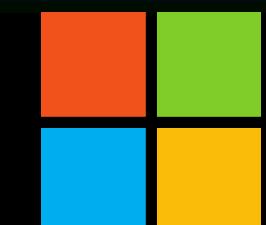


# PWAs

## Where Do I Begin?



Aaron Gustafson

@AaronGustafson

noti.st/AaronGustafson

What exactly is a  
PWA?

What exactly is a  
Progressive Web App?

119

20

40



DISCUSS (51)

...



# What the heck is a "Progressive Web App"? Seriously.



Ben Halpern Nov 6 '17 Updated on Mar 21, 2018 · 3 min read

#webdev

This morning I went to write an article outlining a few things about

**Ben Halpern**

@ben

A Canadian software developer who thinks he's funny.

**+ FOLLOW**

work

Founder/webmaster at DEV

location

Brooklyn, NY

education

Mount Allison University

joined

Dec 27, 2015



# Seriously, though. What is a progressive web app?



Amberley Romo [Follow](#)

Aug 6, 2018 · 8 min read



# Infrequently Noted

Alex Russell on browsers, standards, and the process of progress.

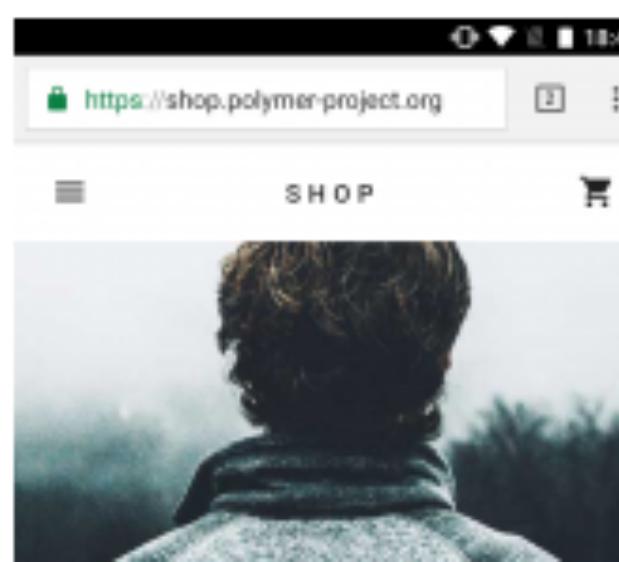
[« PWA Discovery: You Ain't Seen Nothin Yet](#)

[Web Components: The Long Game »](#)

## What, Exactly, Makes Something A Progressive Web App?

Since [Frances](#) and I published a blog post last year introducing [Progressive Web Apps](#), a healthy conversation has started about what is and isn't a PWA. There are a lot of opinions and many shades of gray. What are the hard requirements? Which requirements are marginal? What's aspirational? This article outlines these requirements, attempts to classify them, and provides a baseline for "what is a Progressive Web App?"

Browsers gate Progressive Web App installation prompting and badging on criteria that they detect when users navigate to sites. These criteria have been designed to ensure that sites which invoke prompts are reliable, fast, and engaging.



### What's All This Then?

I'm Alex Russell, a [web developer](#) working on Chrome, Blink, and the Web Platform at Google. I'm guilty of [many JavaScript transgressions](#).

I help lead the team building a new application model for the web, and serve on ECMA TC39 (the standards body for JavaScript). I'm an elected member of the W3C Technical Architecture Group and am Tech Lead for Standards inside the Chrome team. I design and advocate for extensible, layered, data-driven evolution of the web platform.

My professional aim is to make the web a better platform and to the extent that I can keep politics and economics from [creeping in](#).

