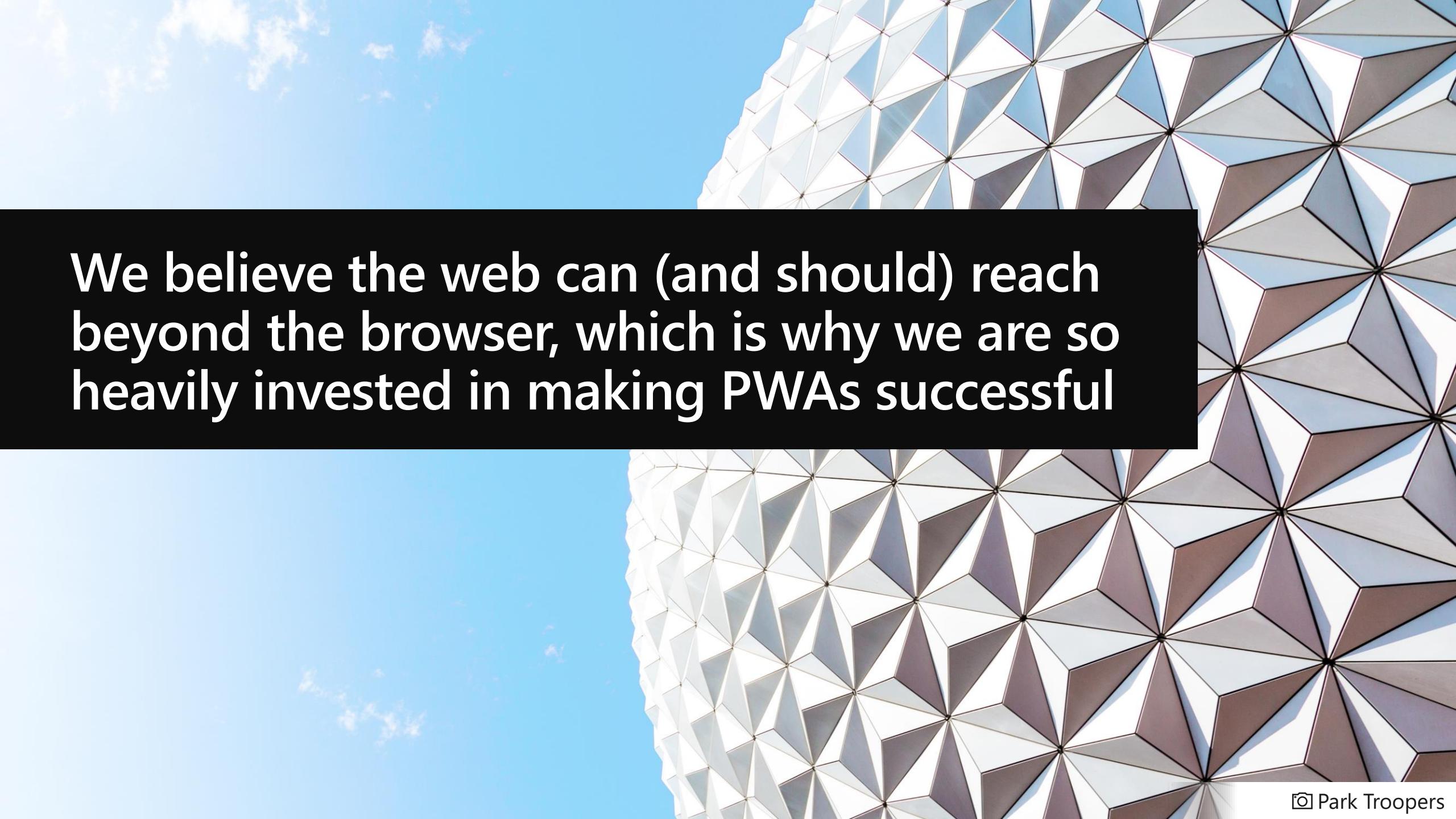


15% increase in
time on site
9% increase in
revenue per visit

west elm

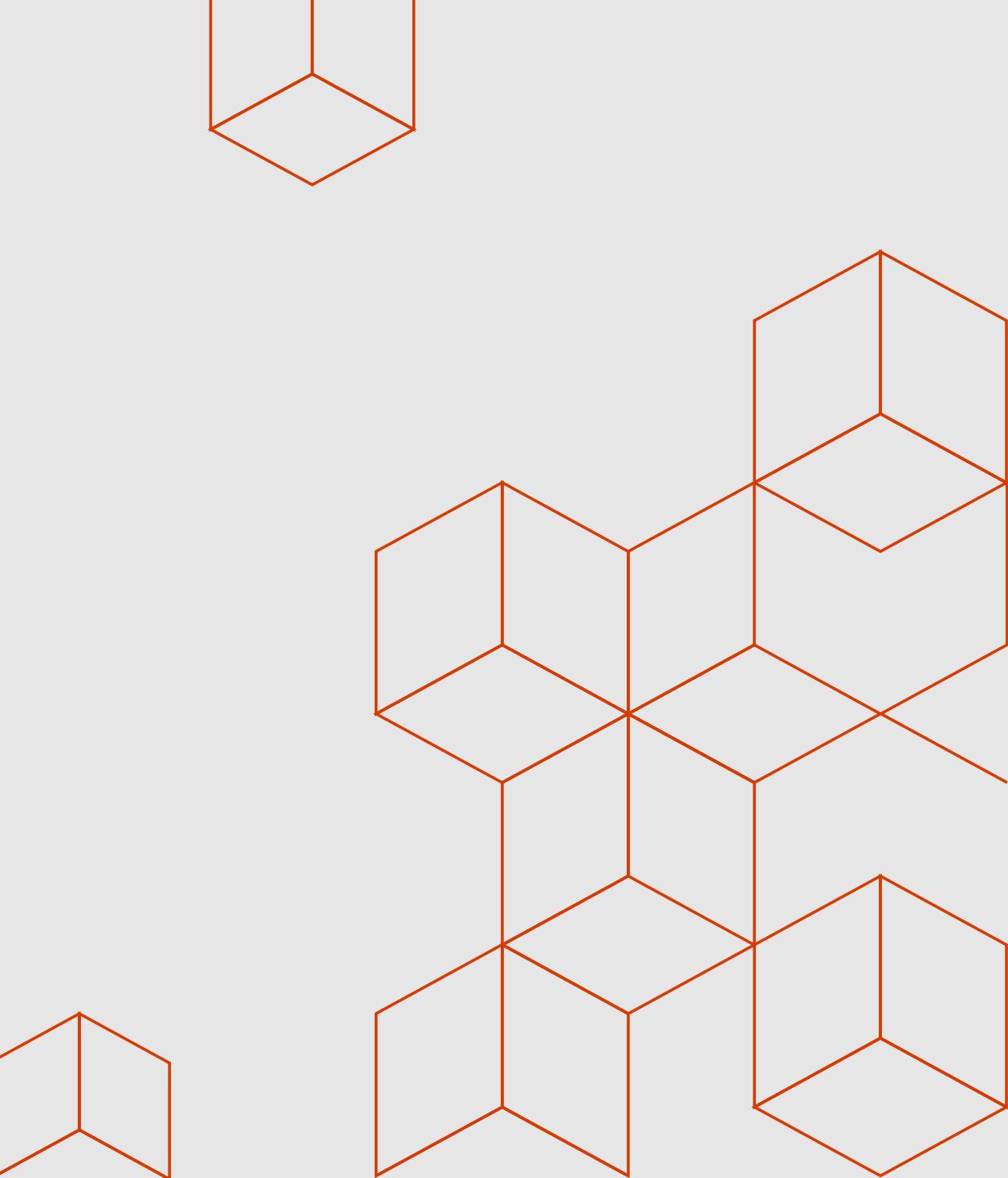
aka.ms/west-elm-pwa-2017



The background features a large, white, geodesic sphere structure, likely the Spaceship Earth at Disney's Epcot, set against a clear blue sky with a few wispy clouds.

We believe the web can (and should) reach beyond the browser, which is why we are so heavily invested in making PWAs successful

What exactly is a Progressive Web App?

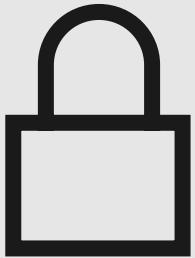


A Minimum Viable PWA



HTTPS

A Minimum Viable PWA



HTTPS

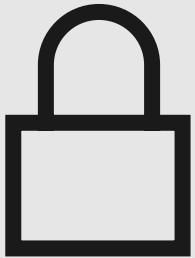


Web App
Manifest

/WebAPI Application Manifest

```
{  
  "lang": "en",  
  "short_name": "Wash Post",  
  "name": "The Washington Post",  
  "icons": [ { "src": "img/launcher-icon-2x.png",  
              "sizes": "96x96",  
              "type": "image/png" } ],  
  "start_url": "/pwa/",  
  "display": "standalone",  
  "orientation": "portrait",  
  "background_color": "black"  
}
```