“Progressive Web App”  
is a marketing term

# Progressive Web App

Game  
Gallery  
Book  
Progressive Web App  
Newspaper  
Art Project  
Tool

# Progressive Web Site

*Who's behind PWAs?*



# What's a PWA, technically?



HTTPS

# What's a PWA, technically?



HTTPS



Web App  
Manifest

# What's a 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"  
}
```

# What's a PWA, technically?



HTTPS



Web App  
Manifest



Service  
Worker



25,962 views | Mar 9, 2018, 07:30am

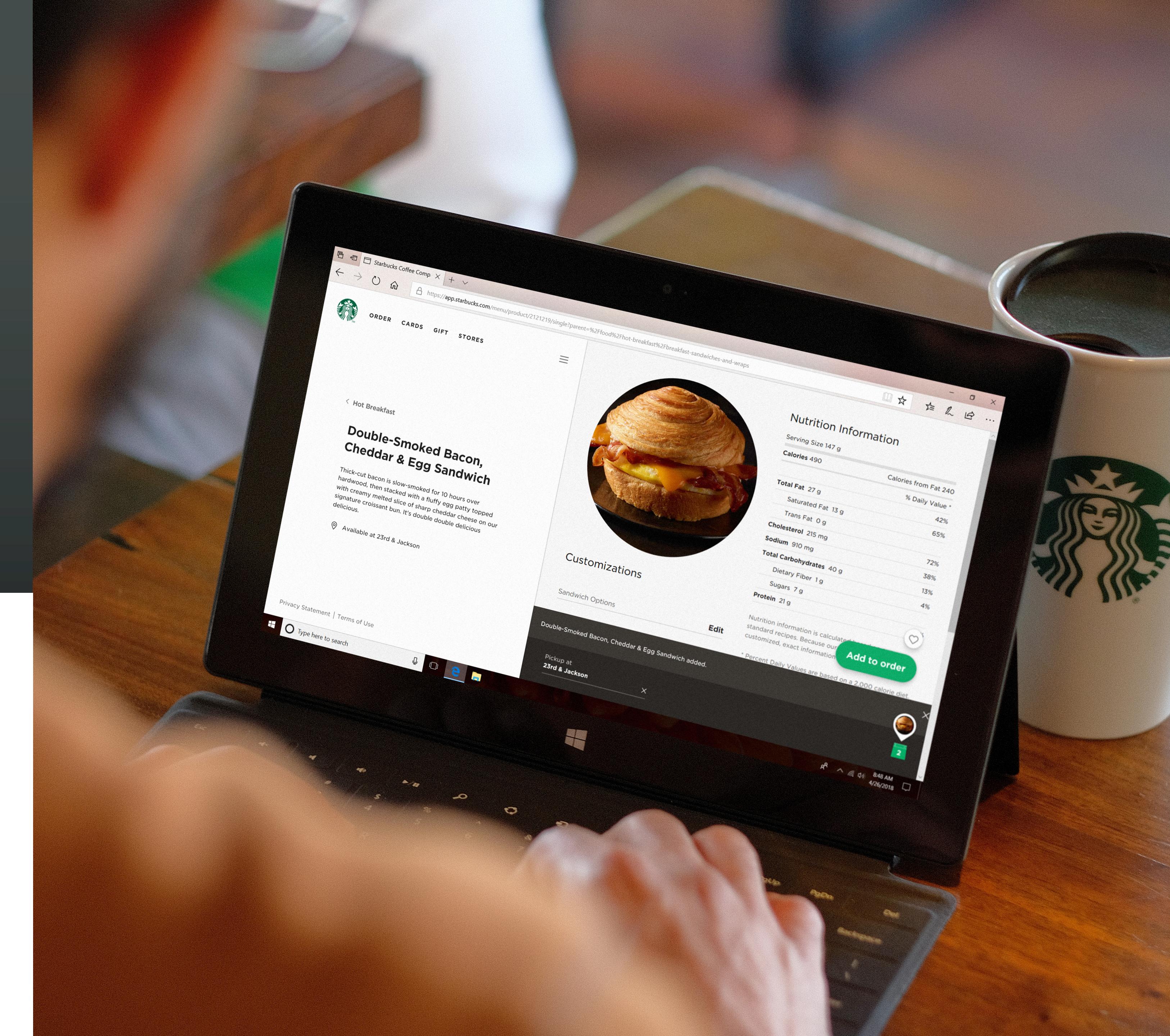
Why Progressive Web Apps Will Replace Native Mobile Apps

Maybe?

# Starbucks: 2x increase in daily active users



aka.ms/google-io-2018



**Tinder:**  
Core experience  
with 90% less code



30MB

Android

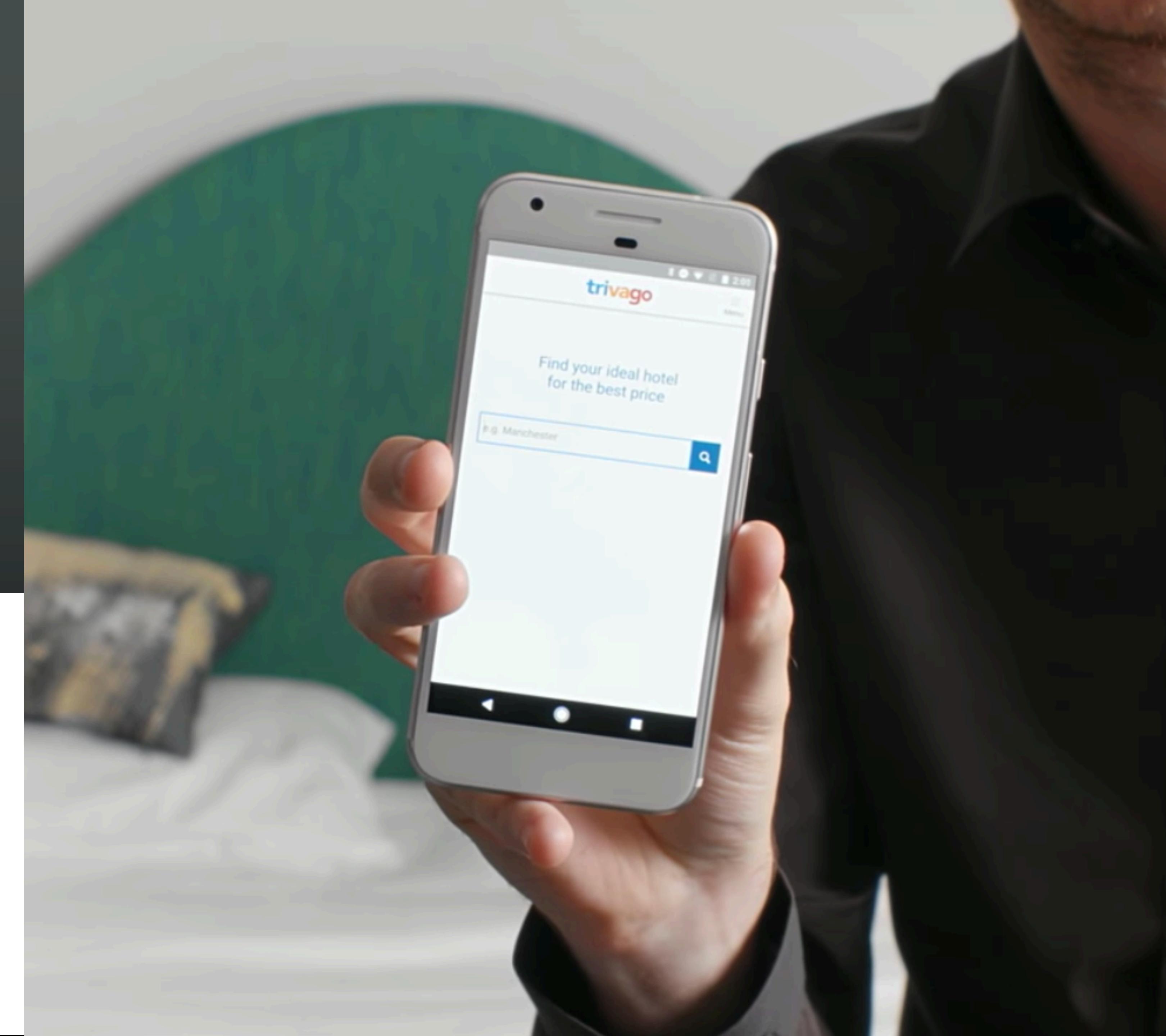
2.8MB

PWA

**Trivago:**  
97% increase in  
click-outs to  
hotel offers



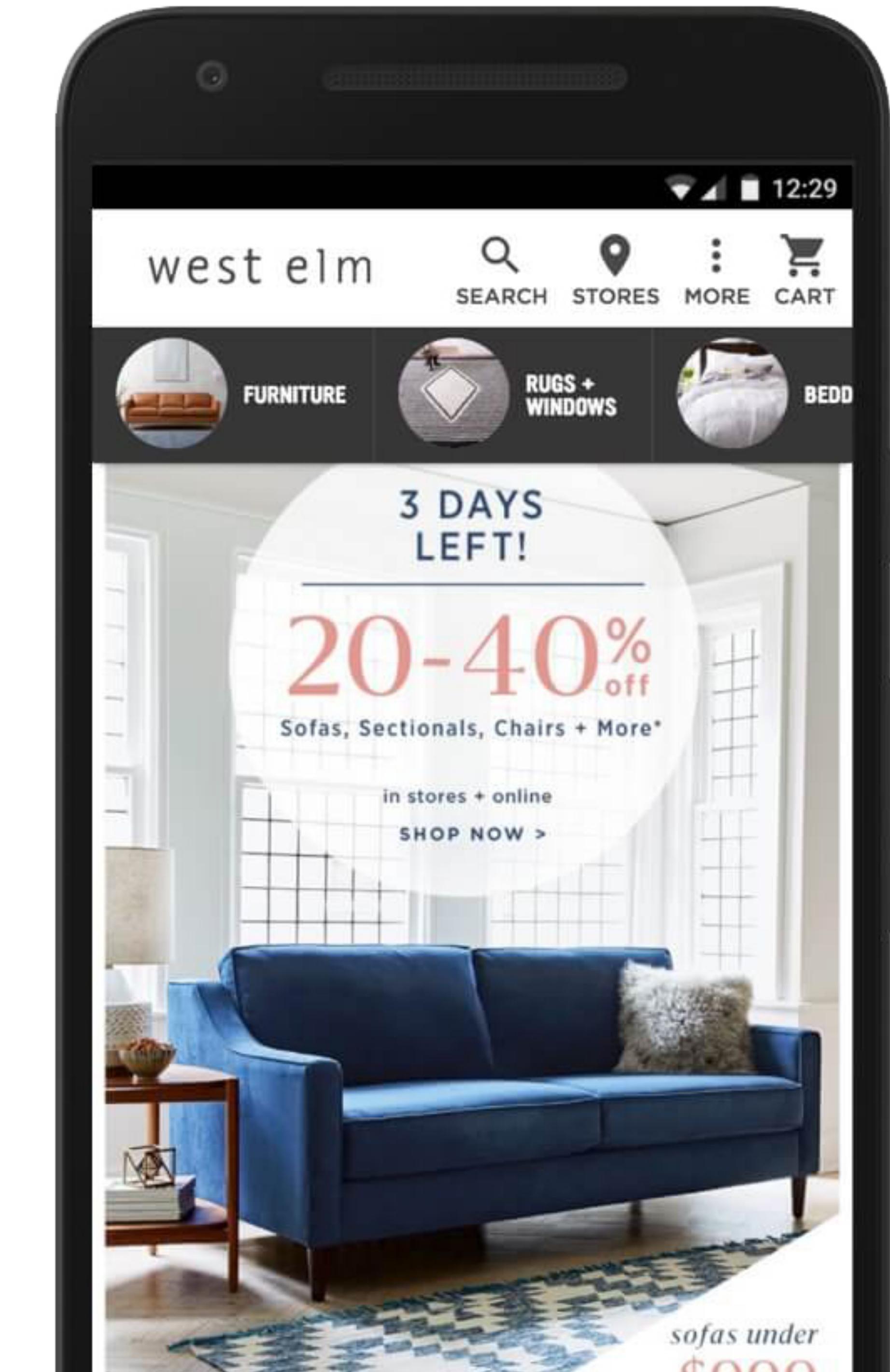
[aka.ms/trivago-pwa-2017](http://aka.ms/trivago-pwa-2017)



**West Elm:**  
15% increase in  
time on site  
9% increase in  
revenue per visit

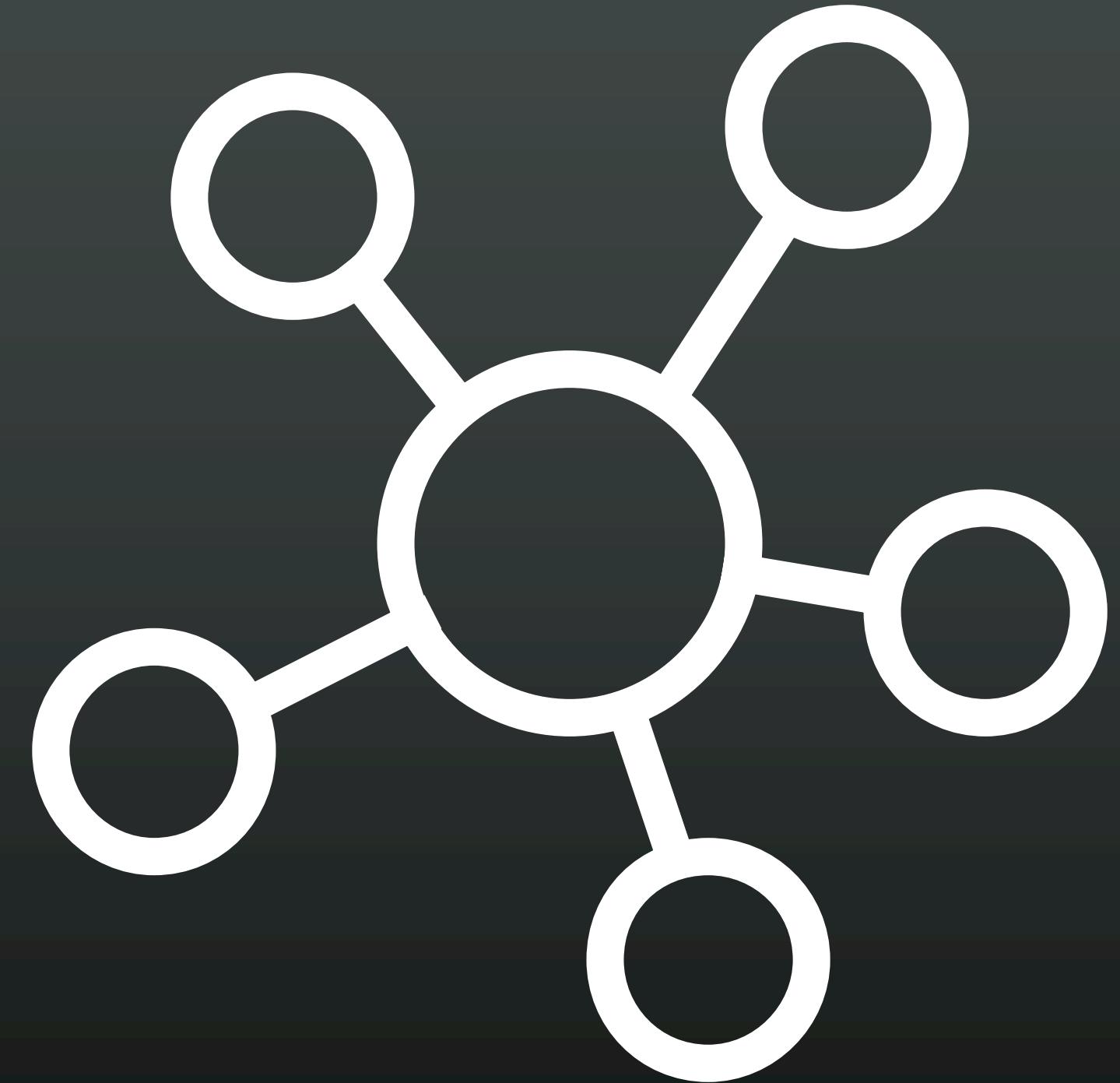
west elm

[aka.ms/west-elm-pwa-2017](http://aka.ms/west-elm-pwa-2017)



# PWA Stats

# Let's talk about Service Worker

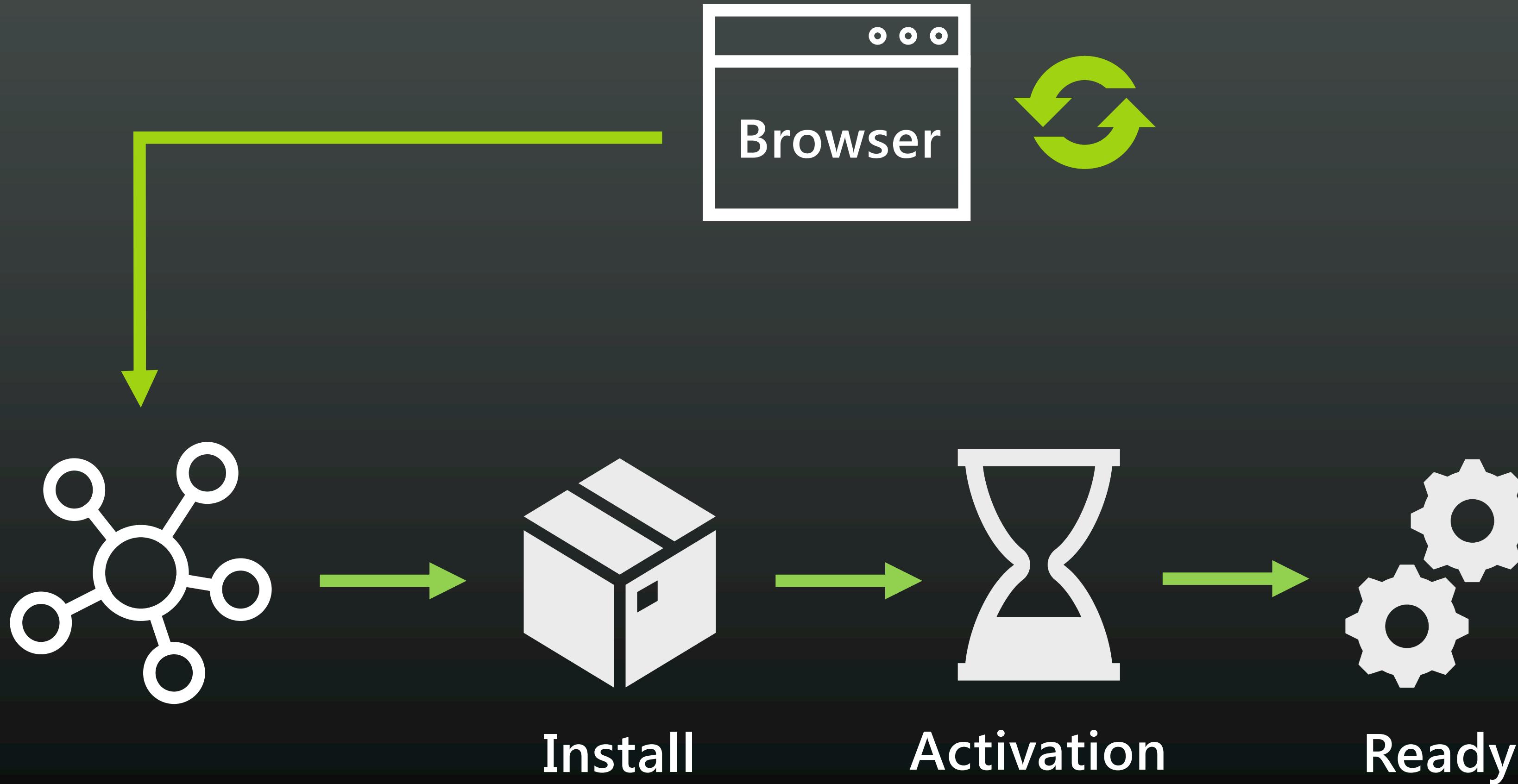


# Registering a Service Worker

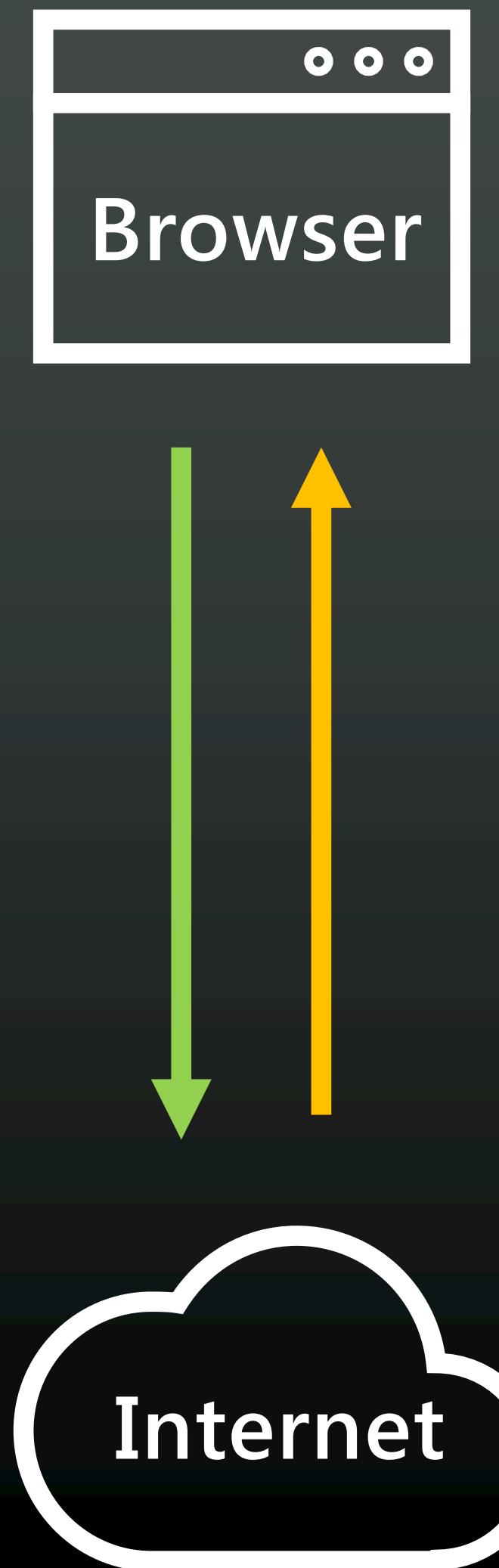
```
if ( "serviceWorker" in navigator ) {  
  navigator.serviceWorker.register( "/serviceworker.min.js" );  
}
```

Path is important!

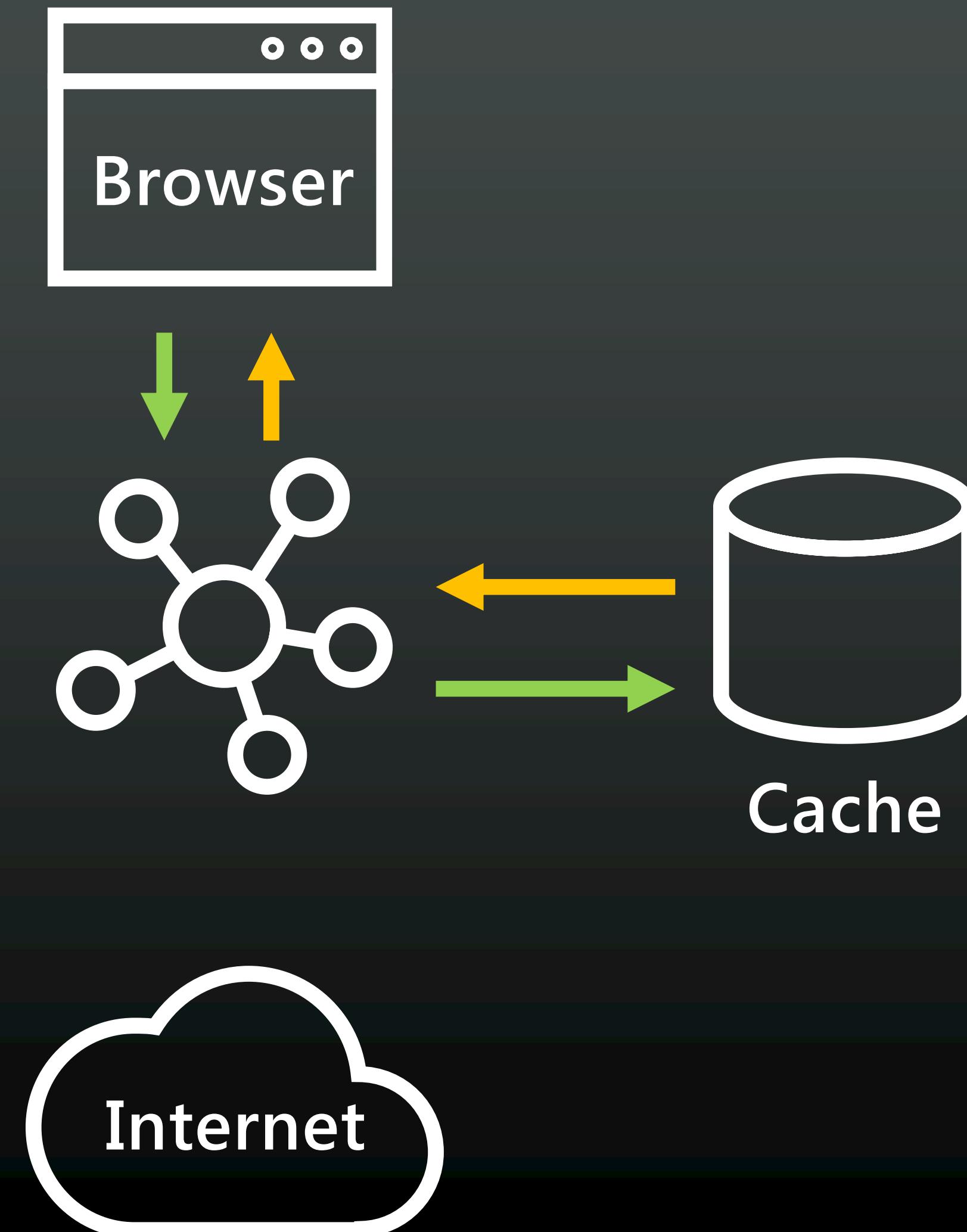
# The Service Worker Lifecycle



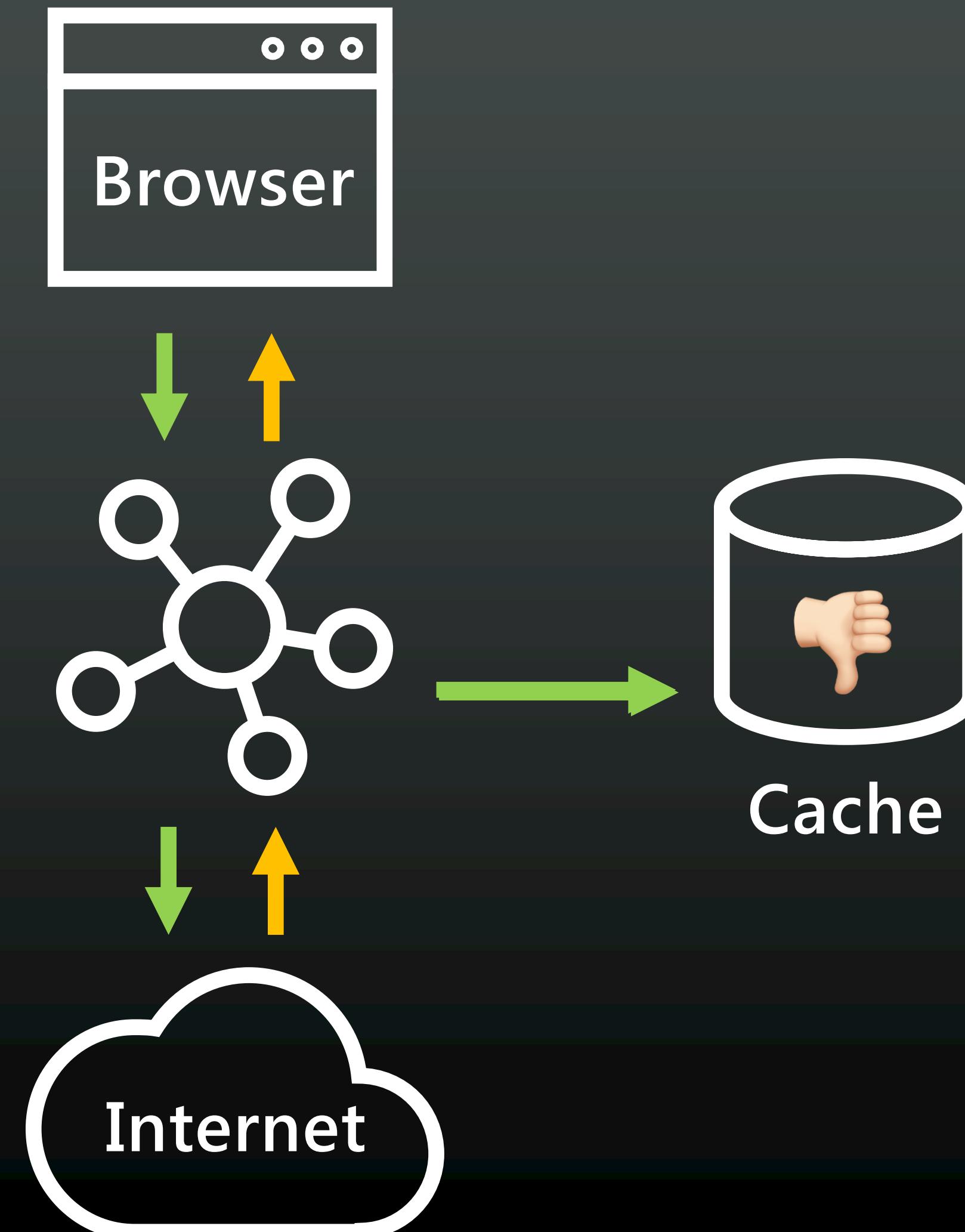
# How connections are made



# Along comes Service Worker



# Along comes Service Worker



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

# Progressive Web App Enhancement

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

# Progressive Web App

# Progressive

/prə'gresiv/

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

# Step 1

## Focus on what matters

IN THIS TEMPLE  
AS IN THE HEARTS OF THE PEOPLE  