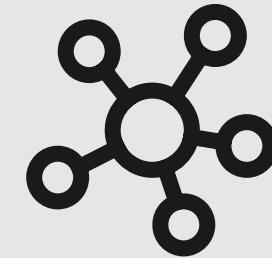
A Minimum Viable PWA



HTTPS

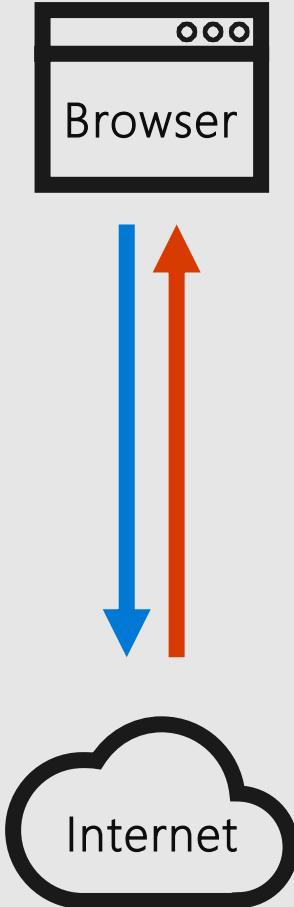


Web App
Manifest

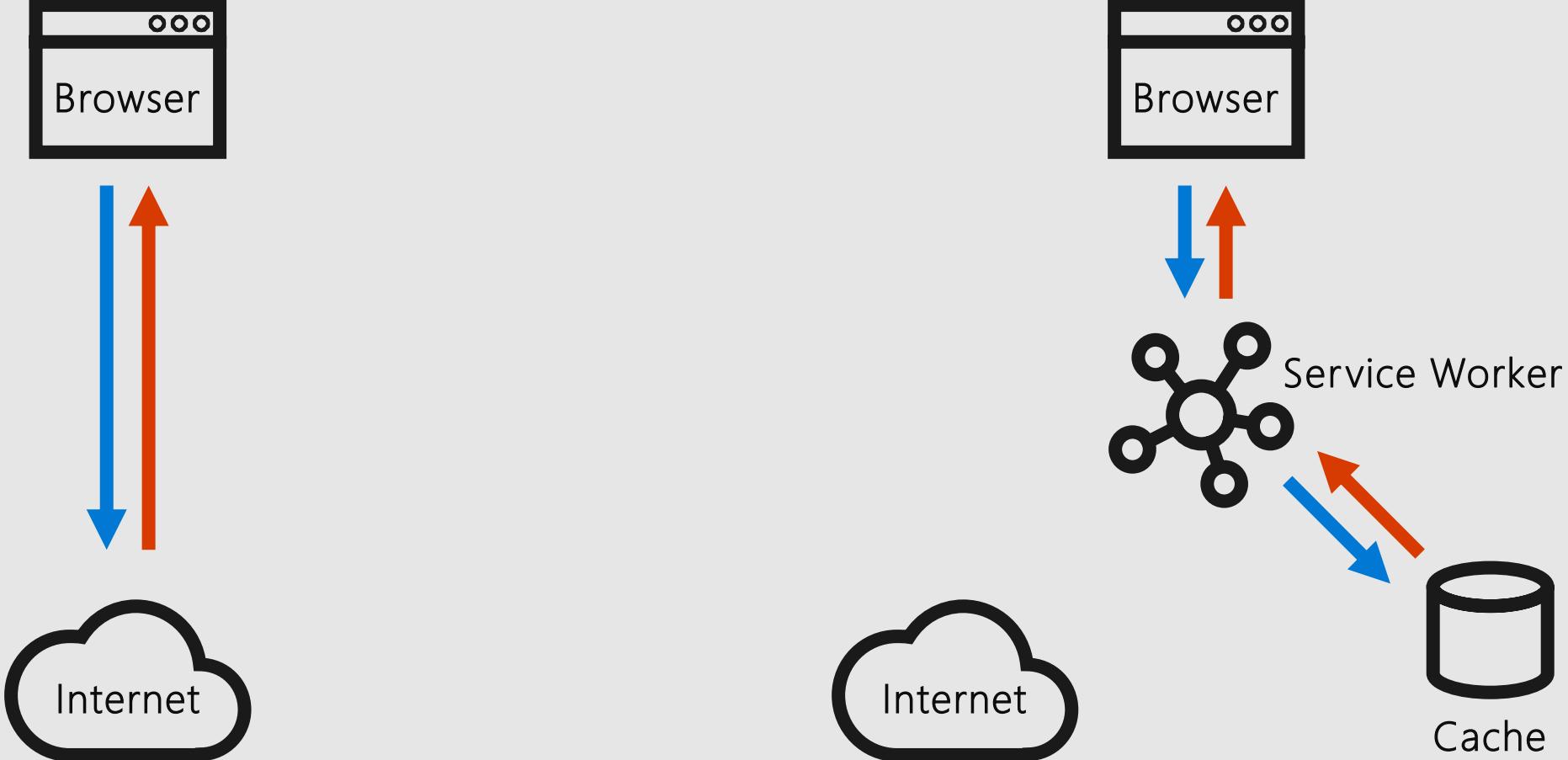


Service
Worker

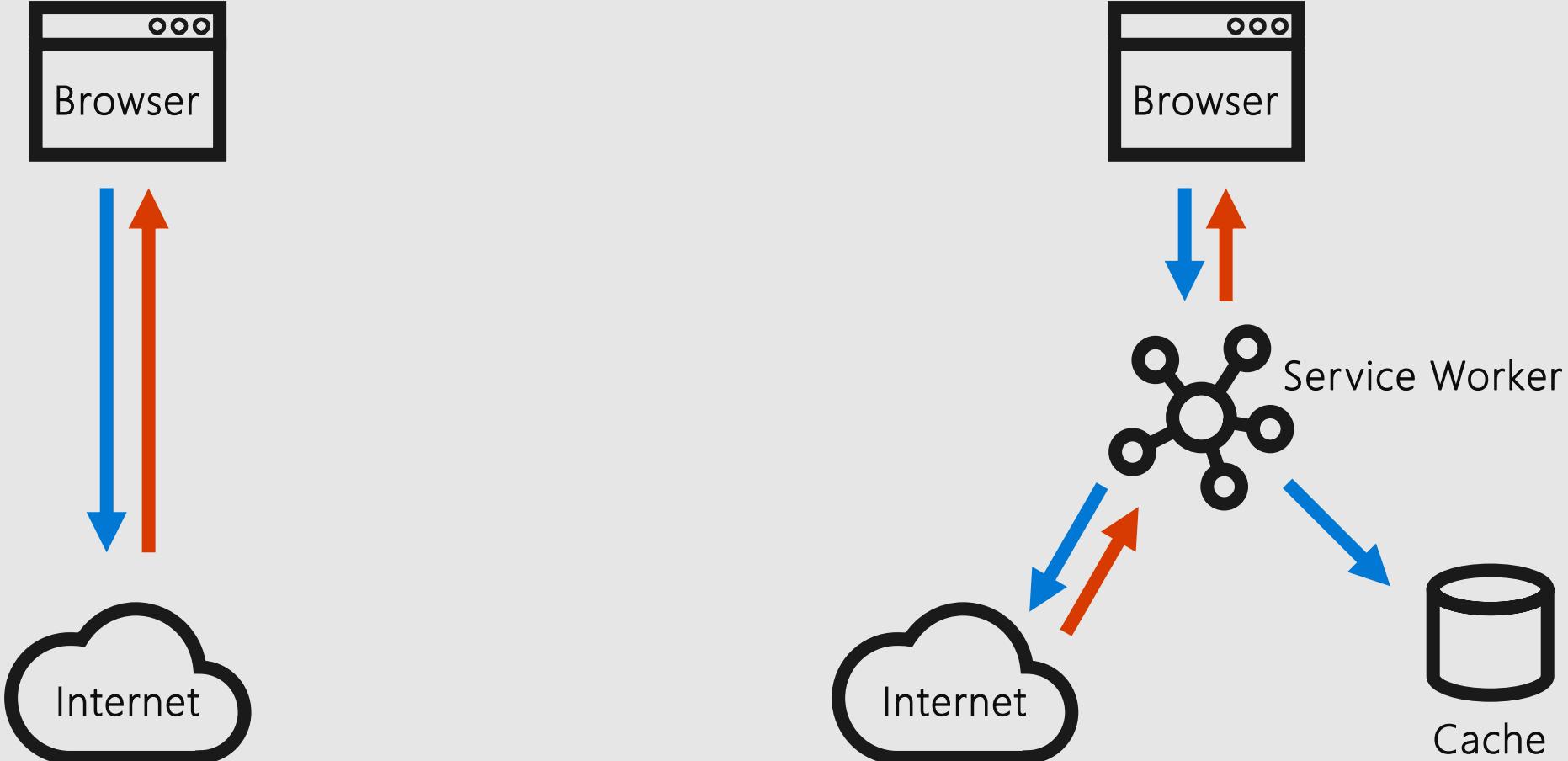
Service Workers



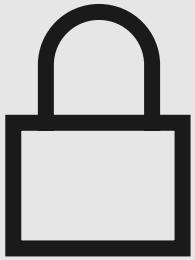
Service Workers



Service Workers



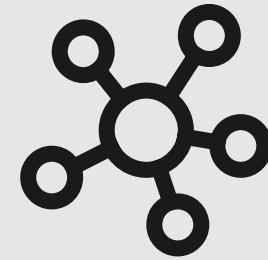
A Minimum Viable PWA



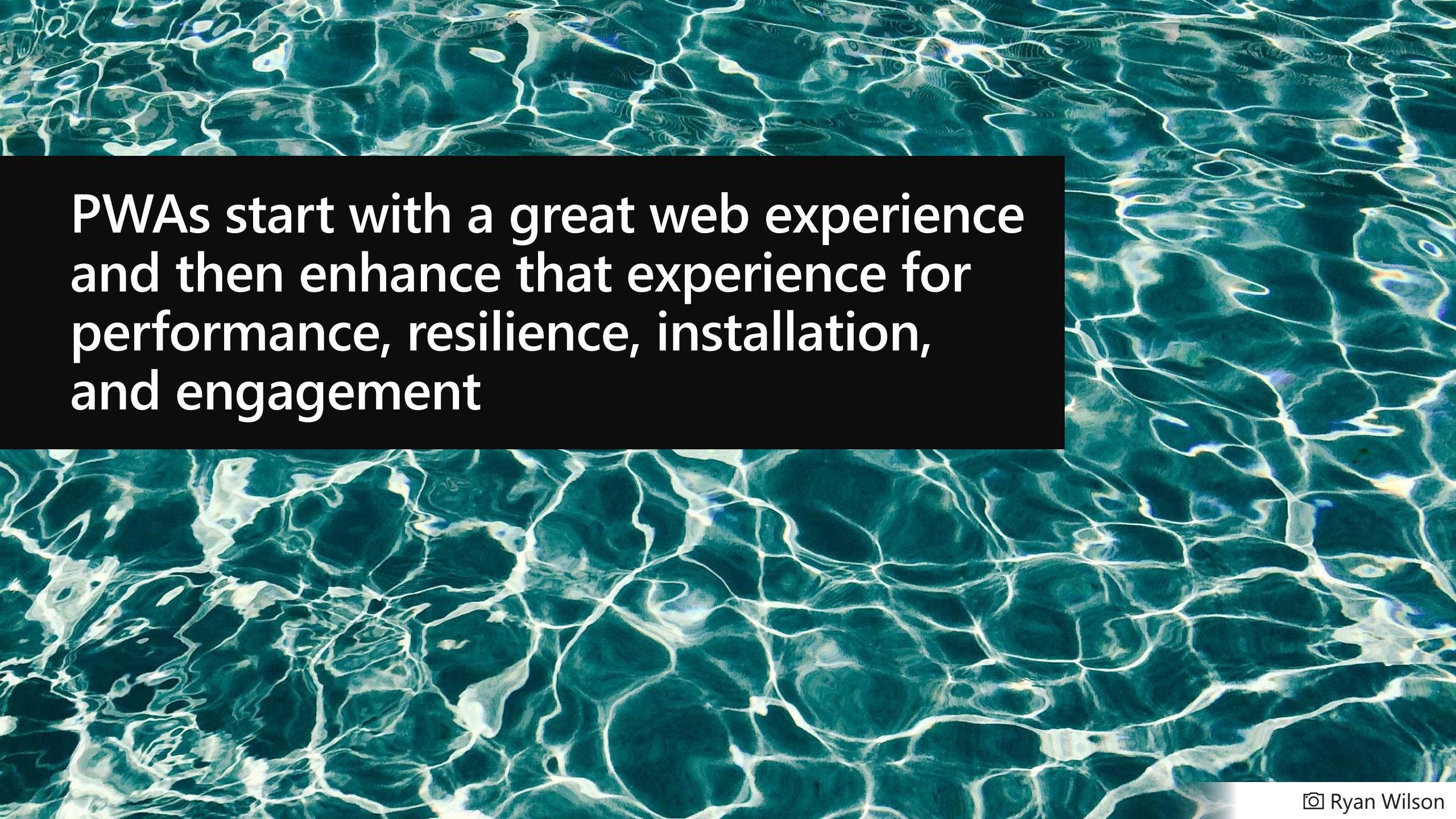
HTTPS



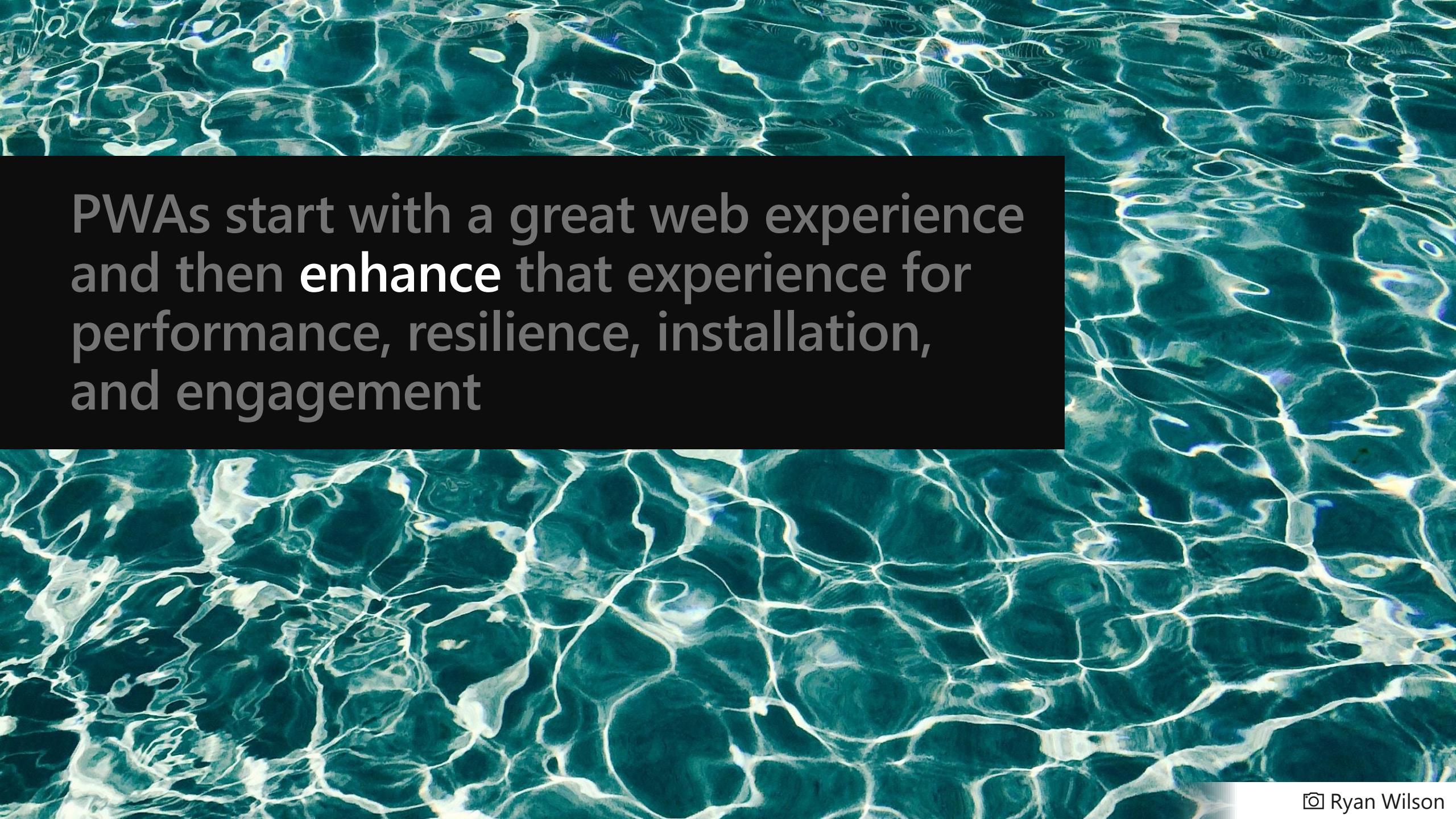
Web App
Manifest



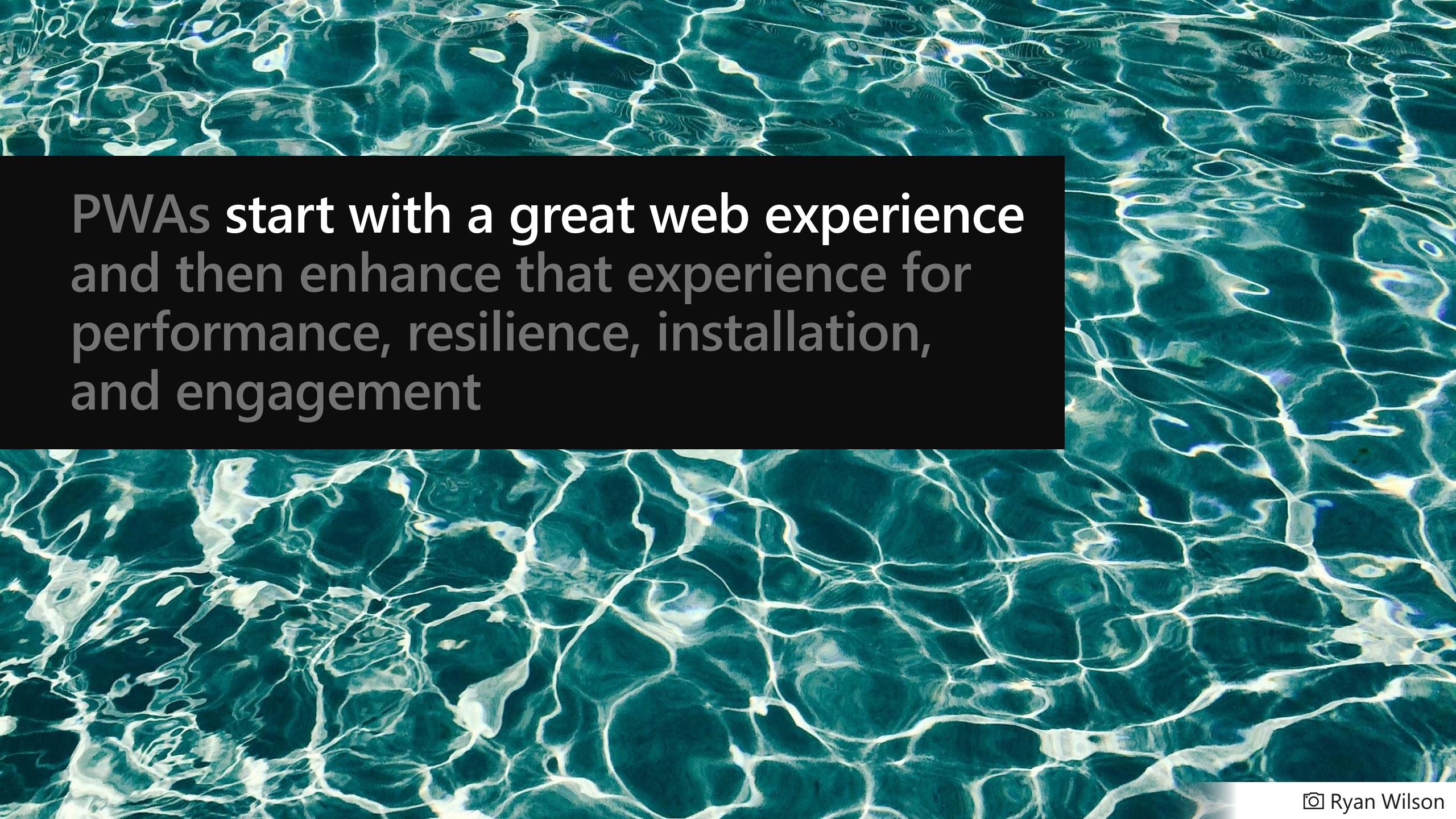
Service
Worker



PWAs start with a great web experience and then enhance that experience for performance, resilience, installation, and engagement



PWAs start with a great web experience
and then enhance that experience for
performance, resilience, installation,
and engagement

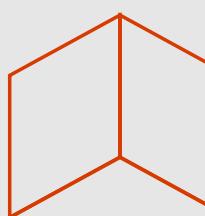
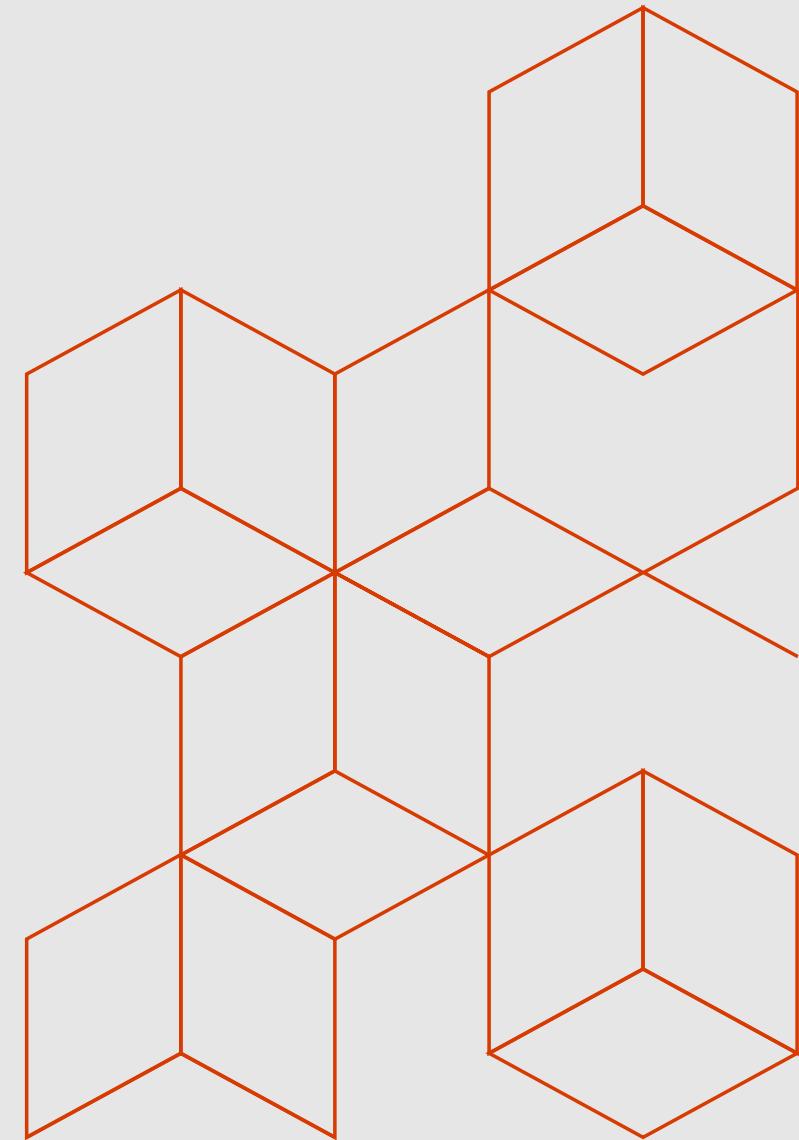


PWAs start with a great web experience
and then enhance that experience for
performance, resilience, installation,
and engagement

Making Office.com a great web experience

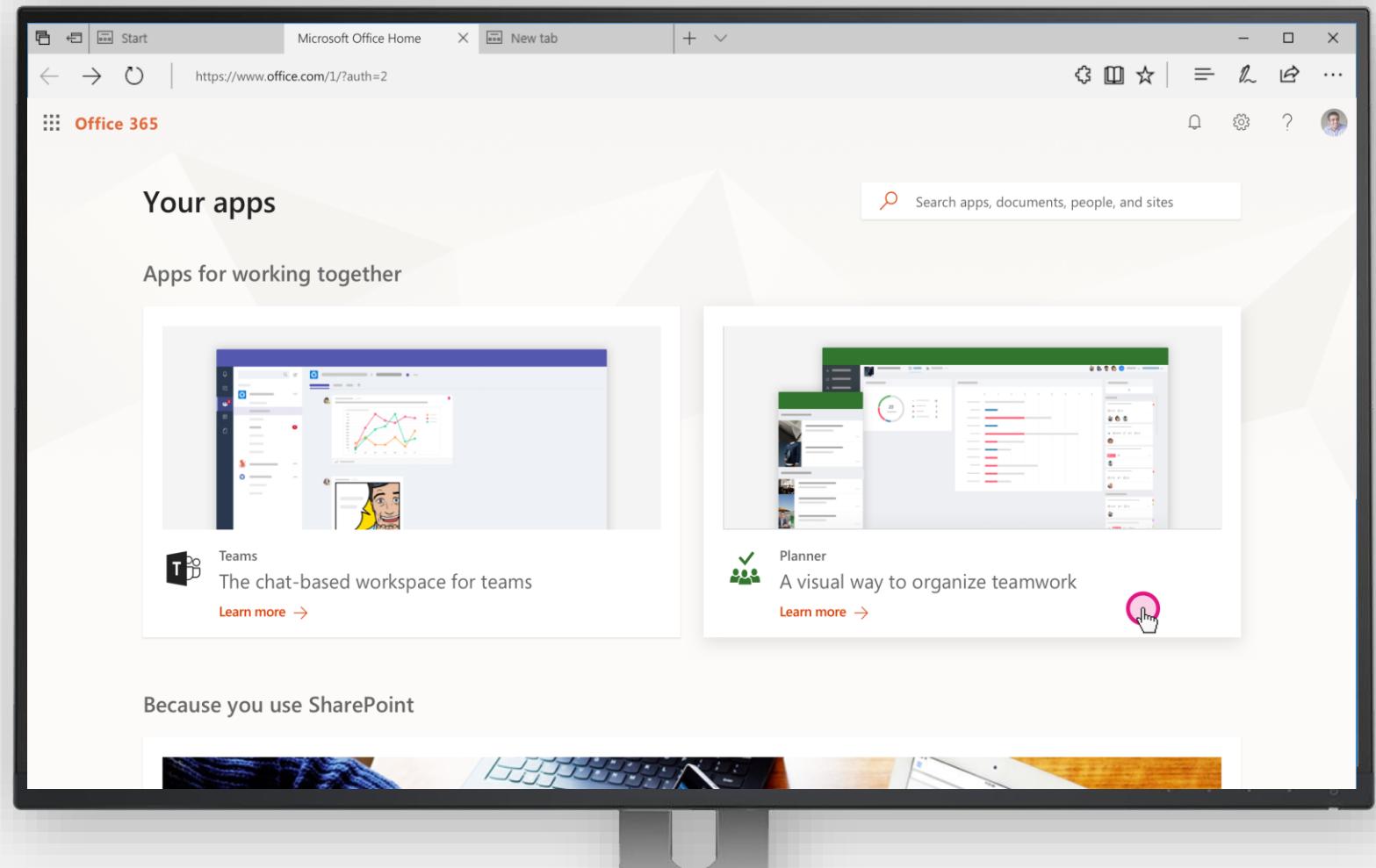
Matt Roe

Matt.Roe@microsoft.com



New to Office 365 in the last year

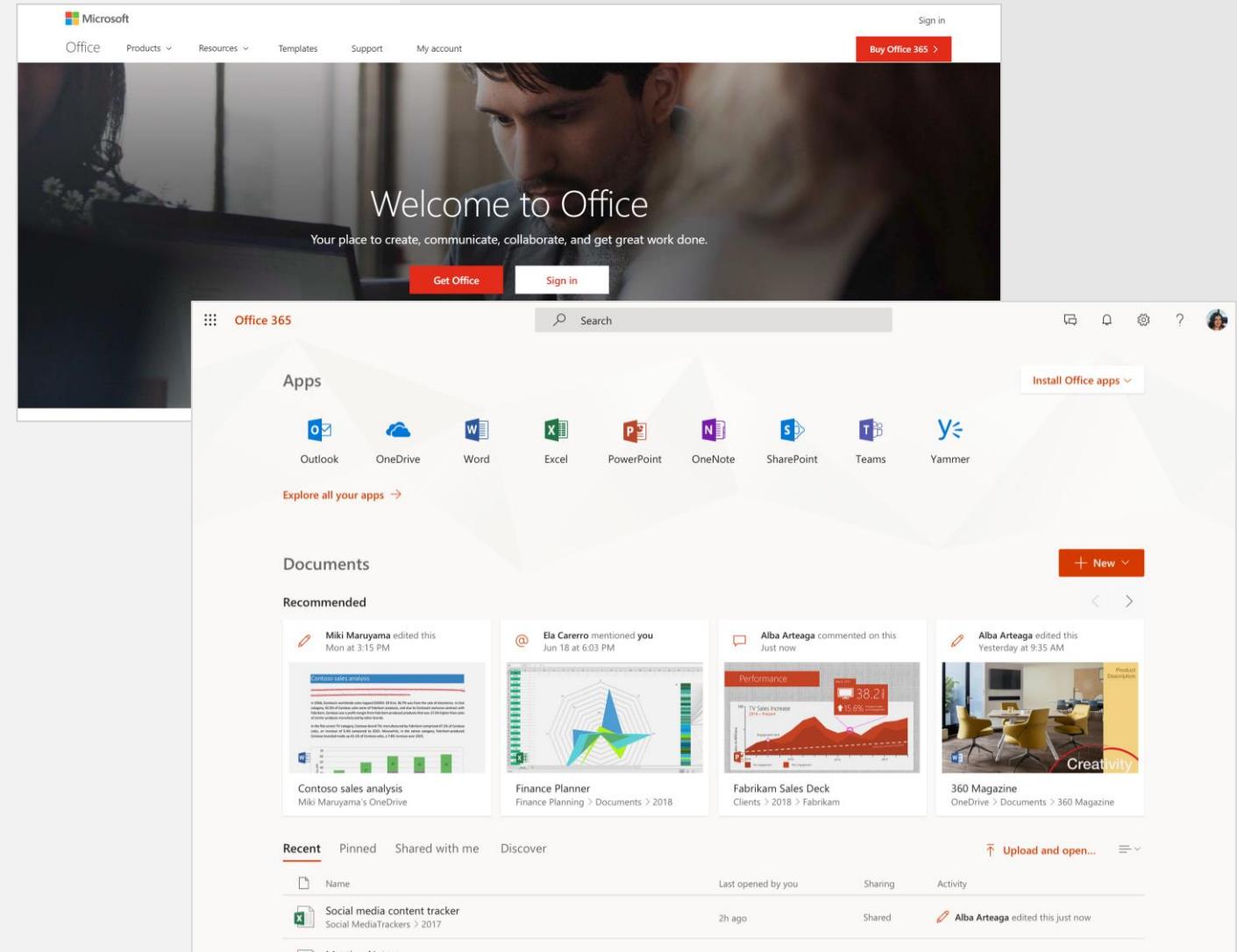
- Sign in and get to documents, apps, and sites that are relevant to you, in one place: www.office.com.
- Open and switch between apps most relevant to you with **Office 365 app launcher**.
- Explore Office 365 apps you are entitled to with the personalized **Office 365 gallery**.



Office.com growth
2x monthly users
so far in 2018 to

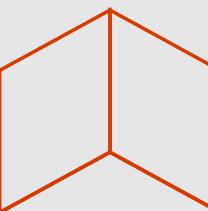
**40M monthly
active users**

6x improved
search success rate with
new enterprise-wide search



Office PWA

Enhancing the experience on Windows 10



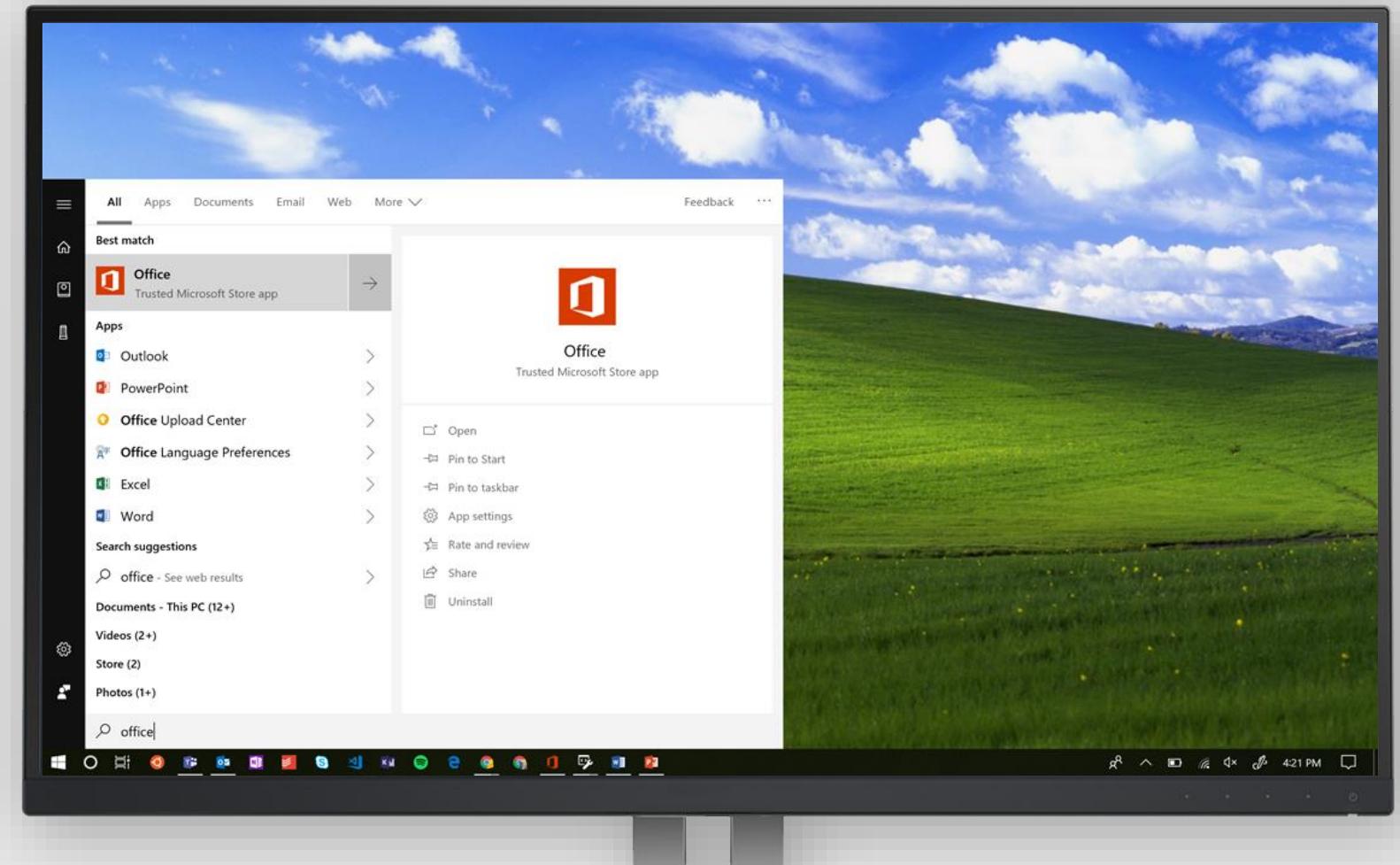
Installation

Engagement

Performance

Resilience

Bringing the value of Office.com on the web to Windows 10 users.