FOR WHOM HE SAVED THE UNION  
THE MEMORY OF ABRAHAM LINCOLN  
IS ENSHRINED FOREVER



# Consider forbes.com circa 2007

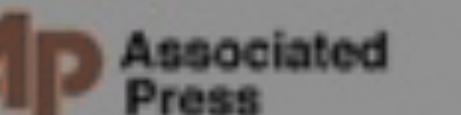
The screenshot shows the homepage of Forbes.com. At the top, there's a banner for "US OPEN.org". Below it, the "Forbes.com" logo is prominently displayed. A search bar with the placeholder "Search: Forbes.com" is followed by links for "Quotes", "Video", "Web", "Blogs", and "Advanced". To the right of the search bar is a button labeled "Go". Further down, there are links for "U.S.", "EUROPE", and "ASIA". The main headline reads "HOME PAGE FOR THE WORLD'S BUSINESS LEADERS". On the right side, there's a sidebar titled "INSIDE FORBES.COM" with links to "Bonds and Markets News", "Hot Gadgets for 2007", and "Small Business Finance Tips". Below the main navigation, there are categories like "HOME", "BUSINESS", "TECH", "MARKETS", "ENTREPRENEURS", "LEADERSHIP", "PERSONAL FINANCE", "FORBESLIFE", "LISTS", and "OPINIONS". At the bottom of the page, there are links for "Video", "Blogs", "E-mail Newsletters", "Org Chart Wiki", "People Tracker", "Portfolio Tracker", "Special Reports", and "Widgets".

E-Mail | Comments | E-Mail Newsletters | RSS

Associated Press

## Book Is Inside Look at War on Terror

By PETE YOST 09.07.07, 3:25 PM ET



**Book Is Inside Look at War on Terror**

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.

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Andrew Teufel  
Director of Research, Fisher Investments

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News	View by Industry	
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Forbes Attaché  
Help Edit Delete Close  
Download All 2006 & 2007  
Next

The Illusion of Control i

alistapart.com/article/the-illusion-of-control-in-web-design#comments

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ARTICLES EVENTS TOPICS WRITE FOR US

# ALISTAPART

## The Illusion of Control in Web Design

by [Aaron Gustafson](#) · April 26, 2018

Published in [Code](#)

# "Mobile first" thinking isn't just about mobile

and engaging web experiences. We scrutinize every detail of an user's getting the animation swing just right. We refactor our interactions of a second off load times. We control absolutely 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

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Remember that text is the first interface

IN THIS TEMPLE  
FOR WHOM HE SAVED THE UNION  
THE MEMORY OF ABRAHAM LINCOLN  
IS ENSHRINED FOREVER



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

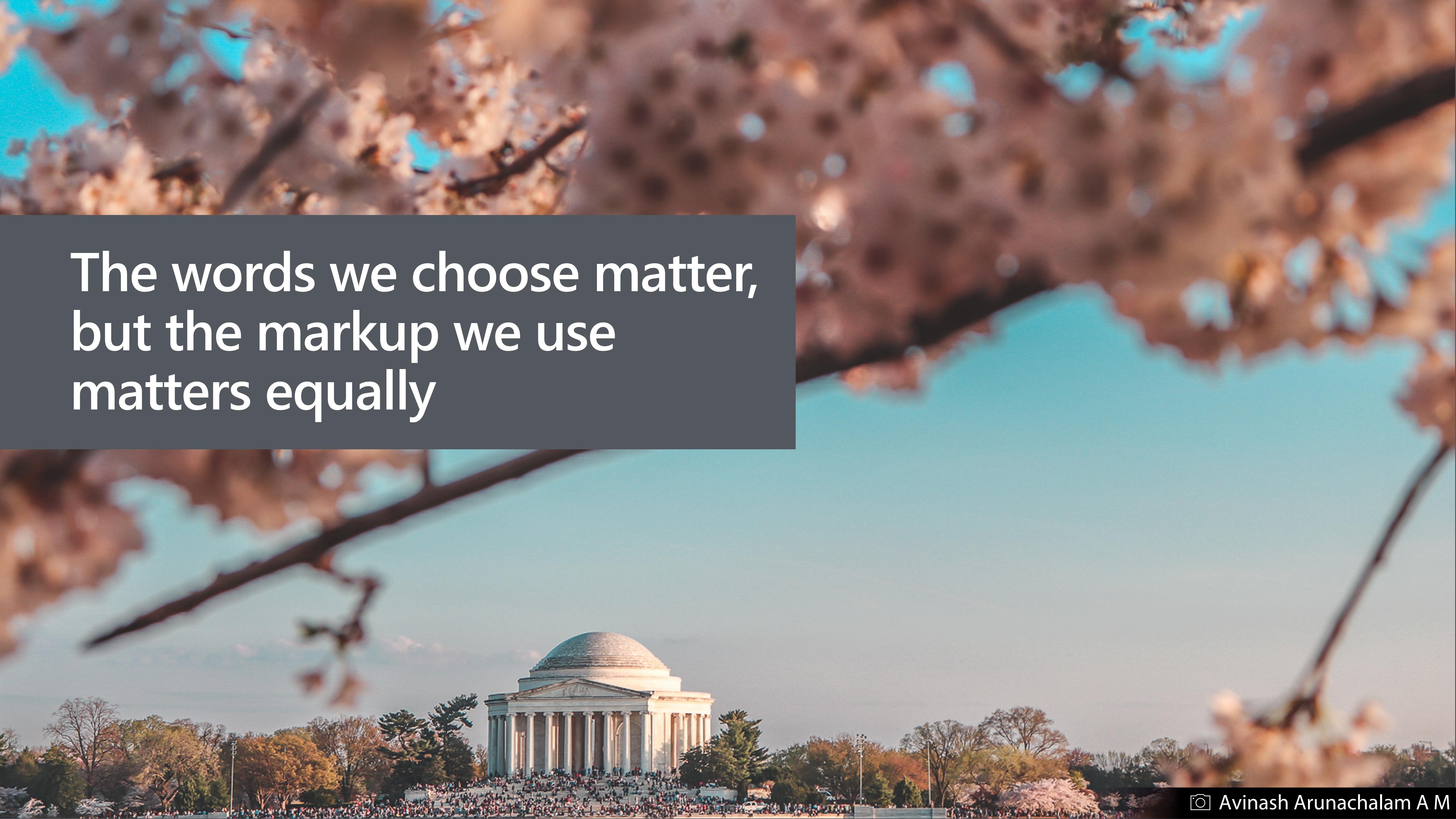
IN THIS TEMPLE  
FOR WHOM HE SAVED THE UNION  
THE MEMORY OF ABRAHAM LINCOLN  
IS ENSHRINED FOREVER





Step 2

Use markup that supports  
the core experience



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 is 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 is the title of the 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>
```