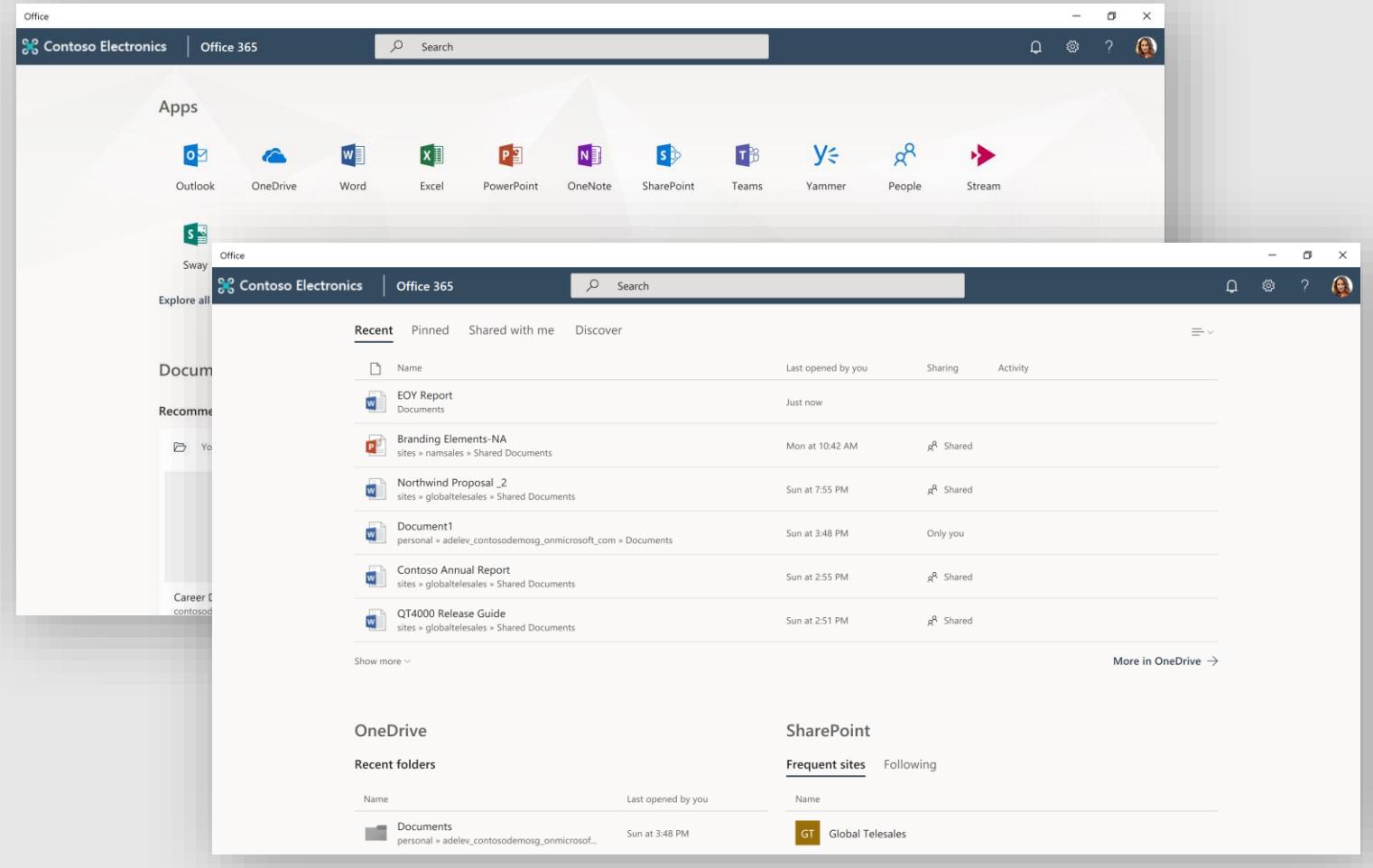


Installation

Engagement

Performance

Resilience



Extend the Office.com value to local applications and documents.

Installation

Engagement

Performance

Resilience

5s / 1.5s

Using ServiceWorker we have been able to significantly reduce the DOM render time

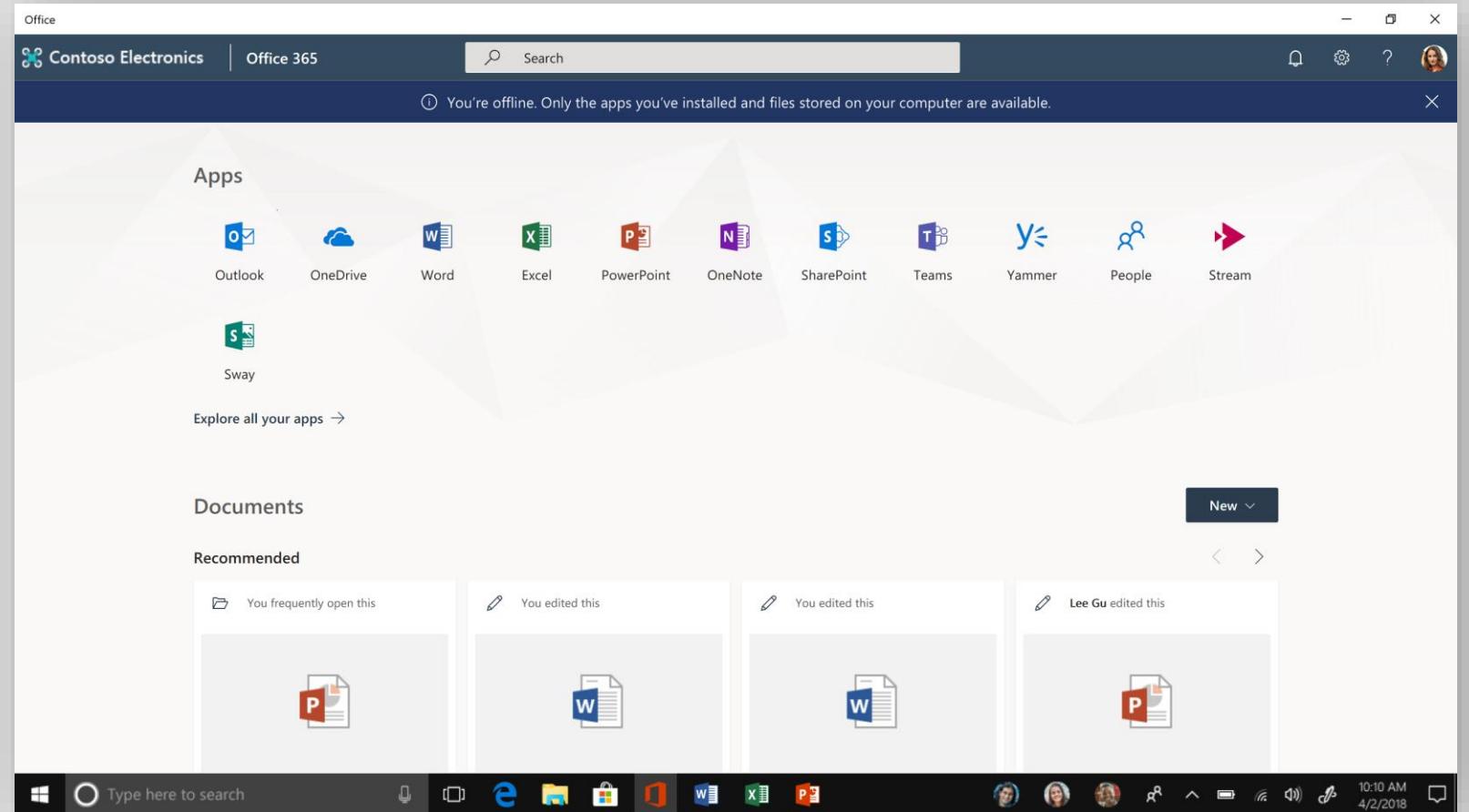
Installation

Engagement

Performance

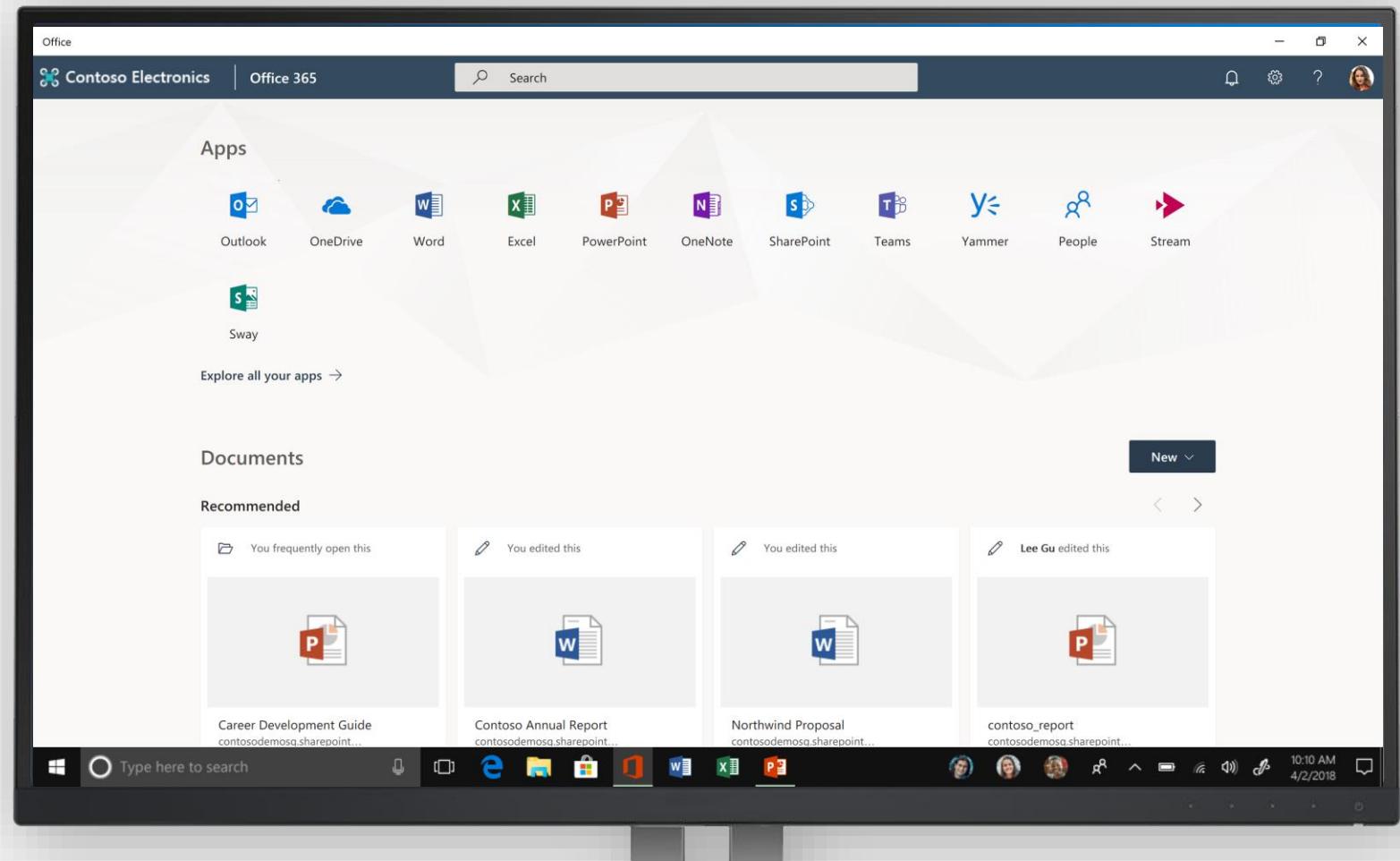
Resilience

Supporting offline and low-bandwidth network scenarios.



Office PWA in Summary

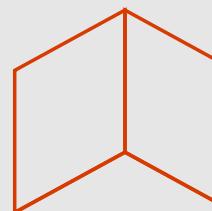
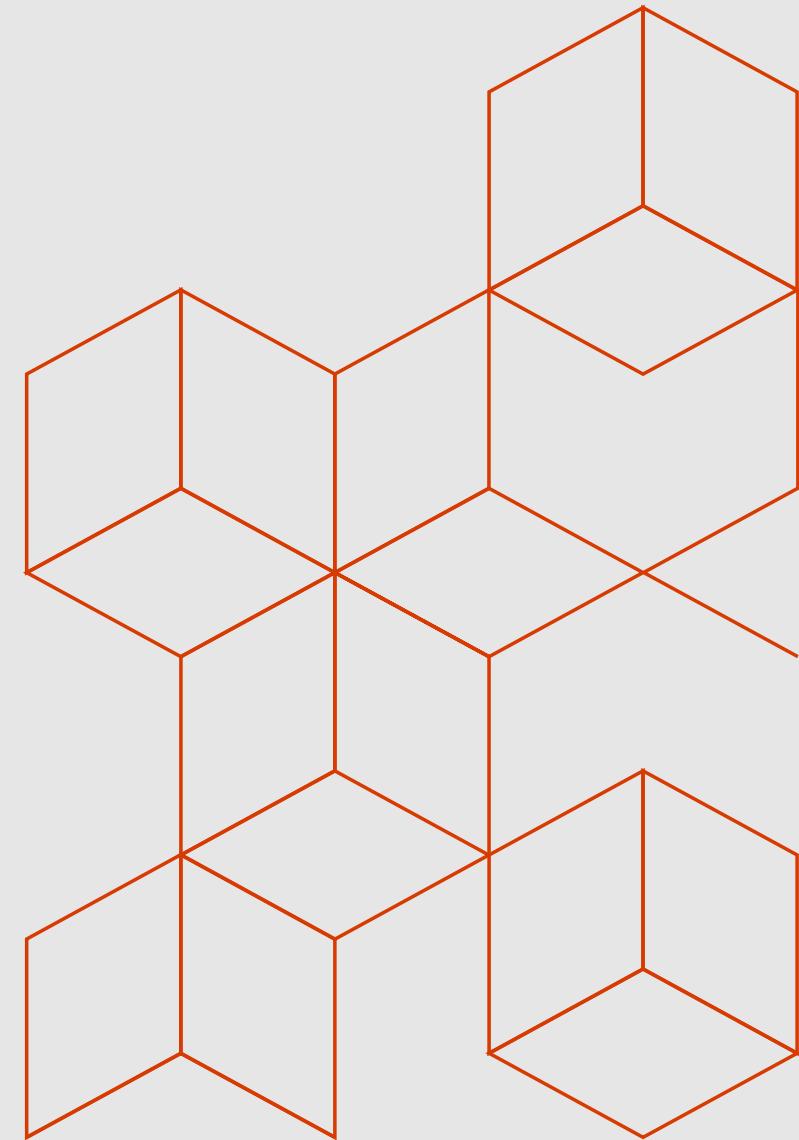
- Bring the full value of Office.com to Windows 10 desktop users.
- Extend the value to provide app-specific differentiated value.
- Do so quickly.

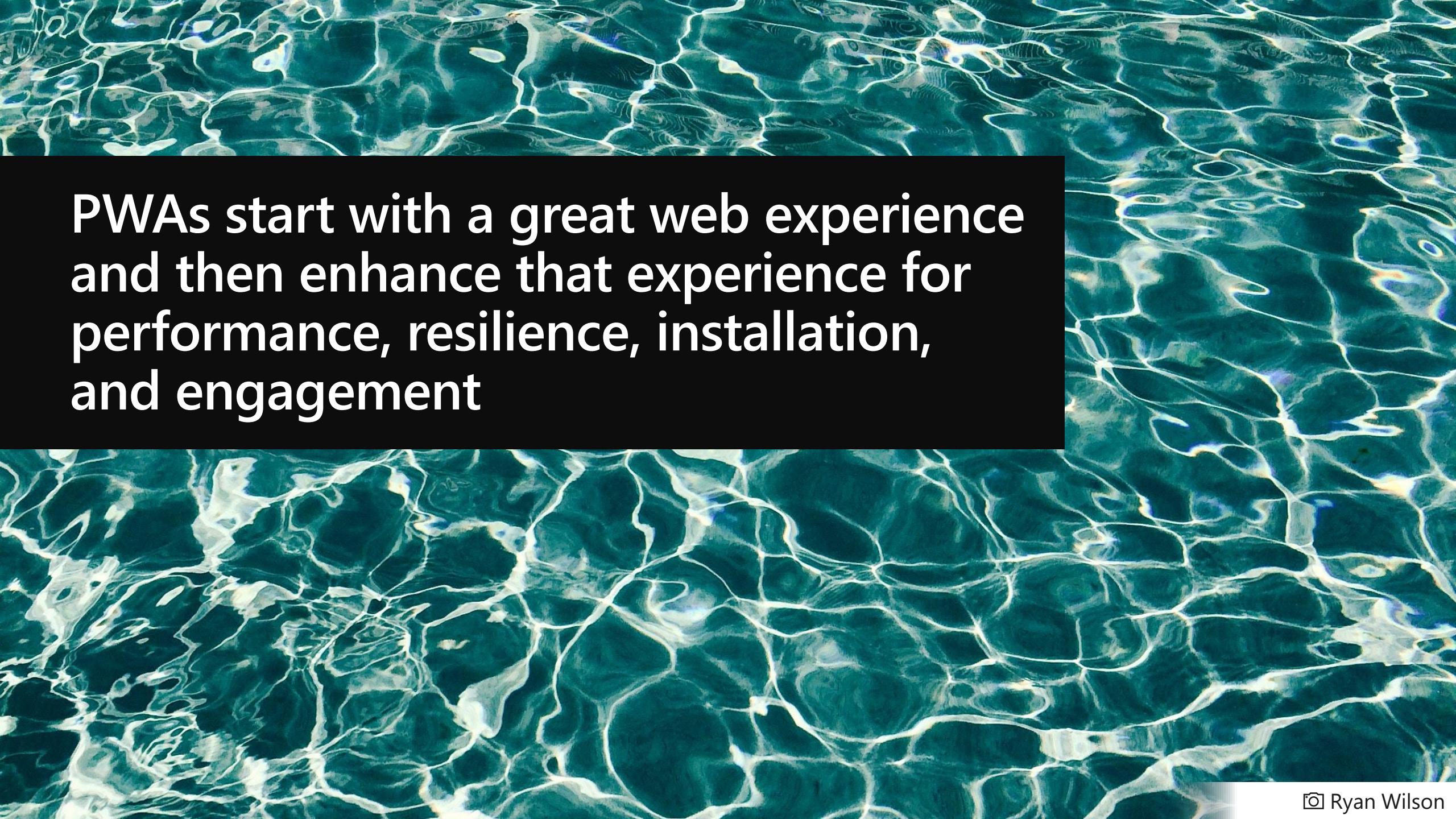


Making Office.com a great web experience

Matt Roe

Matt.Roe@microsoft.com





PWAs start with a great web experience and then enhance that experience for performance, resilience, installation, and engagement



Progressive

/prə'gresiv/

**happening or developing gradually or
in stages; proceeding step by step**

The background of the slide is a collage of three photographs. The top two images show rows of palm trees silhouetted against a bright blue sky. The bottom image shows palm trees silhouetted against a sunset sky with orange and pink clouds.

Step 1
Focus on what matters

Consider forbes.com circa 2007

US OPEN.org

Forbes.com

U.S. EUROPE ASIA HOME PAGE FOR THE WORLD'S BUSINESS LEADERS Free Trial Issue

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Associated Press

Book Is Inside Look at War on Terror

By PETE YOST 09.07.07, 3:25 PM ET

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WASHINGTON - Vice President Dick Cheney and other Bush administration officials "blew through" legal constraints they didn't like and weakened the presidency with a go-it-alone approach in the war on terror, a former Justice Department official writes in a new book.

In "The Terror Presidency," former assistant attorney general Jack Goldsmith details what he calls "one of the underappreciated stories in the war on terror." It's a book he thinks the Bush

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Andrew Teufel
Director of Research, Fisher Investments

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Small Business Attaché



The screenshot shows a Microsoft Edge browser window with the following details:

- Title Bar:** The Illusion of Control i
- Address Bar:** alistapart.com/article/the-illusion-of-control-in-web-design#comments
- Toolbar:** Back, Forward, Stop, Home, Refresh, Address, Favorites, Print, Copy, Paste, Find, etc.
- Top Navigation:** ALA, ALA EE, TeamWork, TeamWork, Translator, Links, Email, MSTravel, Microsoft, OSS, Tank, Resources, Favelets.
- Header:** ARTICLES (highlighted), EVENTS, TOPICS, WRITE FOR US, A LIST APART
- Main Content:**
 - ## The Illusion of Control in Web Design
 - By Aaron Gustafson · April 26, 2018
 - Published in Code
 - "Mobile first" thinking isn't just about mobile

...st and engaging web experiences. We scrutinize every detail of an ...
... everything we can, but the harsh reality is that we control less than we think.
 - 

A Book Apart:
Brief books for people who make
websites.
 - 

An Event Apart:
3 days of design, code, and content
for web & UX designers & devs.
 - Last week, two events reminded us, yet again, of how right Douglas Crockford was when he declared the web “the most hostile software engineering environment imaginable.” Both were serious enough to take down an entire site—actually hundreds of entire sites, as it turned out. And both were avoidable.
 - In understanding what we control (and what we don’t), we will build resilient, engaging products for our users.
 - ### What happened?

The first of these incidents involved the launch of Chrome 66. With that release, Google implemented a security patch with serious implications for folks who weren’t paying attention. You might recall that quite a few questionable SSL certificates issued by Symantec Corporation’s PKI began to surface early last year. Apparently, Symantec had
 - 6 comments

Share this on: Twitter, Facebook, Google+

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The background of the image features a dense cluster of palm trees silhouetted against a clear blue sky. In the lower half of the image, there is a horizontal strip where the palm trees are backlit by a warm, orange and pink sunset, creating a more vibrant and colorful scene.

Remember that text is the first interface

The background of the slide is a collage of three photographs. The top photograph shows palm trees silhouetted against a clear blue sky. The bottom-left photograph shows palm trees silhouetted against a sunset or sunrise sky with orange and pink clouds. The bottom-right photograph shows palm trees silhouetted against a sky with scattered white clouds.

Is there anything missing that would help users be more successful?



Step 2
Use markup that supports
Focus on what matters



The words we choose matter,
but the markup we use matters equally

What does it mean?

```
<div class="entry">
  <div class="entry__title">Progressive Web Apps and
    the Windows Ecosystem</div>
  <div class="entry__meta">
    <div><b>Published</b> 24 May 2017</div>
    <div><b>Reading Time</b> 25 minutes</div>
  </div>
  <div class="entry__content">
    I had the great pleasure of delivering a talk...
    <br><br>
    I do a lot of traveling and it's...
  </div>
</div>
```

This `div` marks up a piece of self-contained content

```
<div class="entry">
  <div class="entry__title">Progressive Web Apps and
    the Windows Ecosystem</div>
  <div class="entry__meta">
    <div><b>Published</b> 24 May 2017</div>
    <div><b>Reading Time</b> 25 minutes</div>
  </div>
  <div class="entry__content">
    I had the great pleasure of delivering a talk...
    <br><br>
    I do a lot of traveling and it's...
  </div>
</div>
```

There's a tag for that: `article`

```
<article class="entry">
  <div class="entry__title">Progressive Web Apps and
    the Windows Ecosystem</div>
  <div class="entry__meta">
    <div><b>Published</b> 24 May 2017</div>
    <div><b>Reading Time</b> 25 minutes</div>
  </div>
  <div class="entry__content">
    I had the great pleasure of delivering a talk...
    <br><br>
    I do a lot of traveling and it's...
  </div>
</article>
```

This `div` is the title of the blog post

```
<article class="entry">
  <div class="entry__title">Progressive Web Apps and
    the Windows Ecosystem</div>
  <div class="entry__meta">
    <div><b>Published</b> 24 May 2017</div>
    <div><b>Reading Time</b> 25 minutes</div>
  </div>
  <div class="entry__content">
    I had the great pleasure of delivering a talk...
    <br><br>
    I do a lot of traveling and it's...
  </div>
</article>
```

There's a tag for that: h1-h6

```
<article class="entry">
  <h1 class="entry__title">Progressive Web Apps and
    the Windows Ecosystem</h1>
  <div class="entry__meta">
    <div><b>Published</b> 24 May 2017</div>
    <div><b>Reading Time</b> 25 minutes</div>
  </div>
  <div class="entry__content">
    I had the great pleasure of delivering a talk...
    <br><br>
    I do a lot of traveling and it's...
  </div>
</article>
```

These divs define various properties of the post

```
<article class="entry">
  <h1 class="entry_title">Progressive Web Apps and
    the Windows Ecosystem</h1>
  <div class="entry_meta">
    <div><b>Published</b> 24 May 2017</div>
    <div><b>Reading Time</b> 25 minutes</div>
  </div>
  <div class="entry_content">
    I had the great pleasure of delivering a talk...
    <br><br>
    I do a lot of traveling and it's...
  </div>
</article>
```

There's an element for the: dl

```
<article class="entry">
  <h1 class="entry__title">Progressive Web Apps and
    the Windows Ecosystem</h1>
  <dl class="entry__meta">
    <dt>Published</dt> <dd>24 May 2017</dd>
    <dt>Reading Time</dt> <dd>25 minutes</dd>
  </dl>
  <div class="entry__content">
    I had the great pleasure of delivering a talk...
    <br><br>
    I do a lot of traveling and it's...
  </div>
</article>
```

Bonus: time

```
<article class="entry">
  <h1 class="entry__title">Progressive Web Apps and
    the Windows Ecosystem</h1>
  <dl class="entry__meta">
    <dt>Published</dt> <dd><time>24 May 2017</time></dd>
    <dt>Reading Time</dt> <dd>25 minutes</dd>
  </dl>
  <div class="entry__content">
    I had the great pleasure of delivering a talk...
    <br><br>
    I do a lot of traveling and it's...
  </div>
</article>
```

Bonus: time

```
<time datetime="2017-05-24">  
 24 May 2017</time>
```

```
<time datetime="2017-05-24T11:13:24">  
 24 May 2017</time>
```

```
<time datetime="2017-05-24T11:13:24-04:00">  
 24 May 2017</time>
```

This is “flow” content with line breaks

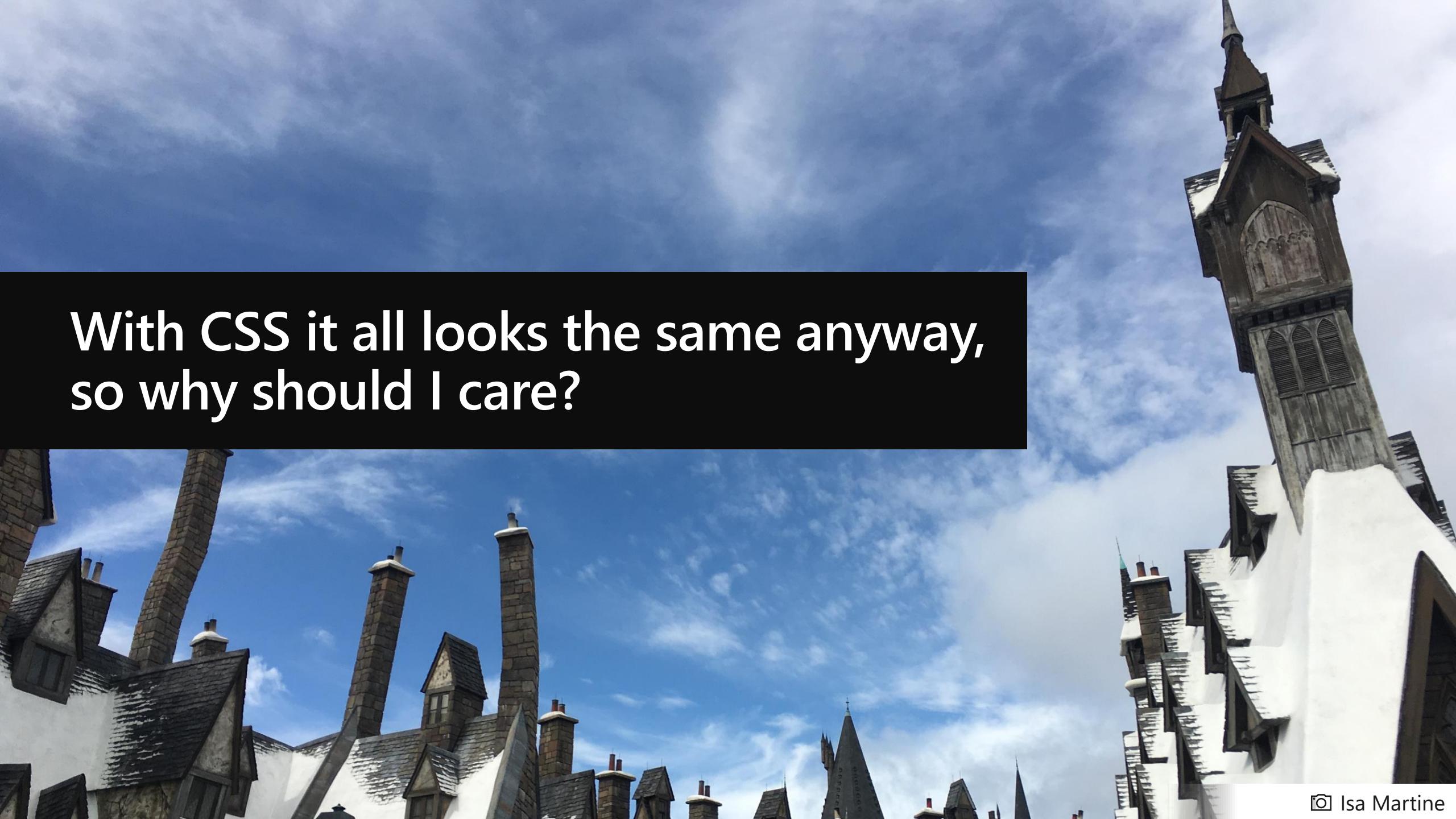
```
<article class="entry">
  <h1 class="entry__title">Progressive Web Apps and
    the Windows Ecosystem</h1>
  <dl class="entry__meta">
    <dt>Published</dt> <dd><time ...>24 May 2017</time></dd>
    <dt>Reading Time</dt> <dd>25 minutes</dd>
  </dl>
  <div class="entry__content">
    I had the great pleasure of delivering a talk...
    <br><br>
    I do a lot of traveling and it's...
  </div>
</article>
```

This is “flow” content with generic divisions

```
<article class="entry">
  <h1 class="entry__title">Progressive Web Apps and
    the Windows Ecosystem</h1>
  <dl class="entry__meta">
    <dt>Published</dt> <dd><time ...>24 May 2017</time></dd>
    <dt>Reading Time</dt> <dd>25 minutes</dd>
  </dl>
  <div class="entry__content">
    <div>I had the great pleasure of delivering a talk...</div>
    <div>I do a lot of traveling and it's...</div>
  </div>
</article>
```

That is meaningful content

```
<article class="entry">
  <h1 class="entry__title">Progressive Web Apps and
    the Windows Ecosystem</h1>
  <dl class="entry__meta">
    <dt>Published</dt> <dd><time ...>24 May 2017</time></dd>
    <dt>Reading Time</dt> <dd>25 minutes</dd>
  </dl>
  <div class="entry__content">
    <p>I had the great pleasure of delivering a talk...</p>
    <p>I do a lot of traveling and it's...</p>
  </div>
</article>
```



With CSS it all looks the same anyway,
so why should I care?

Readability

Progressive Web Apps and the Windows Ecosystem

Published

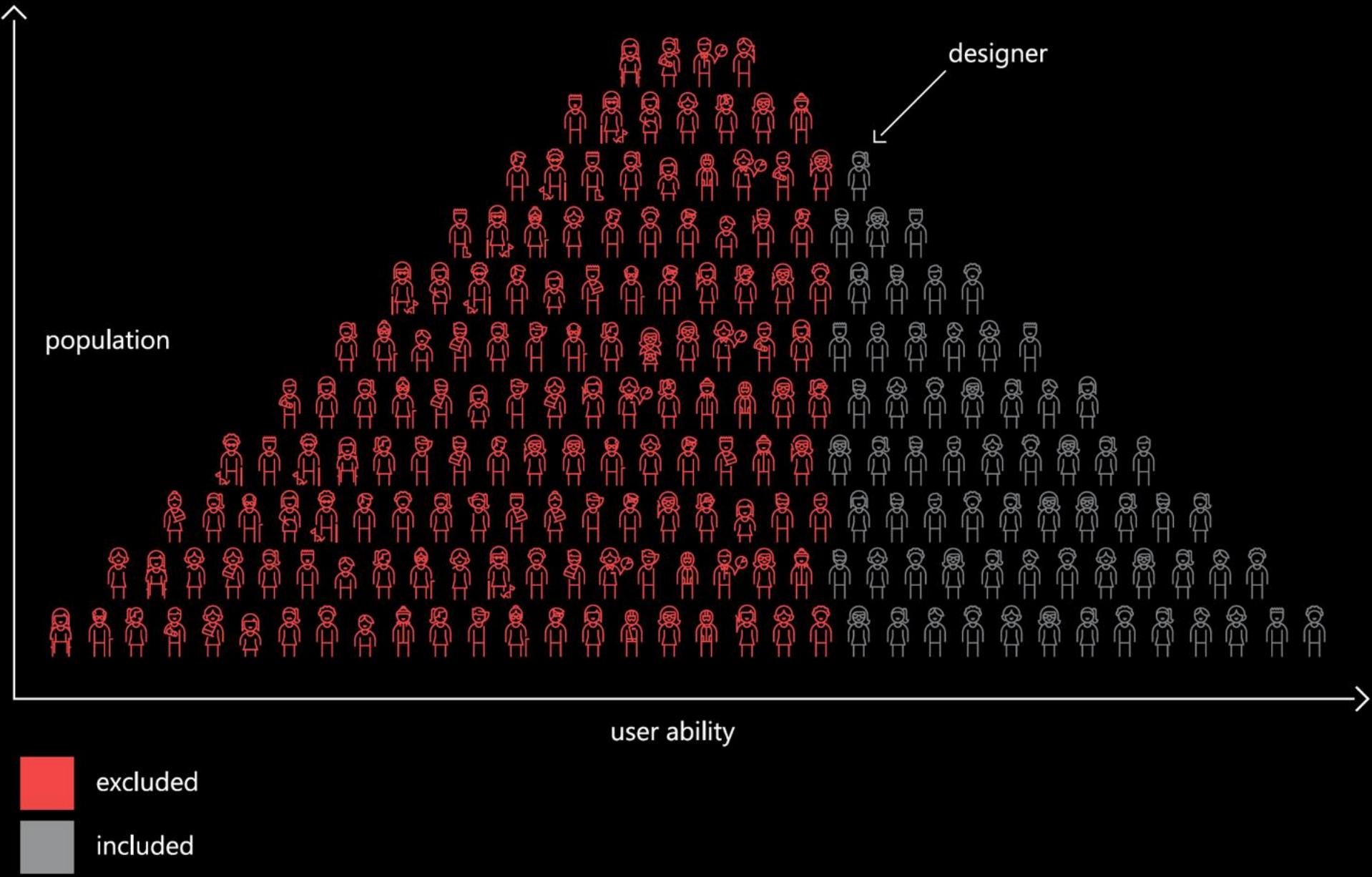
24 May 2017

Reading Time

25 minutes

I had the great pleasure of delivering a talk...

I do a lot of traveling and it's...





"Hey Cortana, read me the top three
headlines in today's New York Times"



Accessing content via semantics:

```
function extractHeadlines( response ){
  var $html = document.createElement('div'),
      $headings, i=0, headlines=[];
  $html.innerHTML = response.contents;
  $headings = $html.querySelectorAll('#top-news')
    .querySelectorAll('article h1, article h2, article h3');
  heading_count = $headings.length;
  while (headlines.length < 3) {
    let $link = $headings[i].querySelector('a');
    if ($link && $link.href) {
      headlines.push({
        title: $headings[i].innerText.trim(),
        link: $link.href
      });
    }
    i++;
  }
  console.log( headlines );
}
```

Accessing content via semantics:

```
function extractHeadlines( response ){
  var $html = document.createElement('div'),
      $headings, i=0, headlines=[];
  $html.innerHTML = response.contents;
  $headings = $html.querySelectorAll('#top-news')
    .querySelectorAll('article h1, article h2, article h3');
  heading_count = $headings.length;
  while (headlines.length < 3) {
    let $link = $headings[i].querySelector('a');
    if ($link && $link.href) {
      headlines.push({
        title: $headings[i].innerText.trim(),
        link: $link.href
      });
    }
    i++;
  }
  console.log( headlines );
}
```



TALKSTAPAK

More about semantics
for “headless” UIs

—and should—use HTML and ARIA to make our content structured, sensible, and most importantly, meaningful.

Conversational Semantics

by [Aaron Gustafson](#) · August 30, 2018

Published in [HTML](#), [Accessibility](#)

Customer support chat bots become the norm, we have to know our content looks but how it could sound. We can

Content, confined

Most bots and digital assistants work from specially-coded data sets, APIs, and models, but there are more than 4.5 billion pages of content on the web, trapped, in many cases, within our websites. Articles, stories, blog posts, educational materials, books, and marketing messages—all on the web, but in many cases unusable in a non-visual

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Developing Dependency Awareness

[Coding](#) 587 # [CSS](#) 243 # [JavaScript](#) 186 # [jQuery](#) 40

I'm sure you've heard the proverb, "A chain is only as strong as its weakest link," probably many times. Its written origin dates back to the 18th century, but I wouldn't be surprised if it was much, much older. And though the work we do has little to do with

Let's say you needed to code a button...



Sign Up

```
<input type="submit" value="Sign Up">
```

```
<button type="submit">Sign Up</button>
```

```
<a class="button" href="#">Sign Up</a>
```

```
<div class="button">Sign Up</div>
```

Let's compare

Pattern	Display	Semantics	Focusable?	Activate By	Submits Forms
input[type=submit]	button	button	Yes	Mouse, touch, ENTER, SPACE	Yes
button[type=submit]	button	button	Yes	Mouse, touch, ENTER, SPACE	Yes
a	link	Named generic	Yes	Mouse, touch, ENTER	No
div	block	Not exposed	No	N/A	No

UX gaps that need to be filled

Pattern	Display	Semantics	Focusable?	Activate By	Submits Forms
input[type=submit]	button	button	Yes	Mouse, touch, ENTER, SPACE	Yes
button[type=submit]	button	button	Yes	Mouse, touch, ENTER, SPACE	Yes
a	link	Named generic	Yes	Mouse, touch, ENTER	No
div	block	Not exposed	No	N/A	No

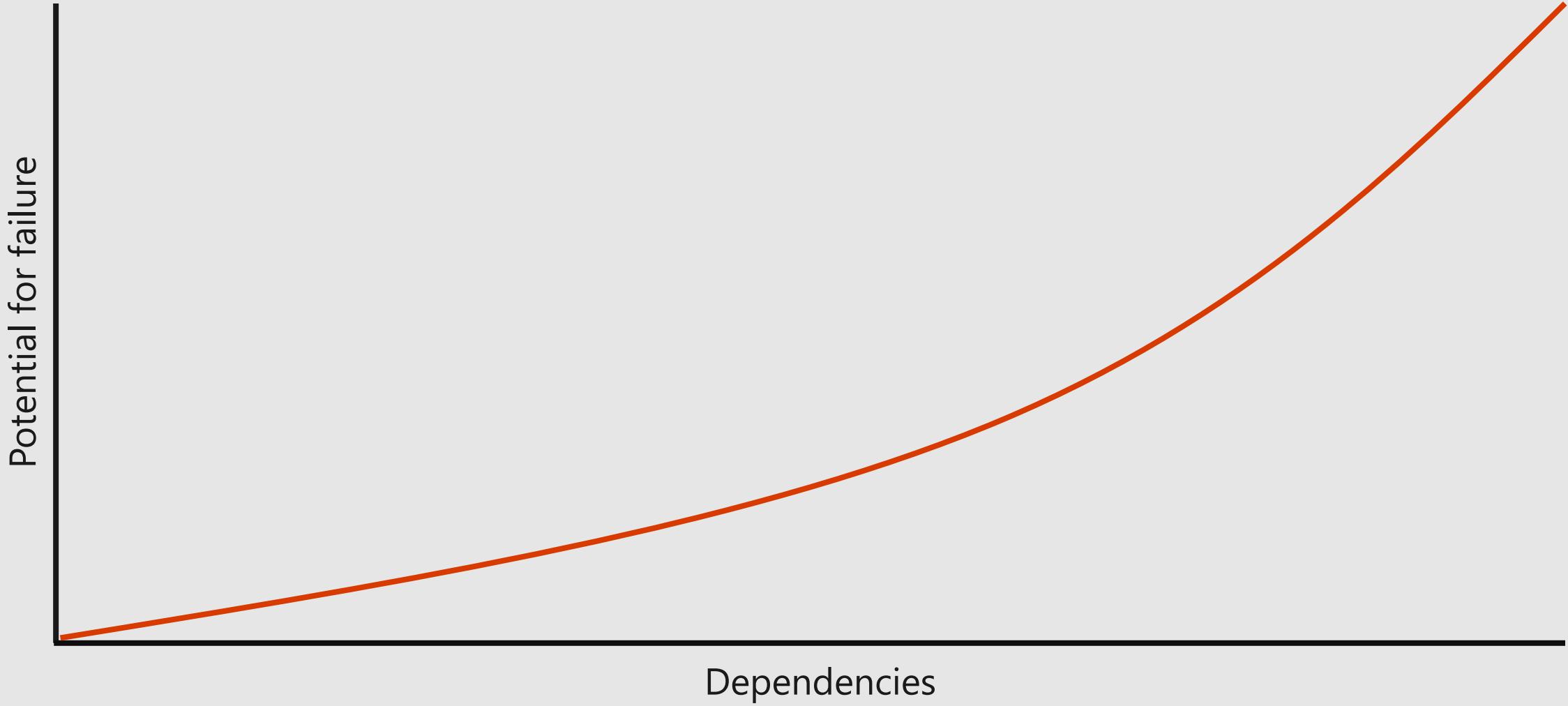
Filling those gaps introduces dependencies

Pattern	Display	Semantics	Focusable?	Activate By	Submits Forms
input[type=submit]	None	None	None	None	None
button[type=submit]	None	None	None	None	None
a	CSS	ARIA	None	JavaScript	JavaScript
div	CSS	ARIA	HTML	JavaScript	JavaScript

Filling those gaps introduces dependencies

Pattern	Display	Semantics	Focusable?	Activate By	Submits Forms
input[type=submit]	None	None	None	None	None
button[type=submit]	None	None	None	None	None
a	CSS	ARIA	None	JavaScript	JavaScript
div	CSS	ARIA	HTML	JavaScript	JavaScript

More dependencies, more (potential) problems



Disaster averted



Michael Spellacy
@Spellacy

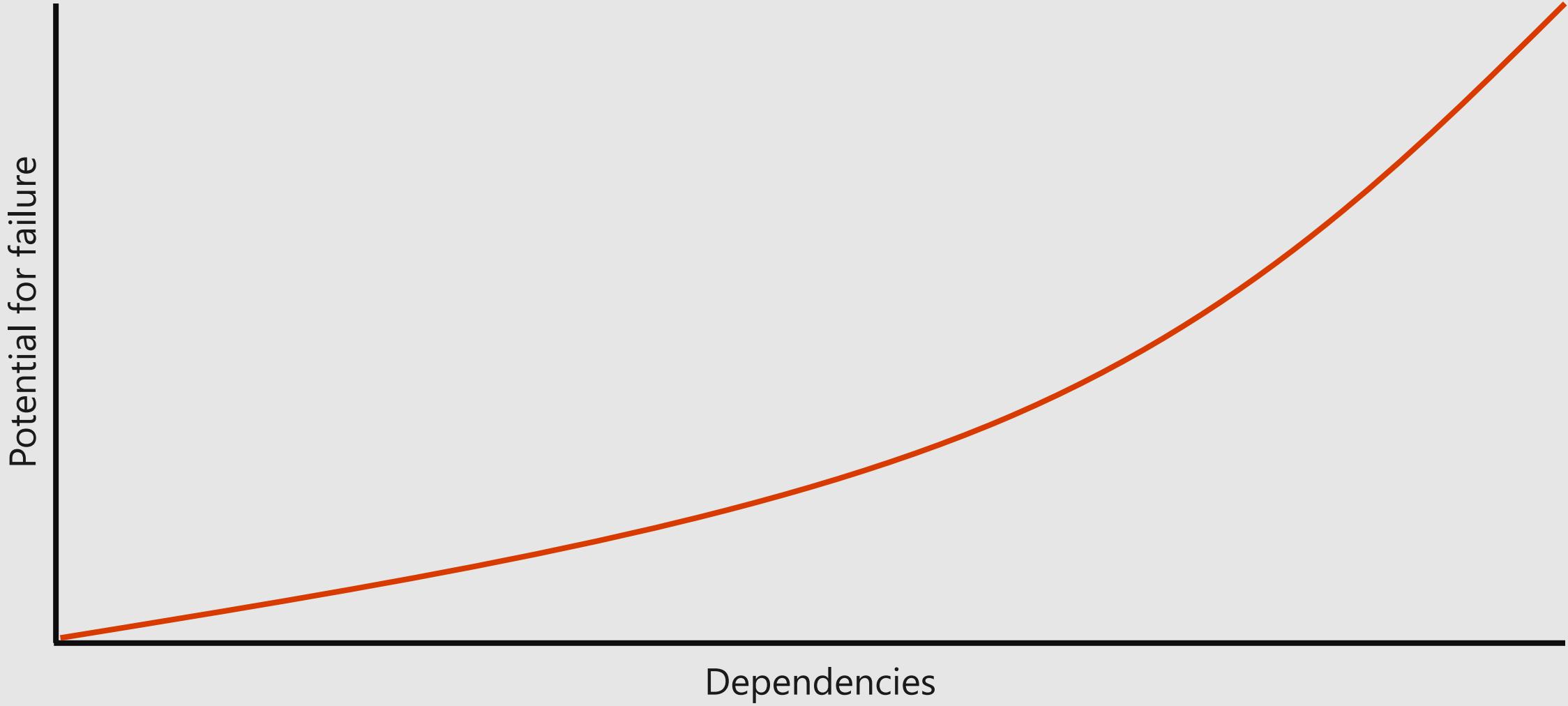
[Follow](#)