# 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 that: `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>
```

# “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>
```

# “Flow” content, divided

```
<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...</div>
    <div>I do a lot of traveling and it's...</div>
  </div>
</article>
```

# This 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...

## Progressive Web Apps and the Windows Ecosystem

Published

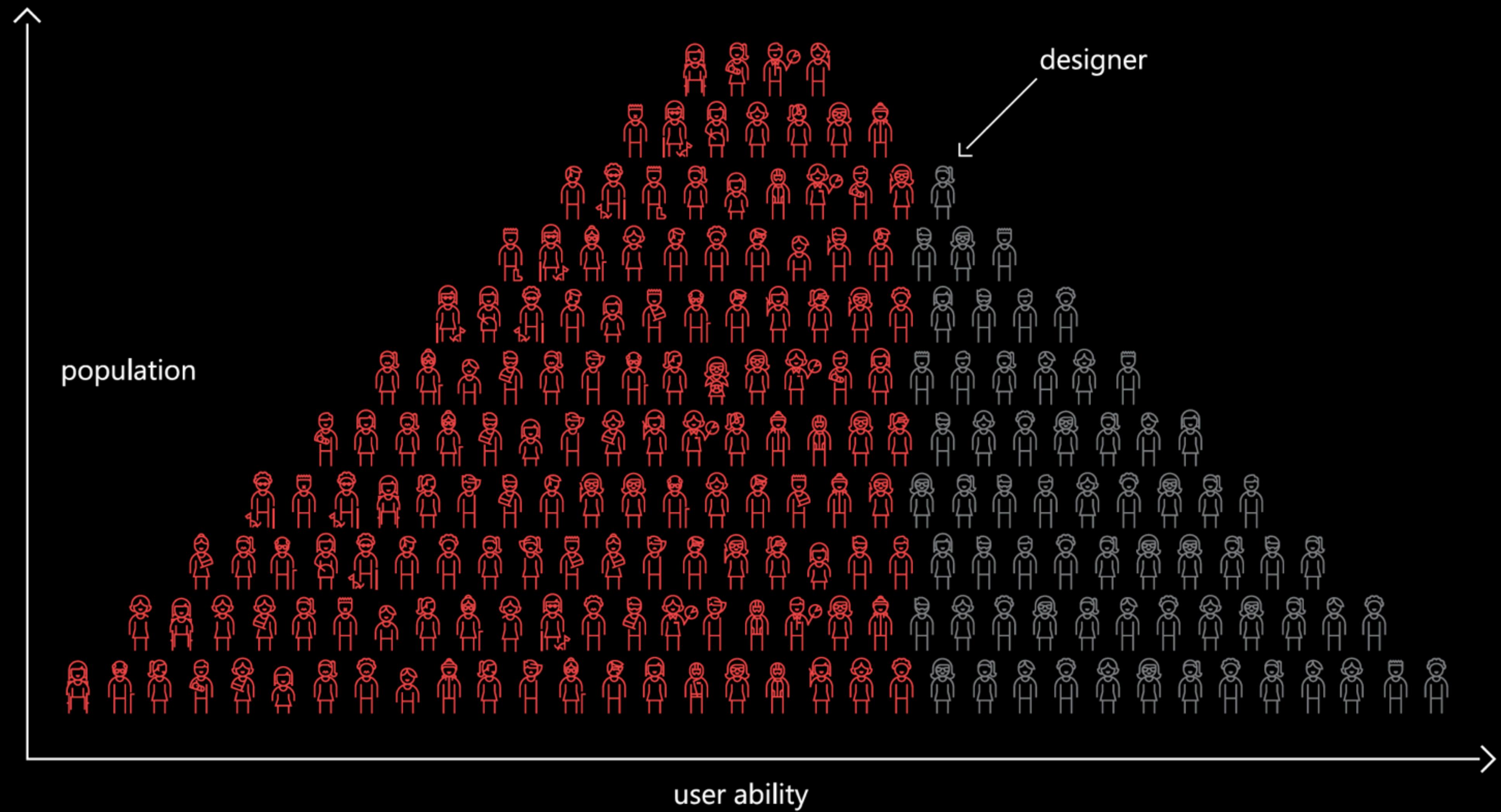
24 May 2017

Reading Time

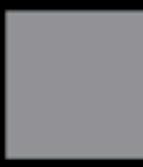
25 minutes

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

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



excluded



included



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



# Access via semantics:

```
function extractHeadlines( response ){
  var $html = document.createElement('div'),
    $headings, i=0, headlines=[];

$html.innerHTML = response.contents;

$headings = $html.querySelectorAll('#top-new')
  .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 );
}
```

# Access via semantics:

```
function extractHeadlines( response ){
  var $html = document.createElement('div'),
    $headings, i=0, headlines=[];

$html.innerHTML = response.contents;

$headings = $html.querySelectorAll('#top-new')
  .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 );
}
```



# ALISTAPART

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Prepare for leadership roles at  
the intersection of design and  
technology in Northwestern's  
online MS in Information  
Design & Strategy program.

## Conversational Semantics

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

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

More about semantics  
for “headless” UIs

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

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

### 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

9 comments

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Prepare for leadership roles at the

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MAY 23, 2016 • [17 COMMENTS](#)

# 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 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
<code>input[type=submit]</code>	button	button	Yes	Mouse, touch, ENTER, SPACE	Yes
<code>button[type=submit]</code>	button	button	Yes	Mouse, touch, ENTER, SPACE	Yes
<code>a</code>	link	Named generic	Yes	Mouse, touch, ENTER	No
<code>div</code>	block	Not exposed	No	N/A	No