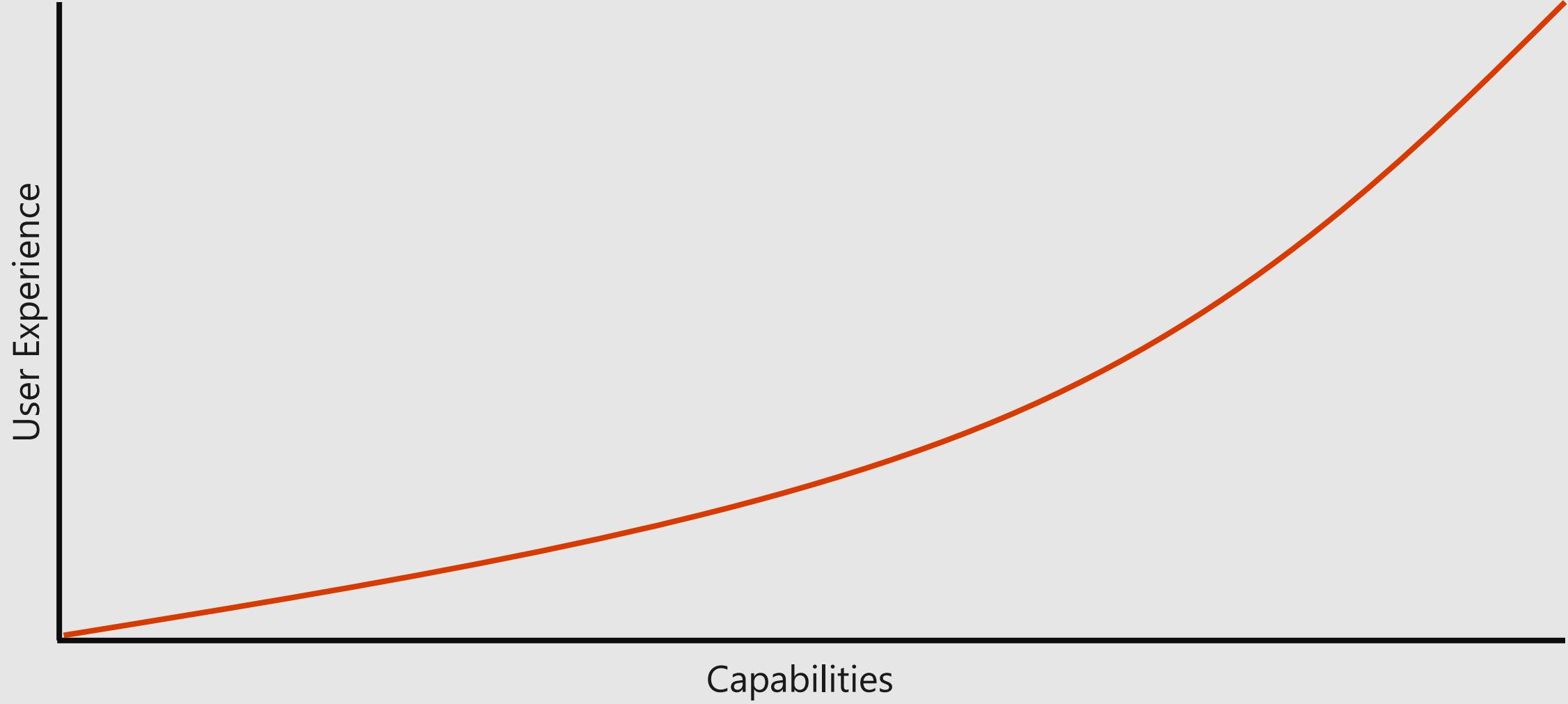
Do you think progressive enhancement is a waste of time? Think again! Chrome 66 just knocked out SSL on a CDN that hosted CSS and JS for 200 of my employer's sites and most of them still work with good ol' HTML!
@AaronGustafson would be proud! :-)

10:15 PM - 18 Apr 2018

More dependencies, more (potential) problems



Enhance the experience

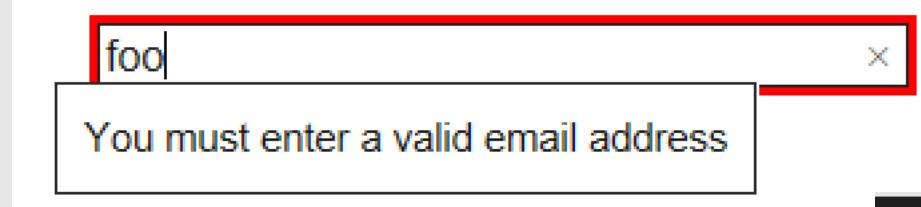


Enhancing UX with markup

```
<input type="email" name="email" id="email"  
      required aria-required="true">
```

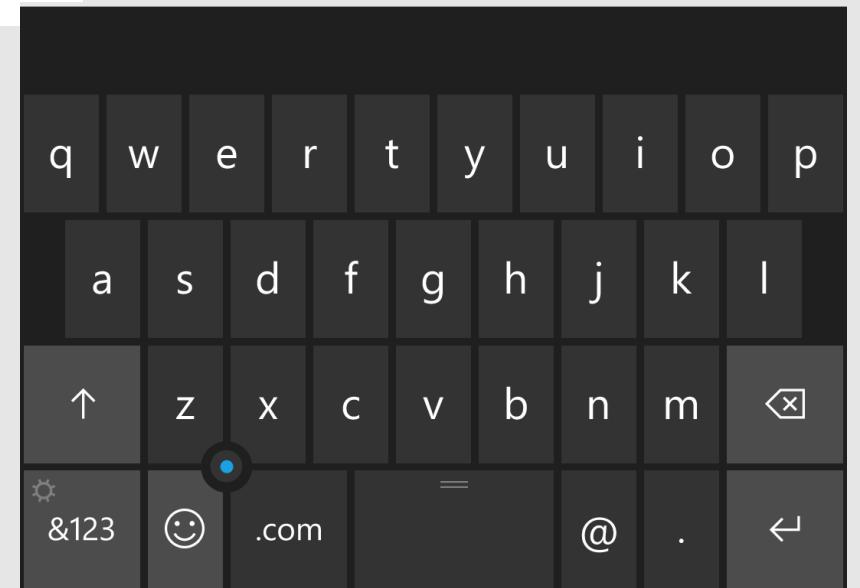
Enhancing UX with markup

```
<input type="email" name="email" id="email"  
required aria-required="true">
```



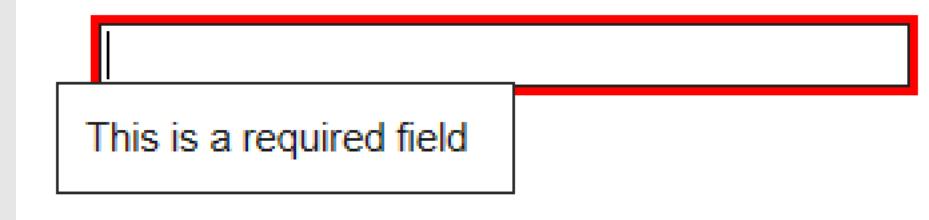
Experience deltas

1. Support for email input type?
2. Validation algorithm implemented?
3. Virtual keyboard?



Enhancing UX with markup

```
<input type="email" name="email" id="email"  
      required aria-required="true">
```



Experience deltas

1. Support for HTML validation?

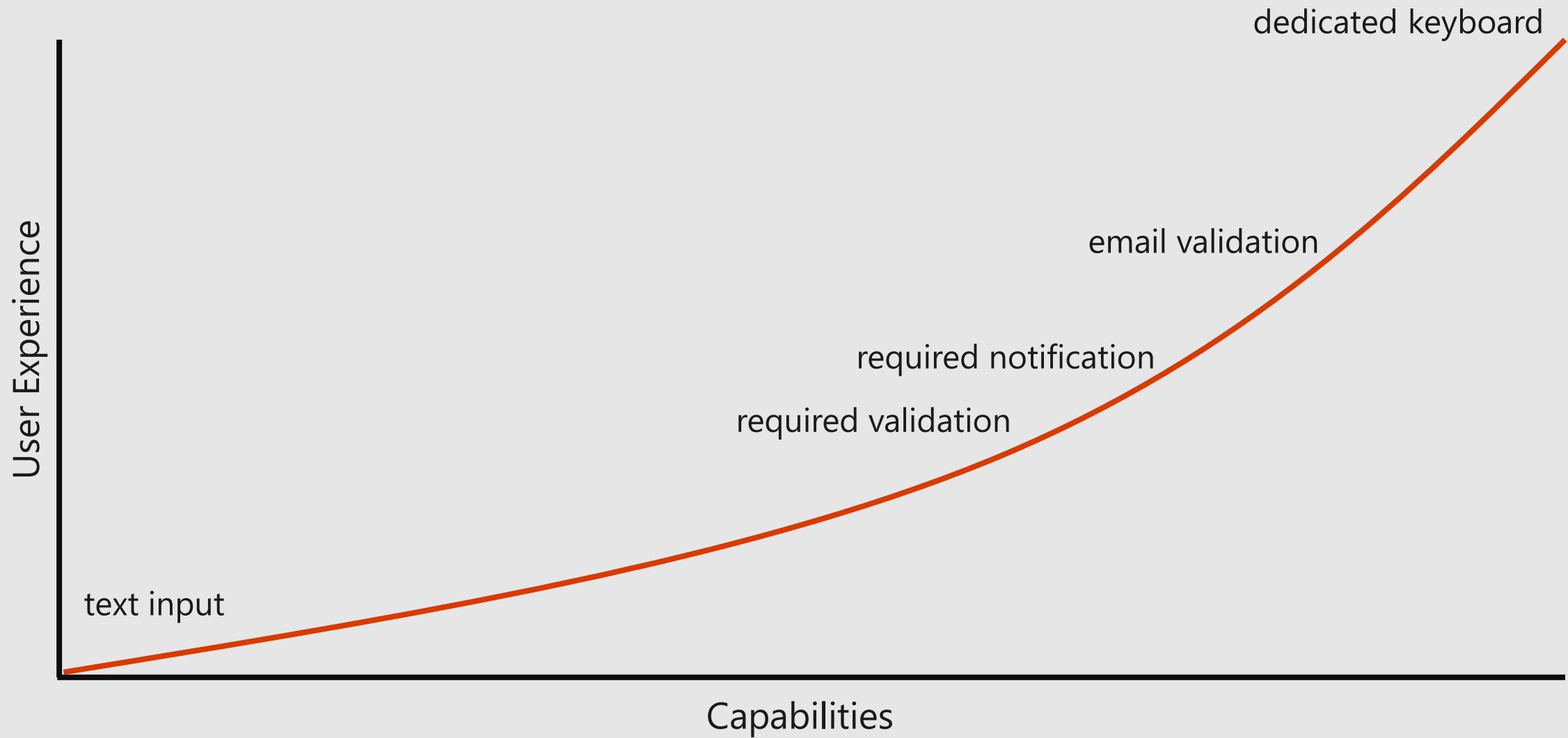
Enhancing UX with markup

```
<input type="email" name="email" id="email"  
      required aria-required="true">
```

Experience deltas

1. Browser exposure of `aria-required` property?
2. Assistive tech implementation of `aria-required`?

Enhance the experience



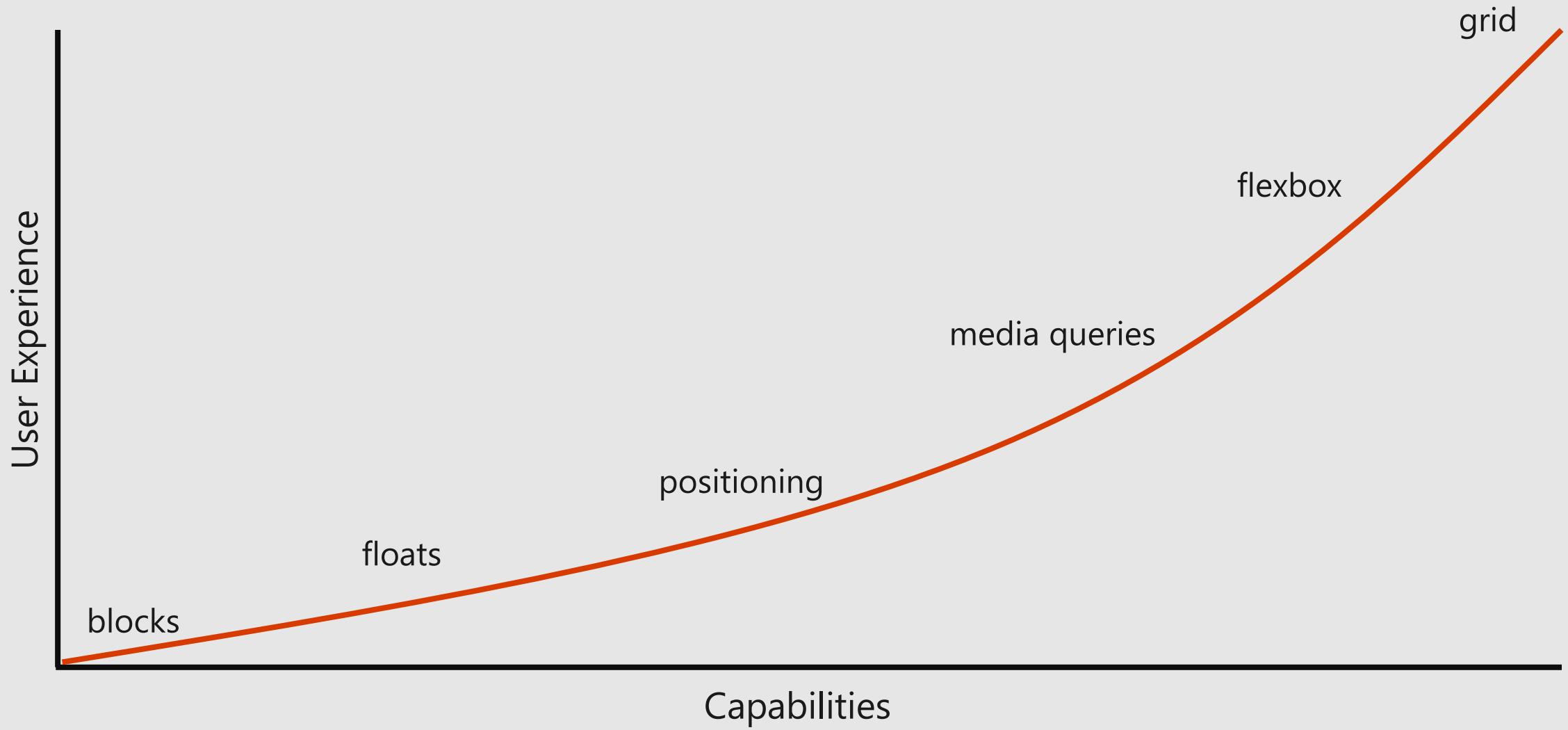


When you think of user experience as a continuum that scales with capabilities, a progressive approach to interfaces is both elegant and powerful.

Step 2
**Use markup that supports
the core experience**

A wide-angle night photograph of a waterfront town. In the foreground, the dark silhouette of a person's head and shoulders is turned towards the right, looking across a body of water at a row of brightly lit buildings. The buildings, which appear to be multi-story apartments or townhouses, have warm yellow and orange lights emanating from their windows and balconies. Some have arched doorways and windows. In the background, a massive, vibrant fireworks display dominates the sky, with numerous bright streaks of light radiating upwards against a dark blue night. The overall atmosphere is festive and scenic.

Enhance the experience



Enhance!



Basic, but ok!

ay!



Gridbyexample

Progressive Enhancement

Grid Garden

Progressive Enhancement Demo

Leverage the power of CSS Grid Layout!

Read [this article](#) for details on how to use CSS Grid Layout today.

I've been amazed at how often those outside the discipline of design assume that what designers do is decoration—likely because so much bad design simply is decoration.

Good design isn't.
Good design is problem solving.

— Jeff Veen



Tools for graphic design

- Alignment
- Balance
- Contrast
- Emphasis
- Gestalt
- Harmony
- Movement
- Proportion
- Proximity
- Repetition
- Rhythm
- Unity
- White Space

Alignment

The screenshot shows the Starbucks mobile application's "Order" screen. A vertical orange line on the left serves as a visual guide for alignment. A horizontal orange line spans across the middle of the screen, aligning with the center of the "DRINKS" section and the "FOOD" section below it.

Top Navigation: ORDER, CARDS, GIFT, STORES, three-dot menu icon.

Section Headers: Order, Menu (underlined), Previous, Favorites.

DRINKS Section: DRINKS, Hot Coffees (with image), Hot Teas (with image), Hot Drinks (with image), Frappuccino® Blended Beverages (with image), Cold Coffees (with image), Iced Teas (with image), Cold Drinks (with image).

FOOD Section: FOOD (with a dark overlay box containing a dropdown menu).

Bottom: For item availability, choose a store ▾, a smiling bag icon.

Contrast

Medium

MEMBER FEATURE STORY

Believing Women Means Believing Their Pain

A notoriously dangerous birth control device reveals the extent to which the medical establishment disbelieves women's pain



Sady Doyle [Follow](#)
Apr 16 · ★ 5 min read



Melissa Davis Gilbert with her husband before her surgery. She has used an Essure device for about 10 years, and her symptoms — pain, cramping, swelling — have gotten worse. In deciding to remove the device, she will have to get a hysterectomy. Photo by Katherine Frey/The New York Times

Proportion



Proximity



Create FREE Account

EMAIL

email@example.com

PASSWORD

Enter your password

- Minimum 8 Characters
- 1 Capital Letter
- 1 Lowercase Letter
- 1 Number

Create FREE Account

By clicking Create FREE Account, I have read and agreed to the terms and conditions

Rhythm

This is a header

Quis reprehenderit sint obcaecati reiciendis voluptas voluptate excepturi recusandae ab accusamus delenti facilis, illo placeat harum, iusto ratione. Ullam laborum voluptas et!

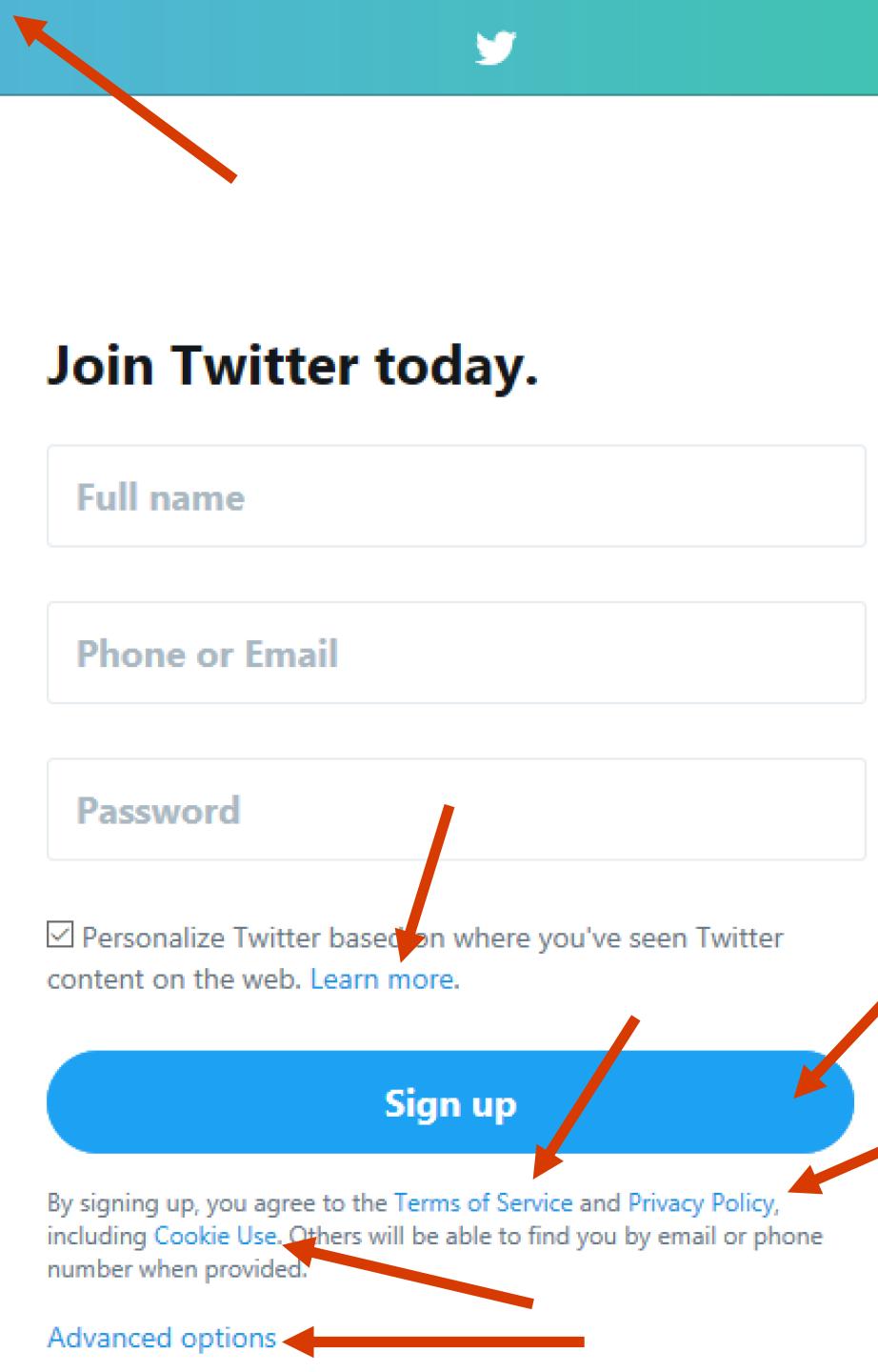
Quis reprehenderit sint obcaecati reiciendis voluptas voluptate excepturi recusandae ab accusamus deleniti facilis, illo placeat harum, iusto ratione. Ullam laborum voluptas et!

Quasi reprehenderit sint obcaecati reiciendis voluptas voluptate excepturi recusandae ab accusamus deleniti facilis, illo placeat harum, iusto ratione. Ullam laborum voluptas et!

This is a header

Quis reprehenderit sint obcaecati reiciendis voluptas voluptate excepturi recusandae ab accusamus deleniti facilis, illo placeat harum, iusto ratione. Ullam laborum voluptas et!

Unity



The image shows the Twitter sign-up page. At the top, there is a teal header with the Twitter logo. Below it, the text "Join Twitter today." is displayed. There are three input fields: "Full name", "Phone or Email", and "Password". Below these fields is a checkbox with the text "Personalize Twitter based on where you've seen Twitter content on the web. Learn more." To the right of the checkbox is a blue "Sign up" button. Below the button, a note states: "By signing up, you agree to the [Terms of Service](#) and [Privacy Policy](#), including [Cookie Use](#). Others will be able to find you by email or phone number when provided." At the bottom left, there is a link to "Advanced options". Red arrows from the Unity section point to the top arrow, the "Personalize" checkbox, the "Sign up" button, the note below it, and the "Advanced options" link.

Join Twitter today.

Full name

Phone or Email

Password

Personalize Twitter based on where you've seen Twitter content on the web. [Learn more](#).

Sign up

By signing up, you agree to the [Terms of Service](#) and [Privacy Policy](#), including [Cookie Use](#). Others will be able to find you by email or phone number when provided.

[Advanced options](#)

Design considerations unique to the web

- Screen size
- Resolution
- Brightness
- Color density
- User preference
- Network speed & quality
- Assistive technology

Design considerations unique to the web

- Screen size
 - Resolution
 - Brightness
 - Color density
 - User preference
 - Network speed & quality
 - Assistive technology
- ☞ Responsive layouts
 - ☞ SVG, responsive images
 - ☞ Contrast
 - ☞ Color choice, media queries
 - ☞ Responsive images, system fonts

Design considerations unique to the web

- Screen size
- Resolution
- Brightness
- Color density
- User preference
- Network speed & quality
- Assistive technology

Examples of user preference

- Larger or smaller fonts

```
@media (min-width: 32em) { ... }
```

- High contrast colors

```
@media (-ms-high-contrast: active) { ... }
```

```
@media (-ms-high-contrast: white-on-black) { ... }
```

```
@media (-ms-high-contrast: black-on-white) { ... }
```

- Reduced motion

```
@media screen and (prefers-reduced-motion: reduce) { ... }
```

Assistive technologies

- Vision
 - Screen magnifiers
 - Screen readers
 - Braille printers & refreshable braille displays
 - High contrast settings
- Motor/mobility
 - Speech recognition
 - Mouse settings
 - Keyboards & keyboard overlays
 - Eye tracking
- Hearing
 - Captions & subtitles

Don't rely on color
alone to convey
important information

Confirm

Cancel

Confirm

Cancel

Good contrast ensures your content is readable

contrast ratio

Background:

white 8.52

hsla(200, 0%, 0%, .7)

Text col

↔ Swap colors

How to use

As you type, the contrast ratio indicated will update.
Hover over the circle to get more detailed information.

When semi-transparent colors are involved as backgrounds, the contrast ratio will have an error margin, to account for the different colors they may be over.

This sample text attempts to visually demonstrate how readable this color combination is, for normal or **bold** text of various sizes and font styles.

Hint: Press the up and down keyboard arrows while over a number inside a functional color notation. Watch it increment/decrement. Try with the Shift or Alt key too!

By Lea Verou • WCAG 2.0 on contrast ratio

Explicit connections ensure everyone can follow references

Figure 3.3 shows the lodging article in Safari with only the default browser styles applied.

...

<figure id="figure-3-3">
...
</figure>

**Explicit connections
ensure everyone can
follow references**

Figure
3.3 shows the lodging
article in Safari with only the
default browser styles applied.

...

<figure id="figure-3-3">
...
</figure>

Registration

left-aligned

20px
4px

24px

Toggle Switch

Off

Toggle Switch

20px
15px
32px
34px

Slider

70px

Rating

80px

70px

Rating

80px

80px

34px
20px
4px24px
20px
4px

80px

32px
24px
20px
4px

80px

Microsoft

Copyright © Microsoft Corporation. All rights reserved.

Provide ample space around interactive elements

[Finish Reading](#)

Consider what
your design
leaves unsaid

Consider what
your design
leaves unsaid

```
<a href="#">  
  <b class="hidden">You can</b>  
  finish reading  
  <b class="hidden">“The Web  
  Should Just Work for  
  Everyone” in less than  
  10 minutes</b>  
</a>
```

Consider what
your design
leaves unsaid

```
<a href="#">  
  <b class="hidden">You can</b>  
  finish reading  
  <b class="hidden">“The Web  
  Should Just Work for  
  Everyone” in less than  
  10 minutes</b>  
</a>
```

Consider what
your design
leaves unsaid

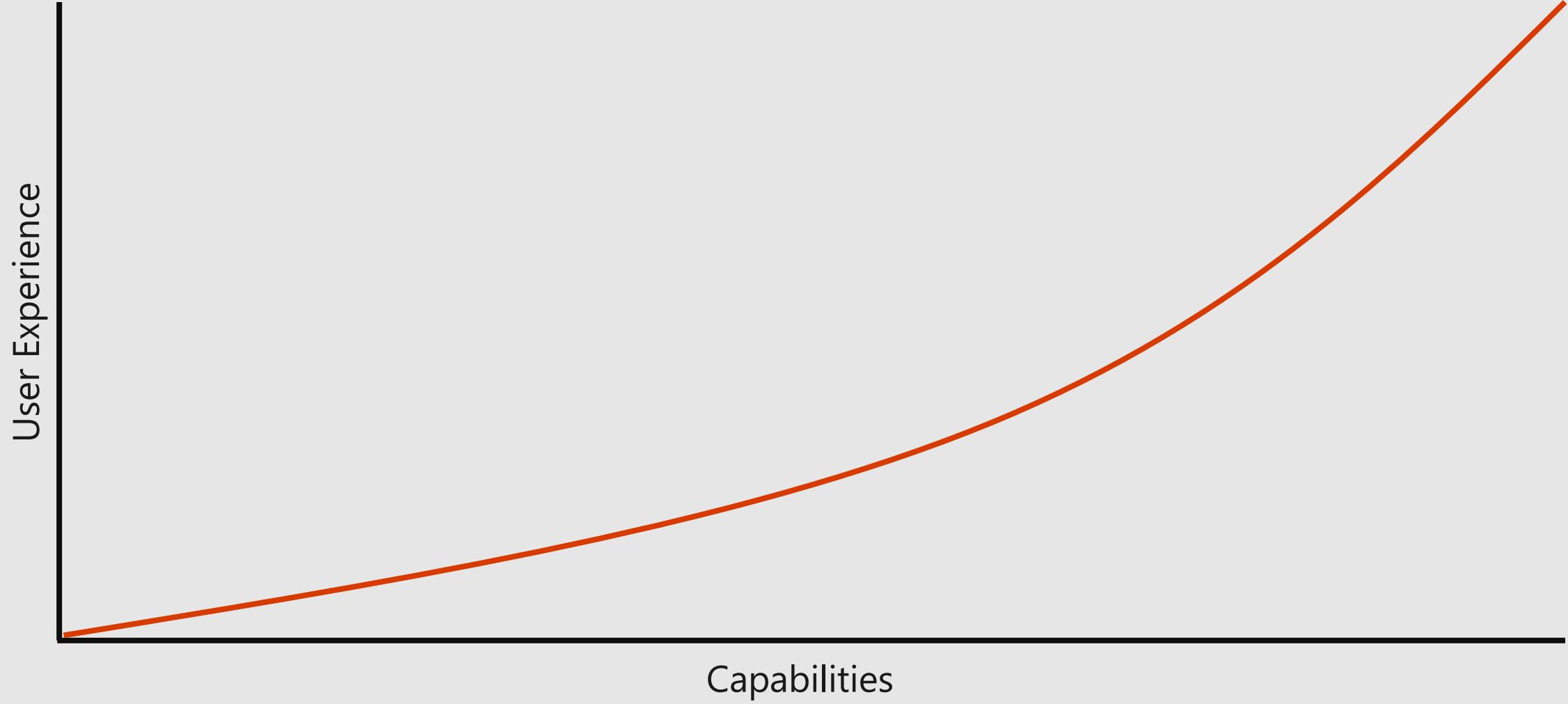
<a href="#"
aria-label="You can
finish reading “The Web
Should Just Work for
Everyone” in less than
10 minutes"
>Finish Reading

Consider what your design leaves unsaid

<a href="#"
aria-label="You can
finish reading “The Web
Should Just Work for
Everyone” in less than
10 minutes"

>Finish Reading

Enhance the experience



Enhancing design in CSS

```
p {  
  color: green;  
  color: rgba(0, 255, 0, .8);  
}
```

Passwords can be a hassle. Most people don't create strong passwords or make sure to maintain a different one for every site. People create easy-to-remember passwords and typically use the same passwords across all of their accounts.

Enhancing design in CSS

```
p {  
  color: green;  
  color: rgba(0, 255, 0, .8);  
}
```

Passwords can be a hassle. Most people don't create strong passwords or make sure to maintain a different one for every site. People create easy-to-remember passwords and typically use the same passwords across all of their accounts.

Older browsers without RGBa support, ignore the second rule

Enhancing design in CSS

```
p {  
  color: green;  
  color: rgba(0, 255, 0, .8);  
}
```

Passwords can be a hassle. Most people don't create strong passwords or make sure to maintain a different one for every site. People create easy-to-remember passwords and typically use the same passwords across all of their accounts.

Modern browsers with RGBa support, overwrite the first rule

Enhancing design in CSS

```
h1:has(+ p) {  
  color: green;  
}
```

**Passwords can be
a hassle**

(That selects h1s that have adjacent sibling paragraphs.)

Enhancing design in CSS

```
h1:has(+ p) {  
    color: green;  
}
```

**Passwords can be
a hassle**

Browsers that don't support :has() ignore the entire rule set

Enhancing design in CSS

```
h1:has(+ p) {  
  color: green;  
}
```

**Passwords can be
a hassle**

As browsers support :has(), matching h1s will turn green

Enhancing design in CSS

```
@media only screen {  
  p {  
    color: green;  
  }  
}
```

Passwords can be a hassle. Most people don't create strong passwords or make sure to maintain a different one for every site. People create easy-to-remember passwords and typically use the same passwords across all of their accounts.

Enhancing design in CSS

```
@media only screen {  
  p {  
    color: green;  
  }  
}
```

Passwords can be a hassle. Most people don't create strong passwords or make sure to maintain a different one for every site. People create easy-to-remember passwords and typically use the same passwords across all of their accounts.

Browsers without media query support ignore the block

Enhancing design in CSS

```
@media only screen {  
  p {  
    color: green;  
  }  
}
```

Passwords can be a hassle. Most people don't create strong passwords or make sure to maintain a different one for every site. People create easy-to-remember passwords and typically use the same passwords across all of their accounts.

Browsers with media query support apply it

Enhancing design in CSS

```
@supports (display: grid) {  
  p {  
    color: green;  
  }  
}
```

Passwords can be a hassle. Most people don't create strong passwords or make sure to maintain a different one for every site. People create easy-to-remember passwords and typically use the same passwords across all of their accounts.

Enhancing design in CSS

```
@supports (display: grid) {  
  p {  
    color: green;  
  }  
}
```

Passwords can be a hassle. Most people don't create strong passwords or make sure to maintain a different one for every site. People create easy-to-remember passwords and typically use the same passwords across all of their accounts.

Browsers that don't grok @supports ignore the block

Enhancing design in CSS

```
@supports (display: grid) {  
  p {  
    color: green;  
  }  
}
```

Passwords can be a hassle. Most people don't create strong passwords or make sure to maintain a different one for every site. People create easy-to-remember passwords and typically use the same passwords across all of their accounts.

Browsers that understand @supports, but don't display grid ignore it

Enhancing design in CSS

```
@supports (display: grid) {  
  p {  
    color: green;  
  }  
}
```

Passwords can be a hassle. Most people don't create strong passwords or make sure to maintain a different one for every site. People create easy-to-remember passwords and typically use the same passwords across all of their accounts.

Browsers that understand @supports and grid apply it

A wide-angle photograph of a waterfront town at night. In the foreground, the dark silhouettes of two people are visible, facing the town across a body of water. The town features multi-story buildings with warm, glowing windows and illuminated storefronts. A large, vibrant fireworks display dominates the upper right portion of the sky, with numerous bright, branching sparks against a dark background.

When it comes to HTML & CSS,
browsers ignore what they don't understand



When it comes to HTML & CSS,
browsers ignore what they don't understand

And new specs smartly override conflicting
syntax

Enhance!



Basic, but ok!

ay!



Gridbyexample

Progressive Enhancement

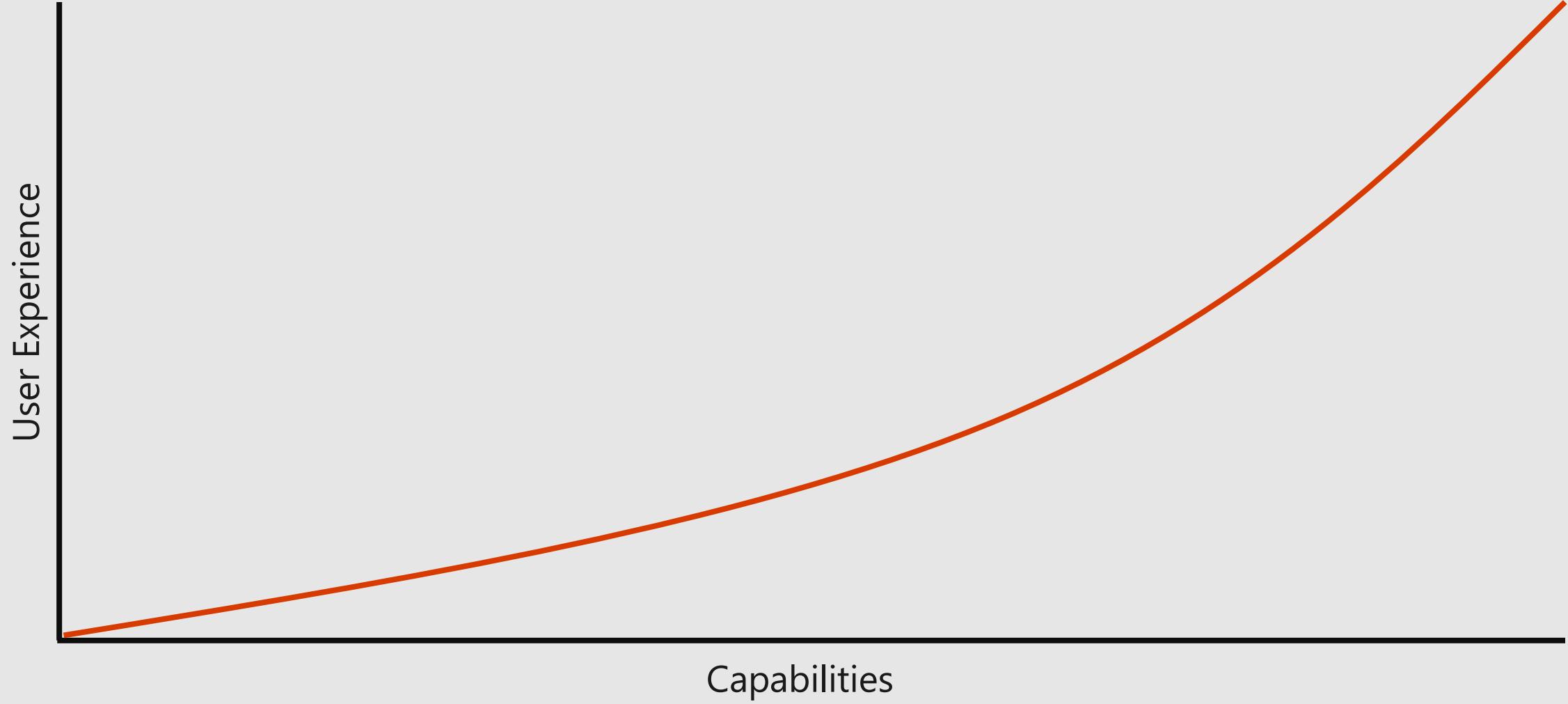
Grid Garden

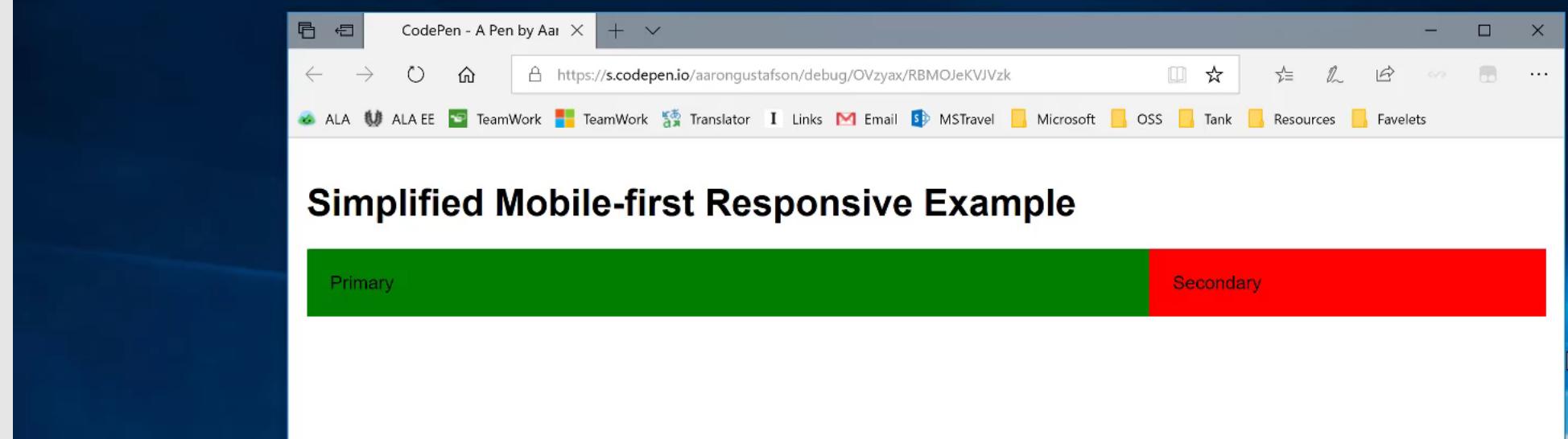
Progressive Enhancement Demo

Leverage the power of CSS Grid Layout!

Read [this article](#) for details on how to use CSS Grid Layout today.

Enhance the experience





"Mobile first" design



Recycle Bin

“Desktop first”

```
.primary {  
    float: left;  
    width: 68%;  
}  
.secondary {  
    float: right;  
    width: 32%;  
}  
@media (max-width:599px) {  
    .primary, .secondary {  
        float: none;  
        width: auto;  
    }  
}
```

“Desktop first”

```
.primary {  
    float: left;  
    width: 68%;  
}  
.secondary {  
    float: right;  
    width: 32%;  
}  
  
@media (max-width:599px) {  
    .primary, .secondary {  
        float: none;  
        width: auto;  
    }  
}
```

“Desktop first”

```
.primary {  
    float: left;  
    width: 68%;  
}  
.secondary {  
    float: right;  
    width: 32%;  
}  
@media (max-width:599px) {  
    .primary, .secondary {  
        float: none;  
        width: auto;  
    }  
}
```

“Mobile first”

```
@media (min-width:600px) {  
    .primary {  
        float: left;  
        width: 68%;  
    }  
    .secondary {  
        float: right;  
        width: 32%;  
    }  
}
```

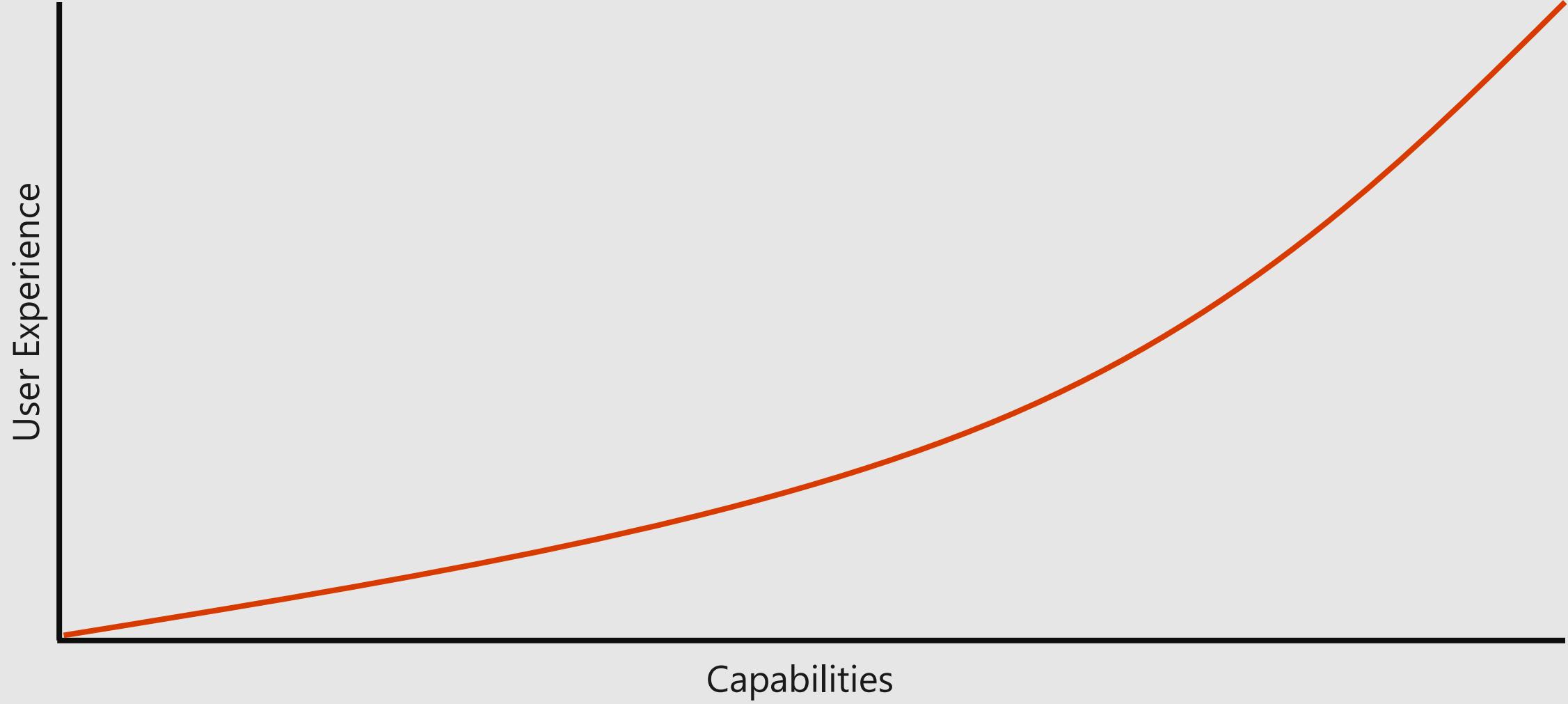
“Mobile first”

```
@media (min-width:600px) {  
    .primary {  
        float: left;  
        width: 68%;  
    }  
    .secondary {  
        float: right;  
        width: 32%;  
    }  
}
```

Other ways to design “mobile first”

- Selectively deliver advanced styles
- Isolate large CSS images in min-width media queries
- Don't hide content images using CSS
- Use responsive images
- Prefer system fonts
- `font-display: optional`

Enhance the experience



The background image shows a roller coaster track made of dark steel beams winding its way through a massive, rugged mountain. The mountain is covered in reddish-brown rock with patches of white snow or ice clinging to its ledges. The sky above is a vibrant, clear blue with a few wispy white clouds.

Step 4

Improve the core experience with JavaScript



When it comes to HTML & CSS,
browsers ignore what they
don't understand

Sadly, that's not the case with
JavaScript

What happens when a browser doesn't let?

```
document.body.innerHTML += '<p>Can I count to four?</p>';
```

```
for ( let i=1; i<=4; i++ )  
{  
  document.body.innerHTML += '<p>' + i + '</p>';  
}
```

```
document.body.innerHTML += '<p>Success!</p>';
```

What happens when a browser doesn't let?

```
document.body.innerHTML += '<p>Can I count to four?</p>';

for ( let i=1; i<=4; i++ )
{
  document.body.innerHTML += '<p>' + i + '</p>';
}

document.body.innerHTML += '<p>Success!</p>';
```

Does your browser support `let`?

If it does, you should see some numbers in paragraphs, followed by a success message.

Can I count to four?

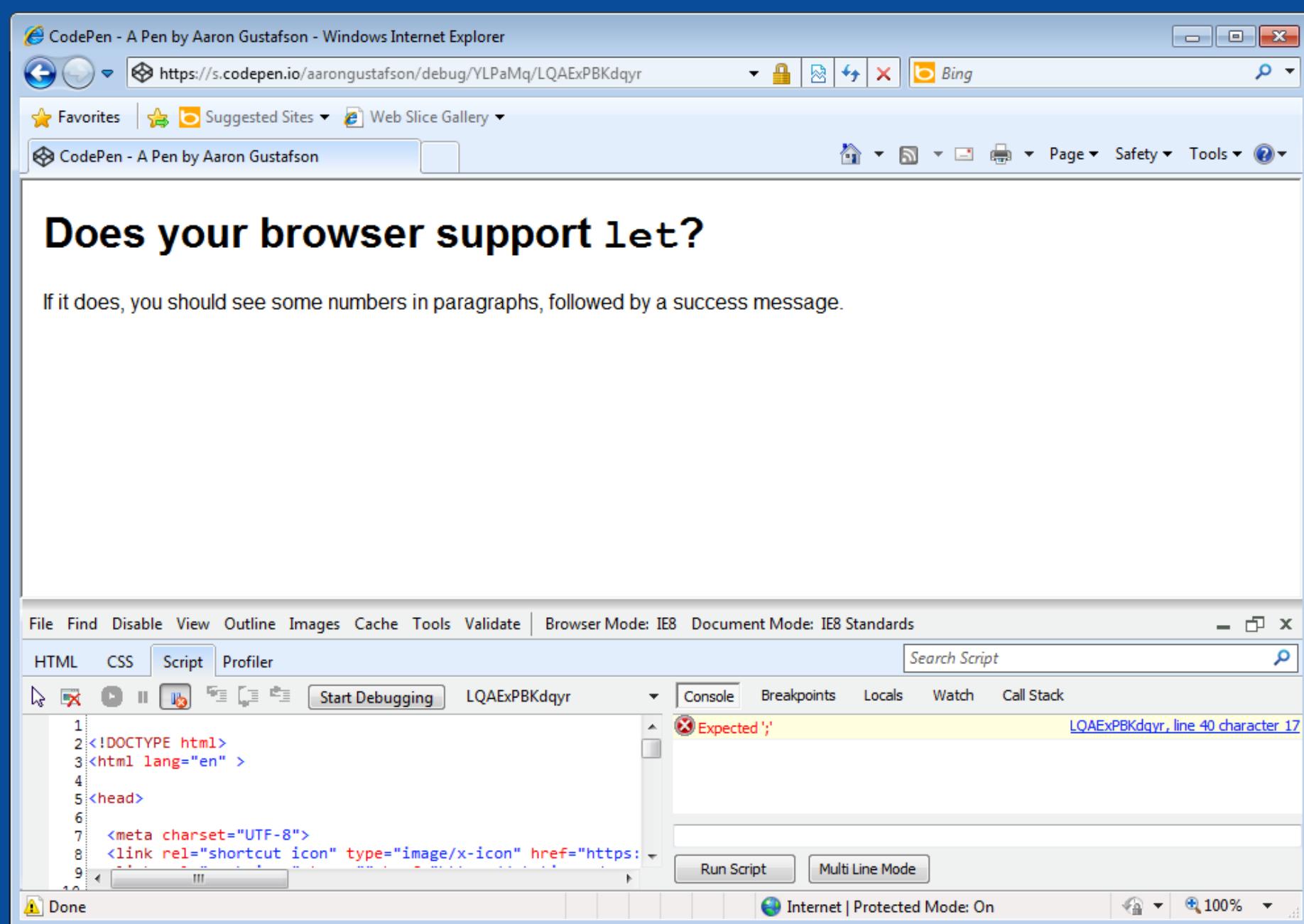
1

2

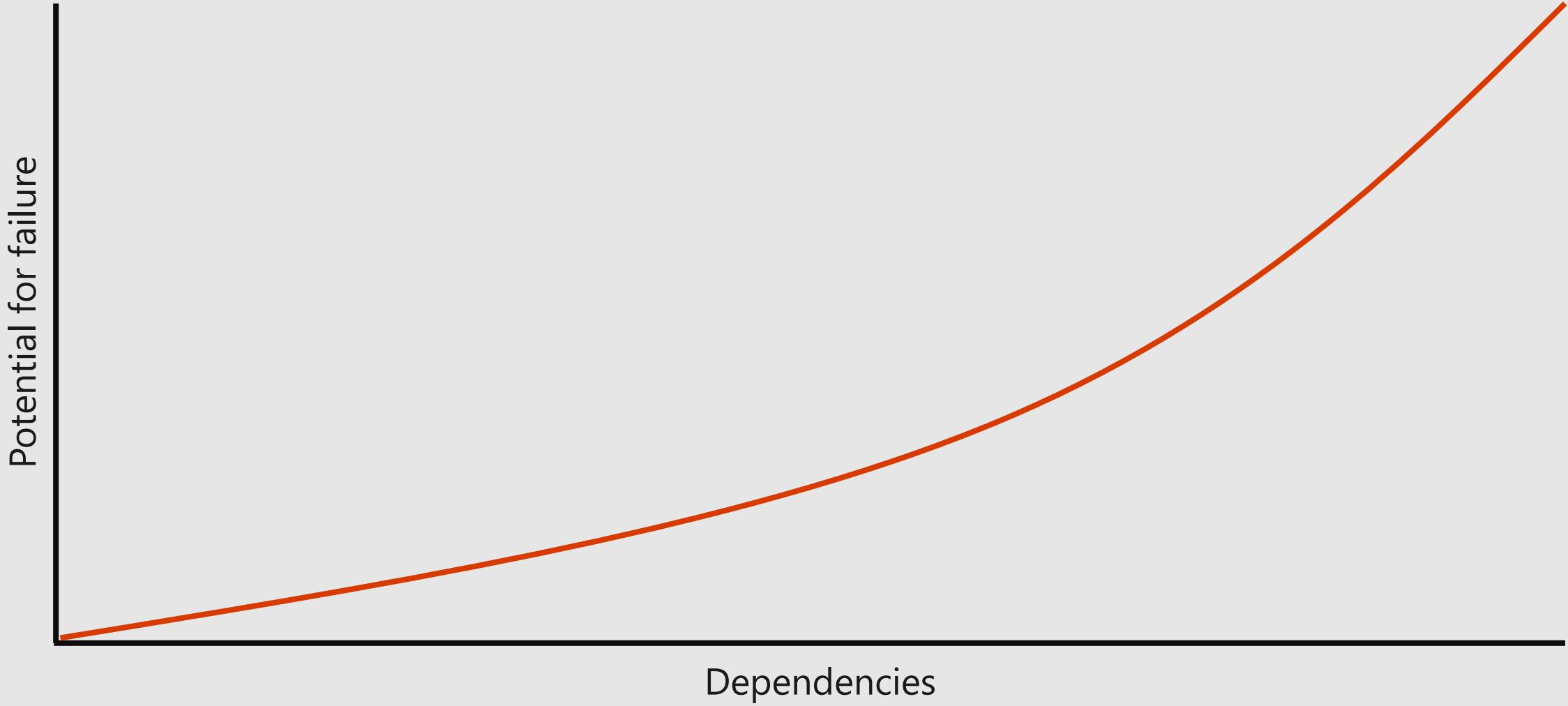
3

4

Success!



More dependencies, more (potential) problems



Removing jQuery from GitHub.com frontend



mislav



koddsson



muan



keithamus



September 06, 2018

We have recently completed a milestone where we were able to drop jQuery as a dependency of the frontend code for GitHub.com. This marks the end of a gradual, years-long transition of increasingly decoupling from jQuery until we were able to completely remove the library. In this post, we will explain a bit of history of how we started depending on jQuery in the first place, how we realized when it was no longer needed, and point out that—instead of replacing it with another library or framework—we were able to achieve everything that we needed using standard browser APIs.

Why jQuery made sense early on

GitHub.com pulled in [jQuery 1.2.1](#) as a dependency in late 2007. For a bit of context, that was a year before Google released the first version of their Chrome browser. There was no standard way to query DOM elements by a CSS selector, no standard way to animate visual styles of an element, and the [XMLHttpRequest interface](#) pioneered by Internet

Removing jQuery from GitHub.com

frontend

As part of our refined approach to building frontend features on GitHub.com, we focused on getting away with regular HTML foundation as much as we could, and only adding JavaScript behaviors as progressive enhancement. As a result, even those web forms and other UI elements that were enhanced using JS would usually also work with JavaScript disabled in the browser.

Why jQuery made sense early on

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Removing jQuery from GitHub.com

As part of our refined approach to building frontend features on GitHub.com, we focused on getting away with regular HTML foundation as much as we could, and only adding JavaScript behaviors as progressive enhancement. As a result, even those web forms and other UI elements that were enhanced using JS would usually also work with JavaScript disabled in the browser.

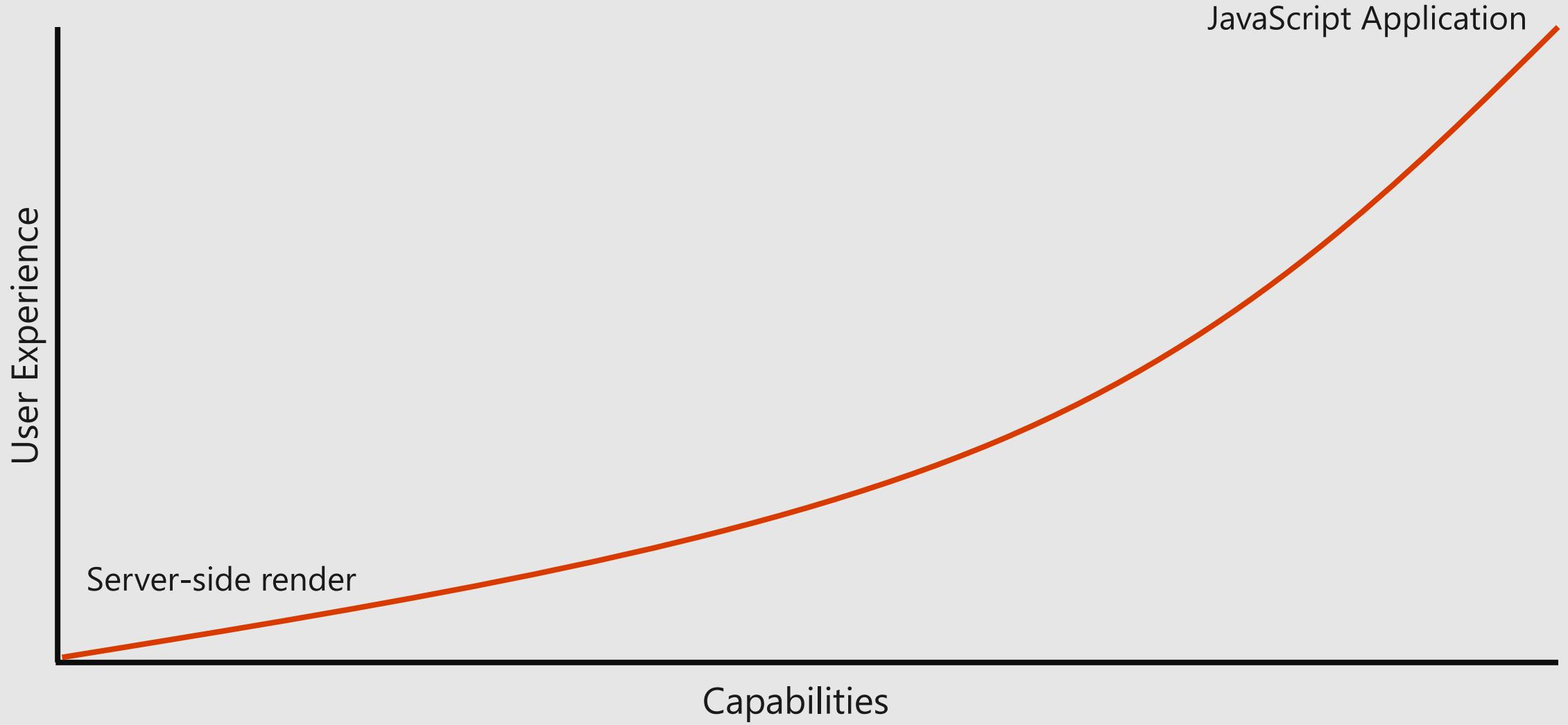
Why jQuery made sense early on

GitHub.com pulled in [jQuery 1.2.1](#) as a dependency in late 2007. For a bit of context, that was a year before Google released the first version of their Chrome browser. There was no standard way to query DOM elements by a CSS selector, no standard way to animate visual styles of an element, and the [XMLHttpRequest interface](#) pioneered by Internet

The background image shows a roller coaster track made of dark steel beams winding its way through large, reddish-brown rock formations. The sky above is a vibrant blue with some white, wispy clouds. A black rectangular box is positioned in the upper left area of the image, containing the text.

We can and should use JavaScript,
but thoughtfully & intentionally

Enhance the experience



Detecting support

```
if ( navigator.credentials ) {  
    // Actual logic goes here  
}
```

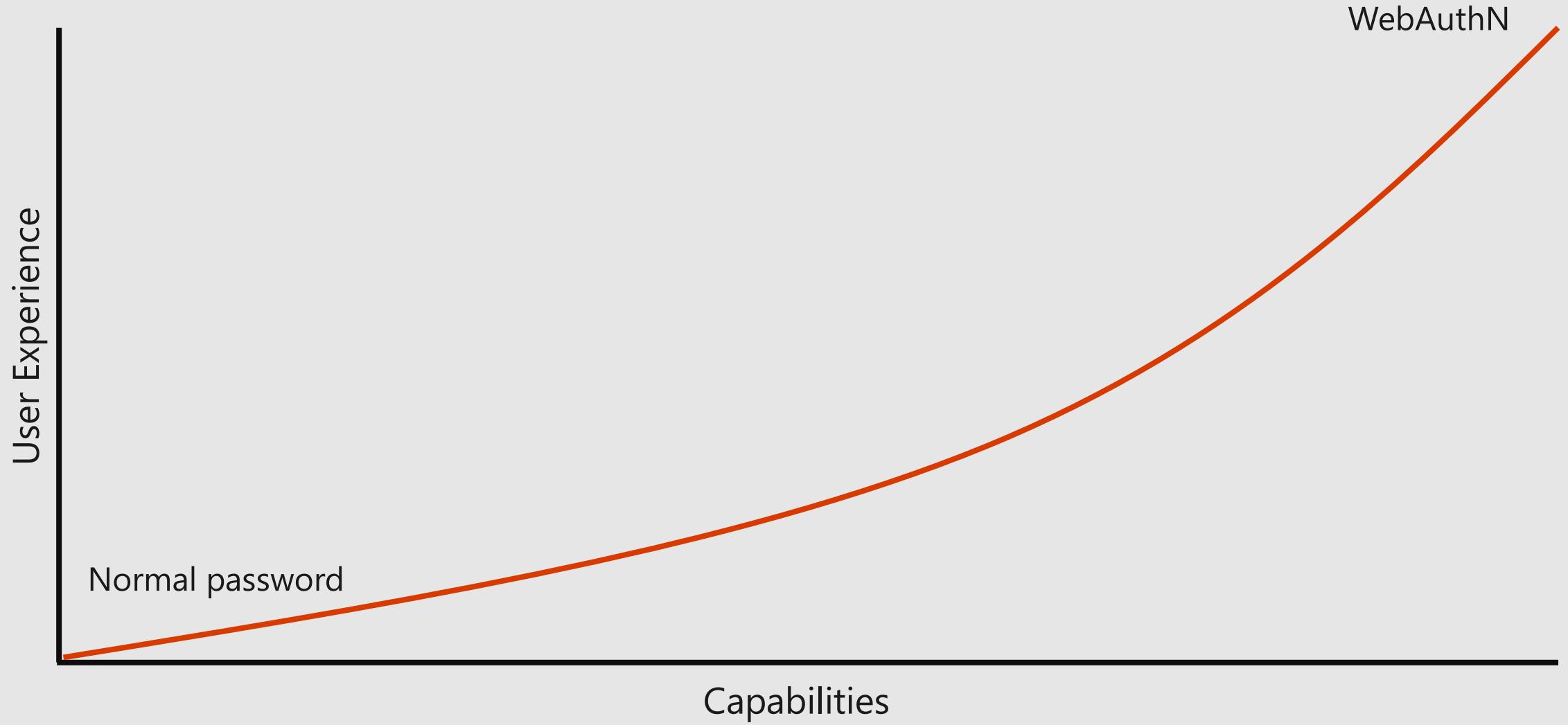
Creating the credential

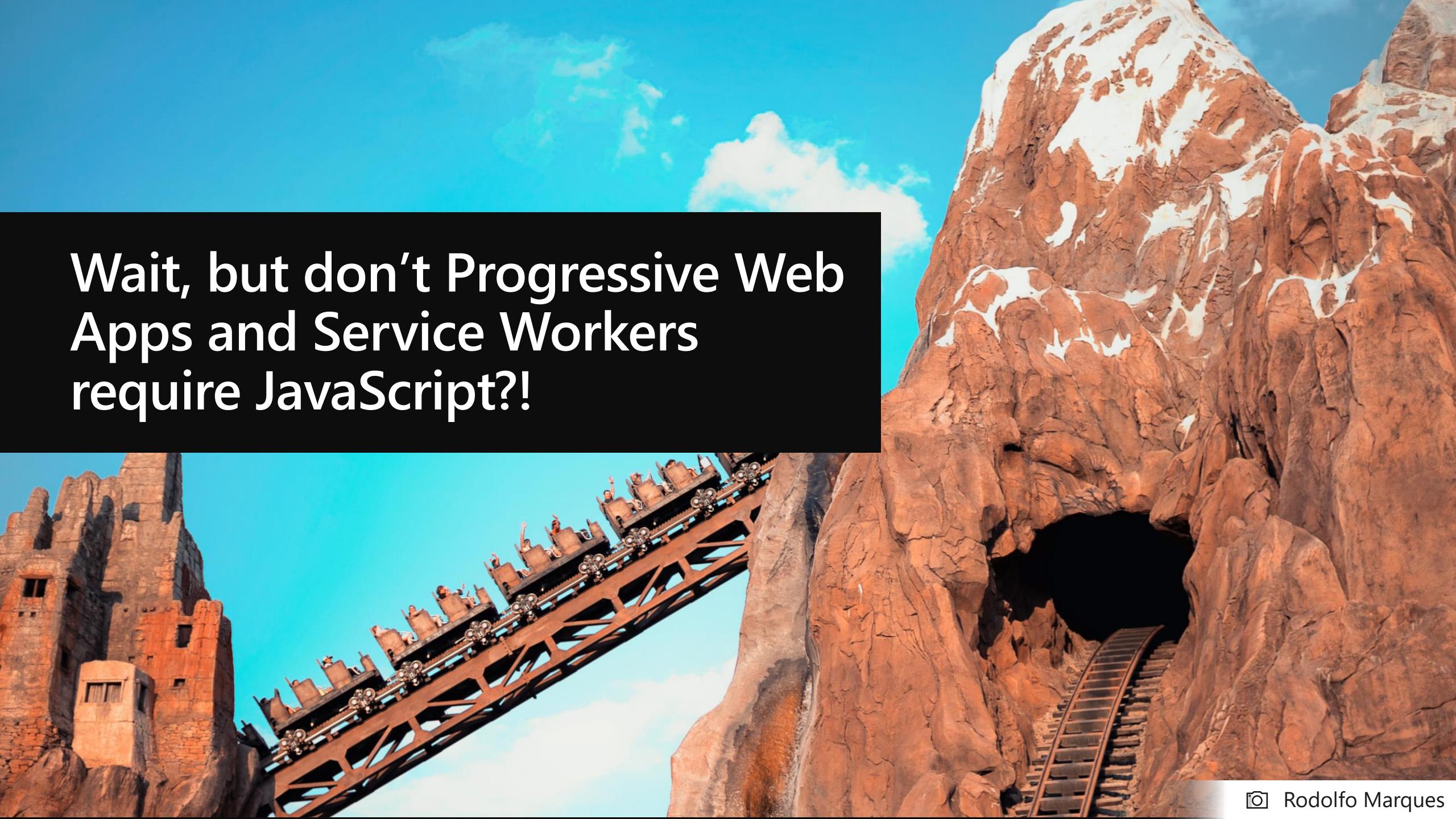
```
// Create a credential with WebAuthn APIs
navigator.credentials.create({
  publicKey: {
    rp: { /* relying party info */ },
    user: { /* user info */ },
    authenticatorSelection: {
      authenticatorAttachment: "platform"
    },
    pubKeyCredParams: [
      type: "public-key",
      alg: -257 /* Accept RS256 credentials */
    ],
    // and other required parameters such as challenge, timeout, ...
  }
}).then(attestation => {
  // Send the credential to your server, which decodes it and stores the public key
  sendToServer(attestation);
});
```

Verifying the credential later

```
// Next time the user visits the page, call the WebAuthn APIs
navigator.credentials.get({
  publicKey: {
    allowCredentials: [{
      type: "public-key",
      id: credentialId // ID of credential(s) previously created
    }]
    // and other required parameters such as challenge, timeout, ...
  }
}).then(assertion => {
  // Send the assertion to your server, which decodes it and ensures the
  // contained signature matches the public key received at credential creation
  sendToServer(assertion);
});
```

Enhance the experience





Wait, but don't Progressive Web Apps and Service Workers require JavaScript?!

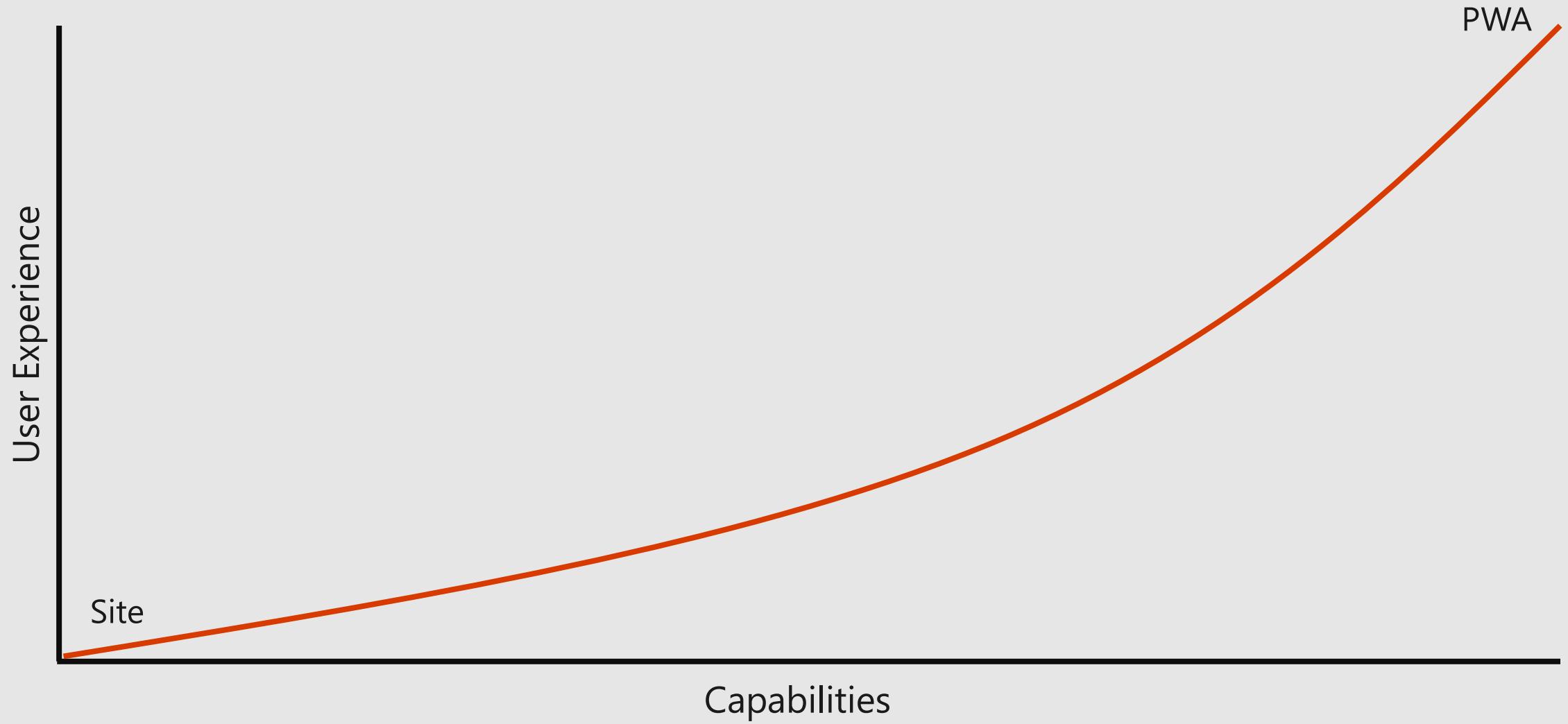
Registering a Service Worker

```
if ( navigator.serviceWorker ) {
  navigator.serviceWorker.register('/serviceworker.js')
    .then(function(registration) {
      console.log('Success!', registration.scope);
    })
    .catch(function(error) {
      console.error('Failure!', error);
    });
}
```

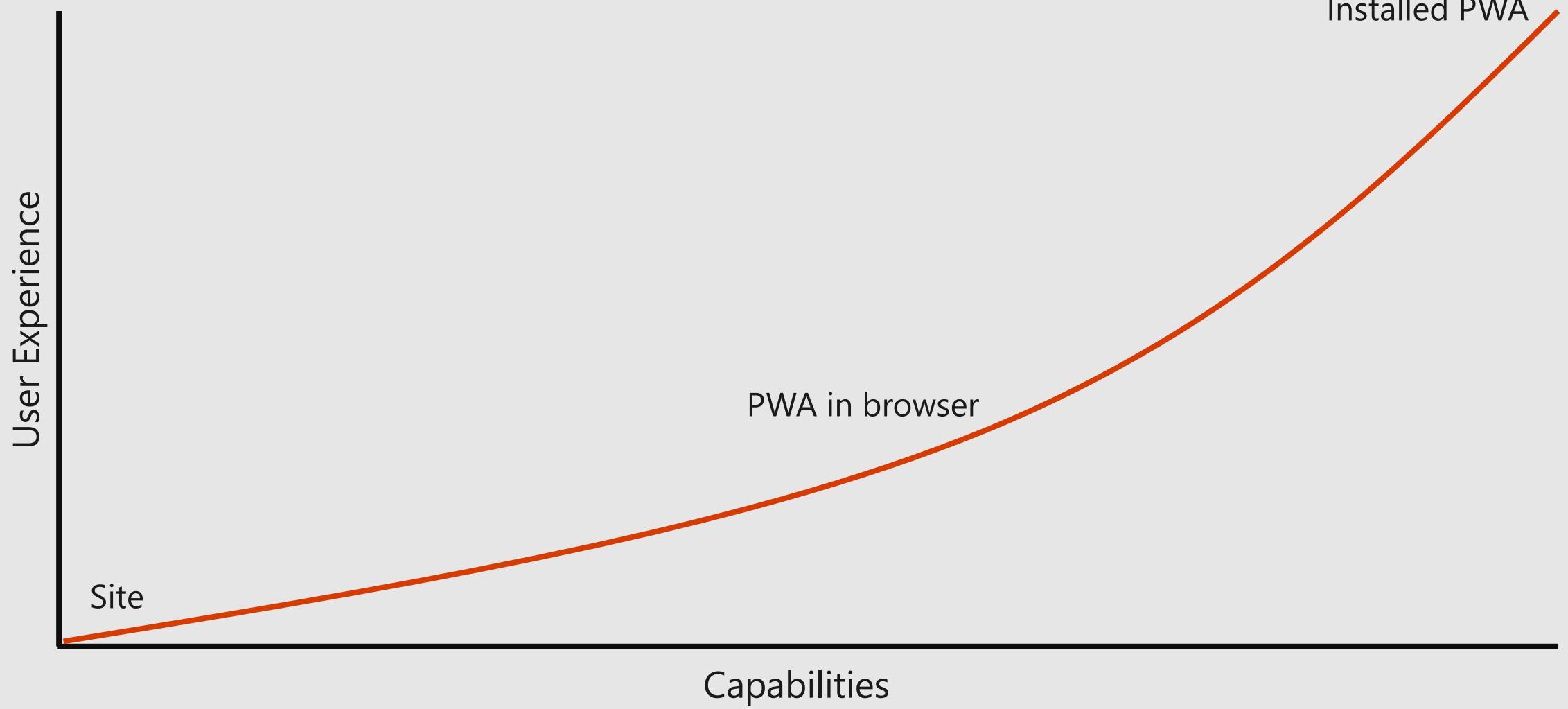
Object detection FTW!

```
if ( navigator.serviceWorker ) {  
  navigator.serviceWorker.register('/serviceworker.js')  
    .then(function(registration) {  
      console.log('Success!', registration.scope);  
    })  
    .catch(function(error) {  
      console.error('Failure!', error);  
    });  
}
```

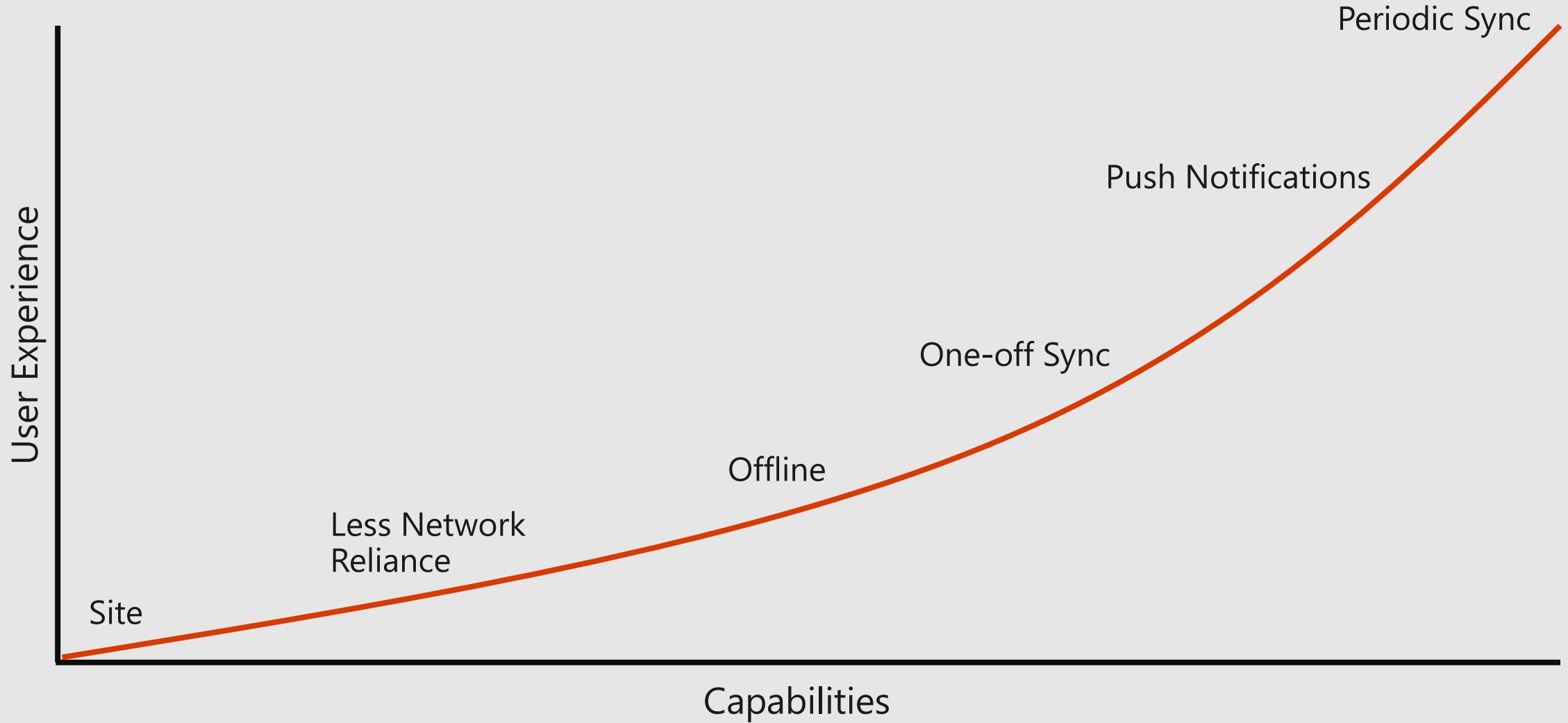
Enhance the experience



Enhance the experience



Enhance the Service Worker



Windows Settings

Find a setting 



System

Display, sound, notifications,
power



Devices

Bluetooth, printers, mouse



Phone

Link your Android, iPhone



Accounts

Your accounts, email, sync,
work, other people



Personalization

Background, lock screen, colors



Apps

Uninstall, defaults, optional
features



Ease of Access

Narrator, magnifier, high
contrast



Time & Language

Speech, region, date



Gaming

Game bar, DVR, broadcasting,
Game Mode



Update & Security

Windows Update, recovery,
backup



Cortana

Cortana language, permissions,
notifications



Privacy

Location, camera

Did you know PWAs can enhance via native APIs?

Detecting “dark mode”

```
if (window.Windows) {
    var uiSettings = new Windows.UI
        .ViewManagement
        .UISettings();
    var color = uiSettings
        .getColorValue(
            Windows.UI
                .ViewManagement
                .UIColorType
                .background
        );
    if (color.r == 0 && color.g == 0
        && color.b == 0) {
        // changes for Dark Mode
    }
}
```

```
if (window.Windows) {  
    var uiSettings = new Windows.UI  
        .ViewManagement  
        .UISettings();  
  
    var color = uiSettings  
        .getColorValue(  
            Windows.UI  
            .ViewManagement  
            .UIColorType  
            .background  
        );  
    if (color.r == 0 && color.g == 0  
        && color.b == 0) {  
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    }  
}
```

Detecting “dark mode”

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            Windows.UI  
            .ViewManagement  
            .UIColorType  
            .background  
        );  
    if (color.r == 0 && color.g == 0  
        && color.b == 0) {  
        // changes for Dark Mode  
    }  
}
```

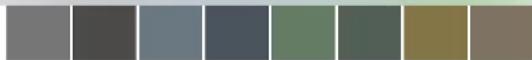
Detecting “dark mode”

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if (window.Windows) {  
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    var color = uiSettings  
        .getColorValue(  
            Windows.UI  
            .ViewManagement  
            .UIColorType  
            .background  
        );  
  
    if (color.r == 0 && color.g == 0  
        && color.b == 0) {  
        // changes for Dark Mode  
    }  
}
```

Detecting “dark mode”

```
if (color.r == 0 && color.g == 0  
    && color.b == 0) {  
    // changes for Dark Mode  
}  
}
```

Colors



+ Custom color

More options

Transparency effects

On

Show accent color on the following surfaces

Start, taskbar, and action center

Title bars

Choose your default app mode

Light

Dark

Related Settings

[High contrast settings](#)

[Sync your settings](#)

Have a question?

[Get help](#)

Make Windows better

[Give feedback](#)

Testing PWA + Windows Dark Mode

This is a test to demonstrate how a PWA can respond to Windows' Dark Mode.

```
if ( window.Windows )
{
    var uiSettings = new Windows.UI .ViewManagement .UISettings();
    var color = uiSettings .getColorValue( Windows.UI.ViewManagement .UIColorType.background );
    if ( color.r == 0 && color.g == 0 && color.b == 0 )
    {
        // Dark mode
    }
    else
    {
        // Light mode (default)
    }
}
```

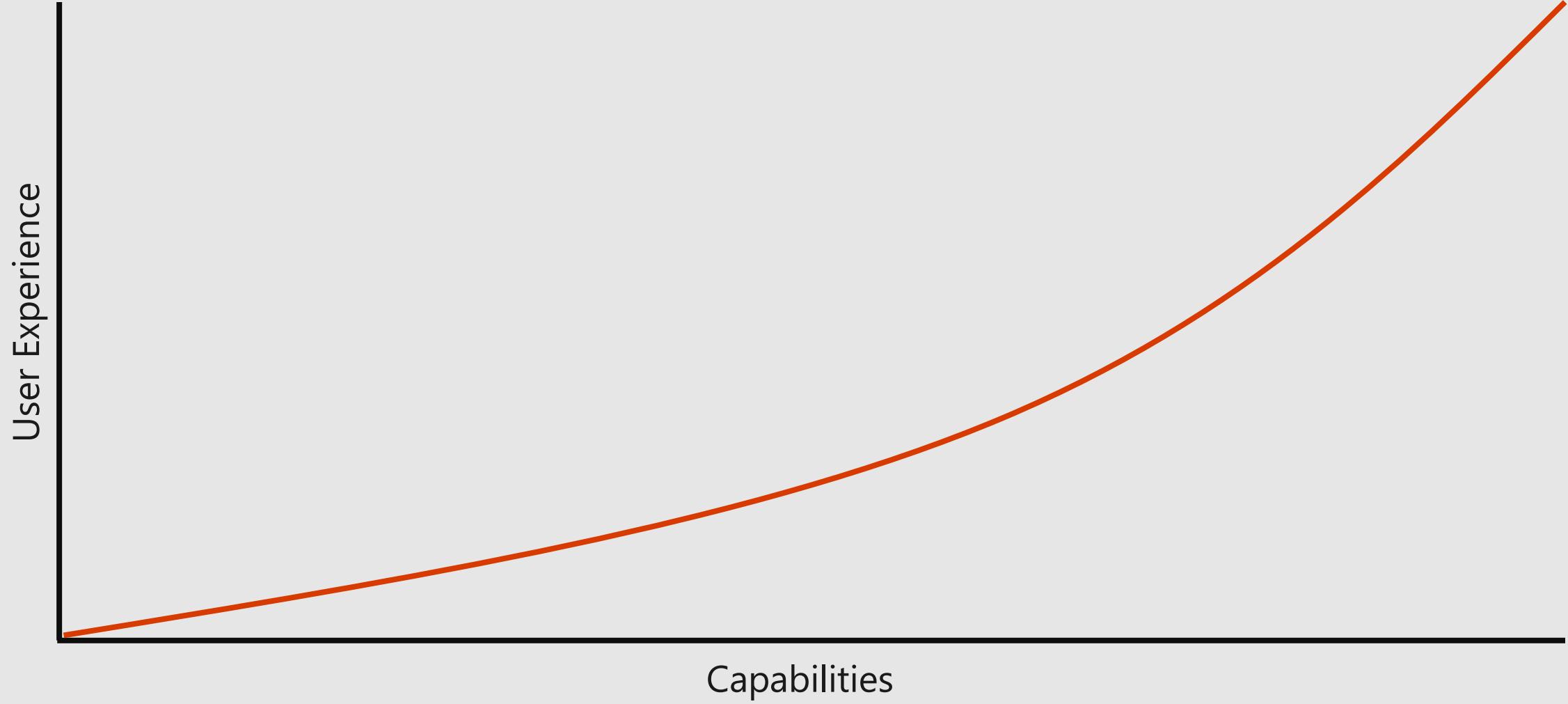
This is an installed PWA WinRT JS is already in the Cache Adding WinRT JS to the Page

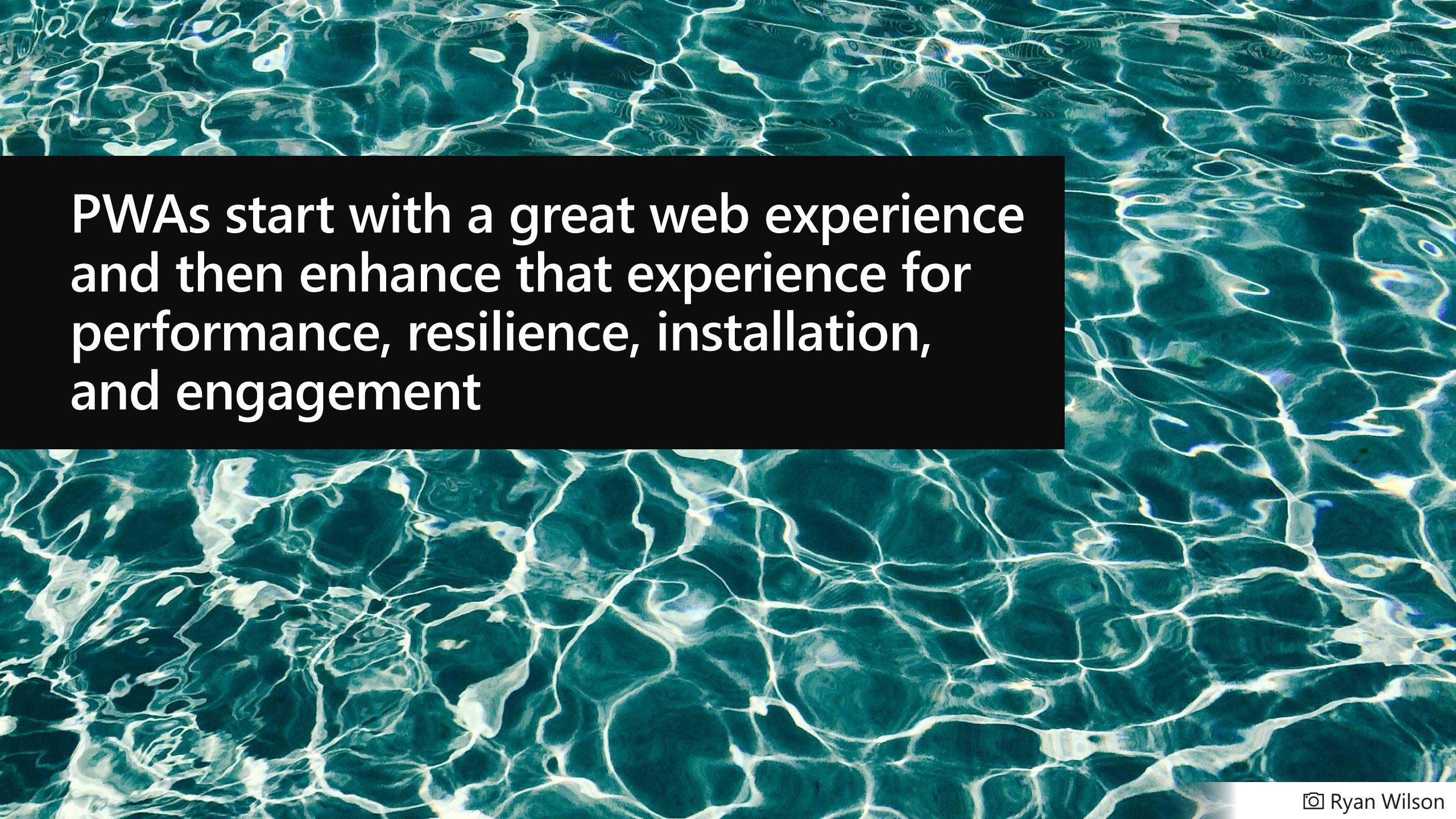


The background image shows a roller coaster track made of dark steel beams winding its way through large, reddish-brown rock formations. One formation on the right has a prominent, rounded peak with patches of white snow or ice clinging to its upper slopes. The sky above is a vibrant, clear blue with a few wispy white clouds.

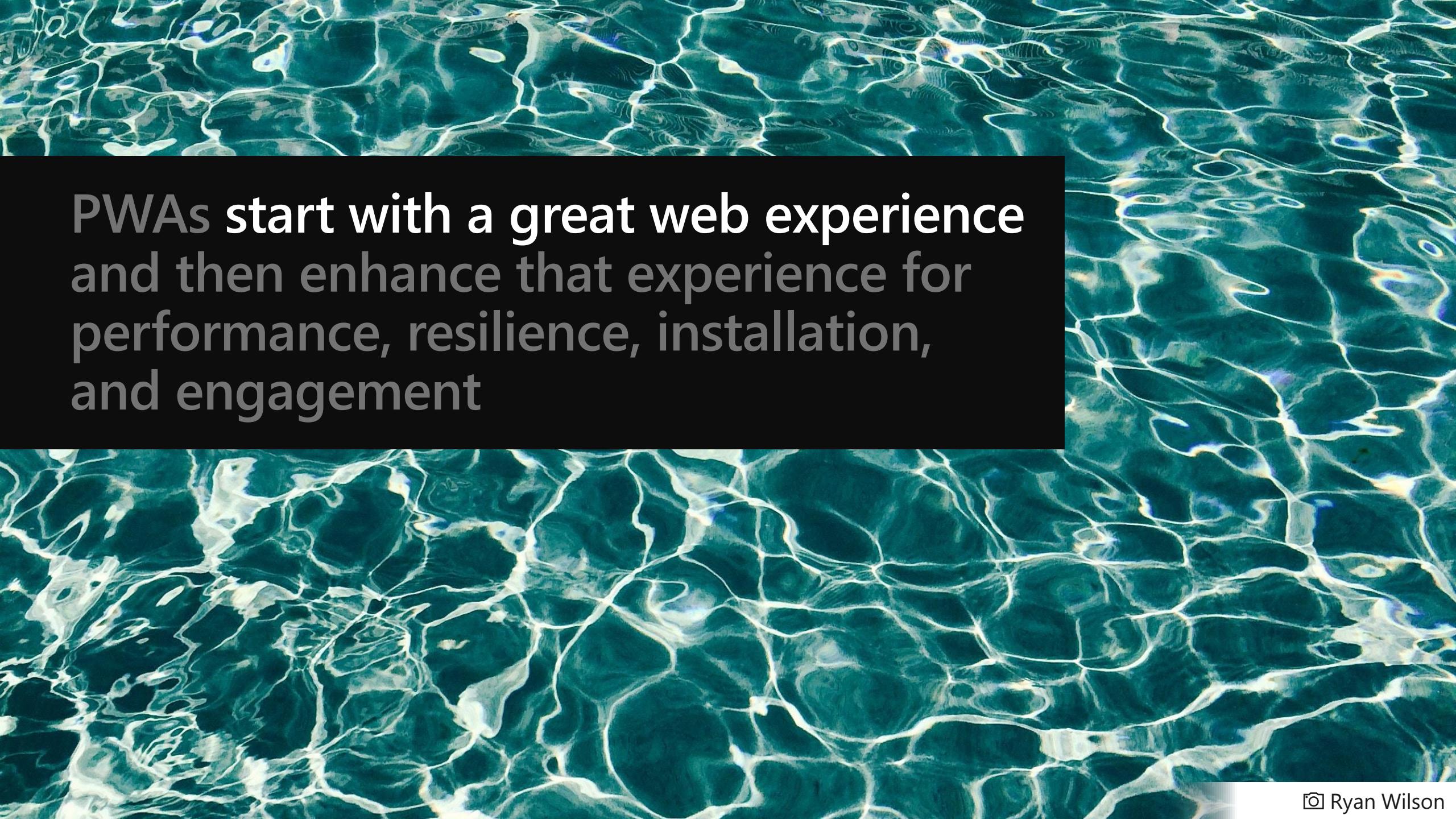
We can and should use JavaScript,
but thoughtfully & intentionally

Enhance the experience





PWAs start with a great web experience and then enhance that experience for performance, resilience, installation, and engagement



PWAs start with a great web experience
and then enhance that experience for
performance, resilience, installation,
and engagement



Focus Markup
Design JavaScript

Thank you!

Aaron Gustafson

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[@AaronGustafson](https://twitter.com/AaronGustafson)

Free Course: aka.ms/modern-web-course

Free Book: aka.ms/adaptive-web-design