# UX gaps that need to be filled

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

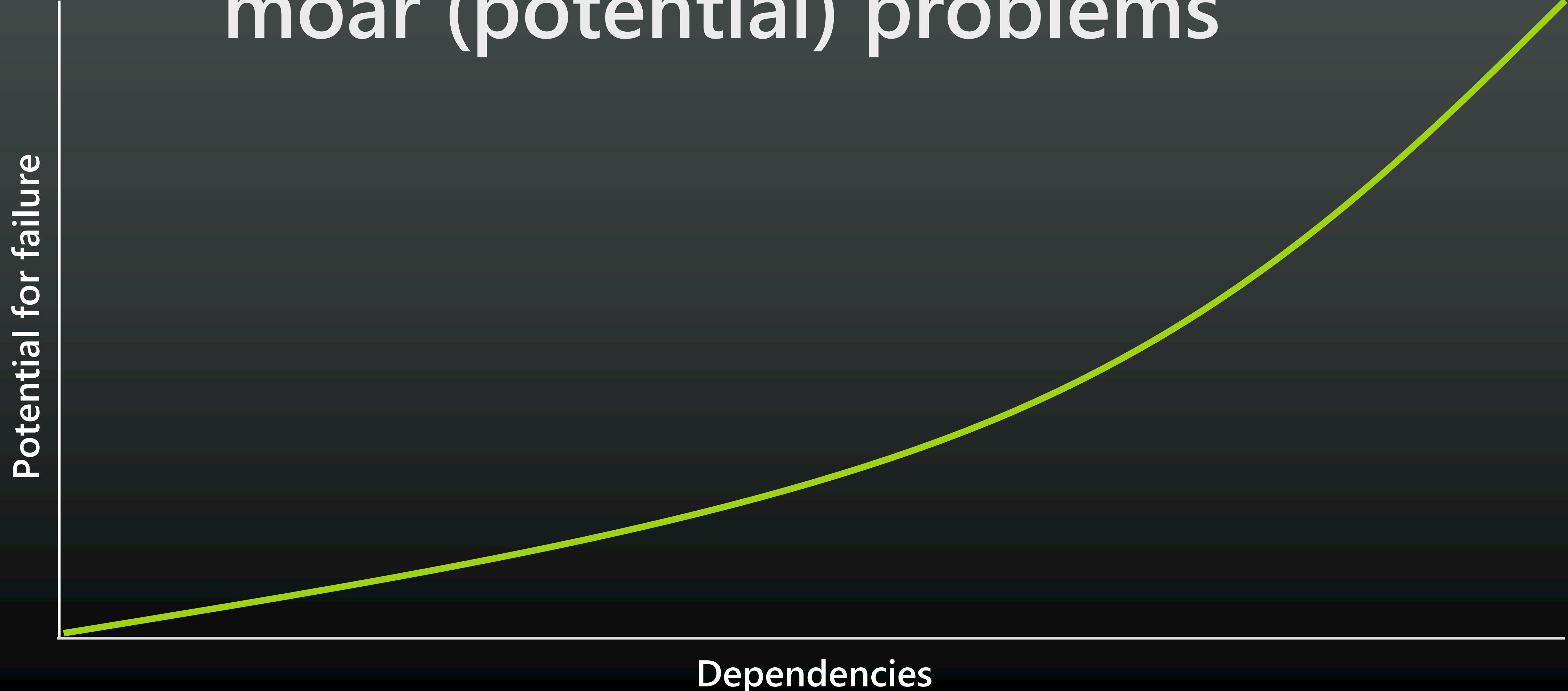
# Moar dependencies

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

# Moar 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

# Moar dependencies, moar (potential) problems



# Disaster averted



**Michael Spellacy**  
@Spellacy

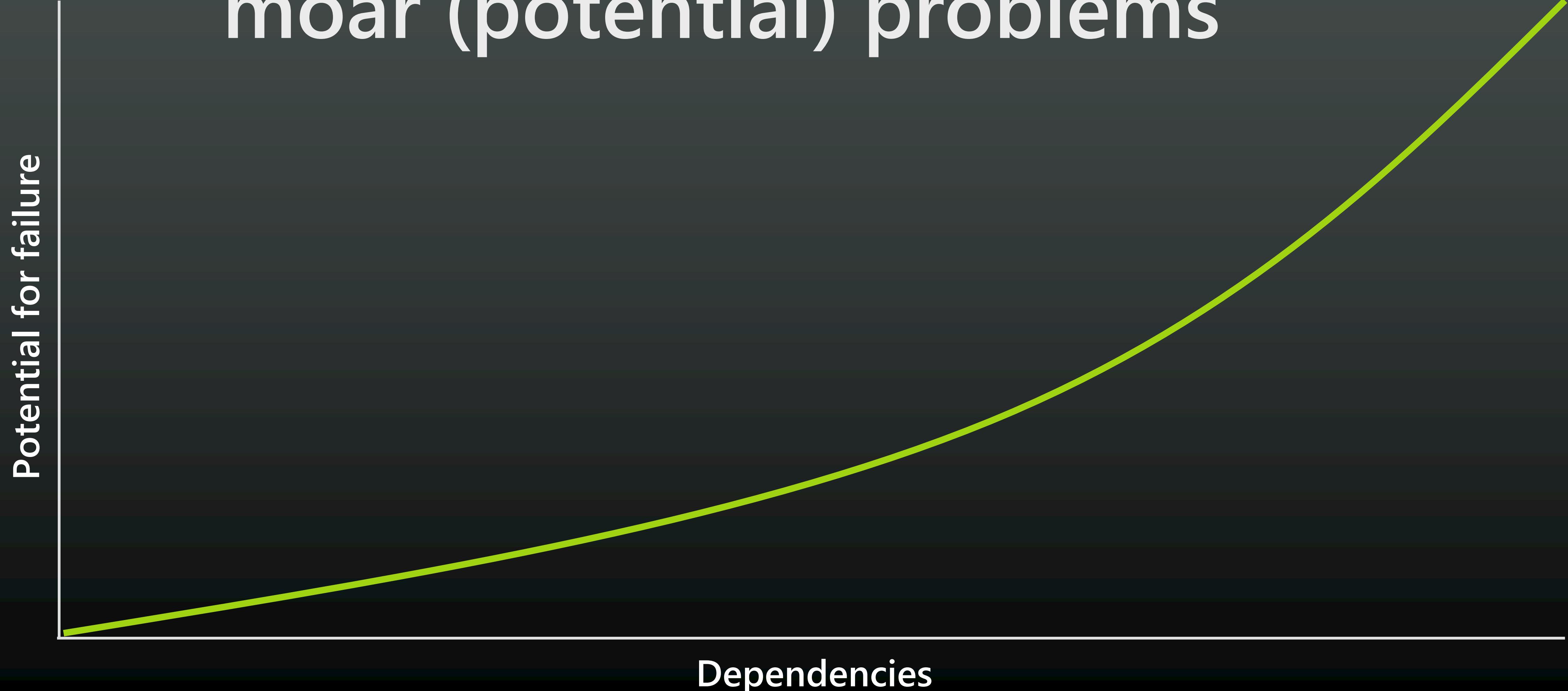
[Follow](#)



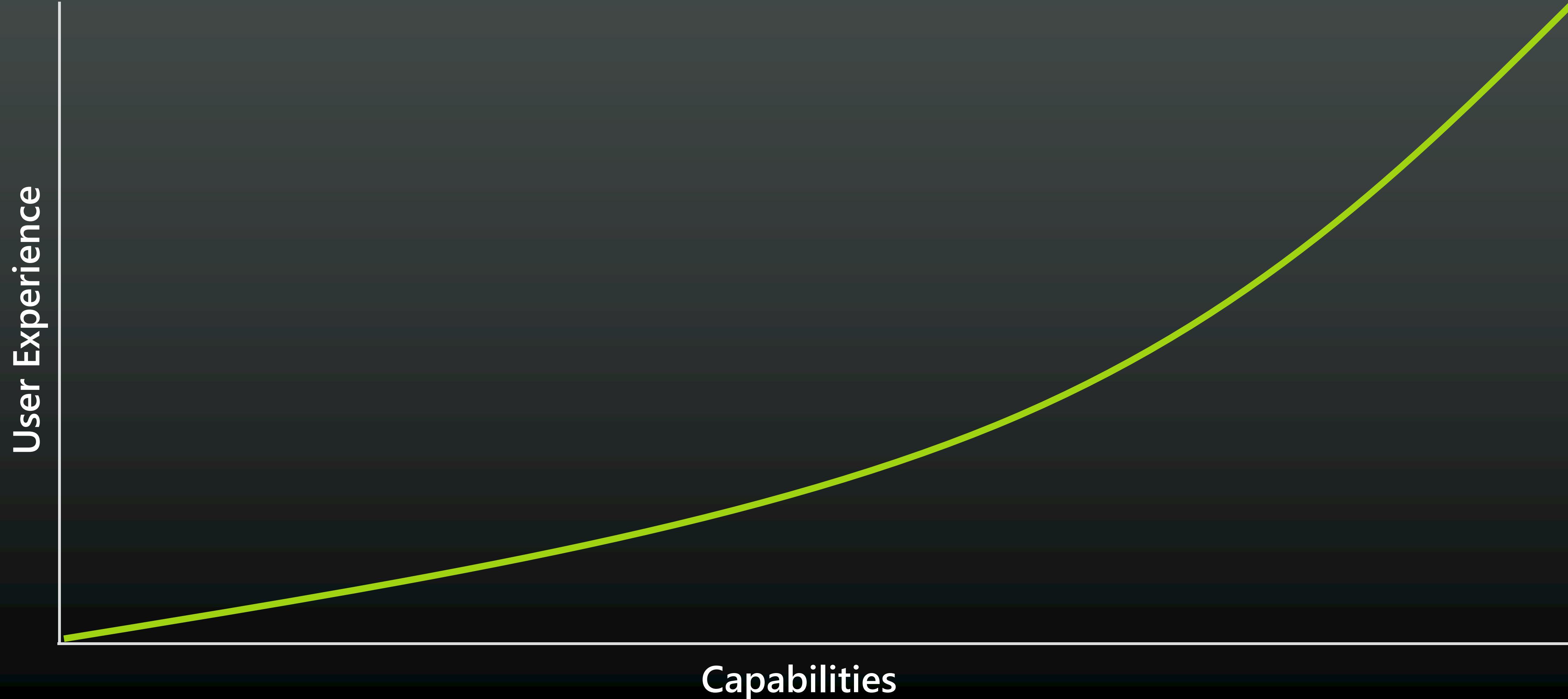
Do you think progressive enhancement is a waste of time? Think again! Chrome 66 just knocked out SSL on a CDN that hosted CSS and JS for 200 of my employer's sites and most of them still work with good ol' HTML!  
**@AaronGustafson** would be proud! :-)

10:15 PM - 18 Apr 2018

# Moar dependencies, moar (potential) problems



# Enhance the experience



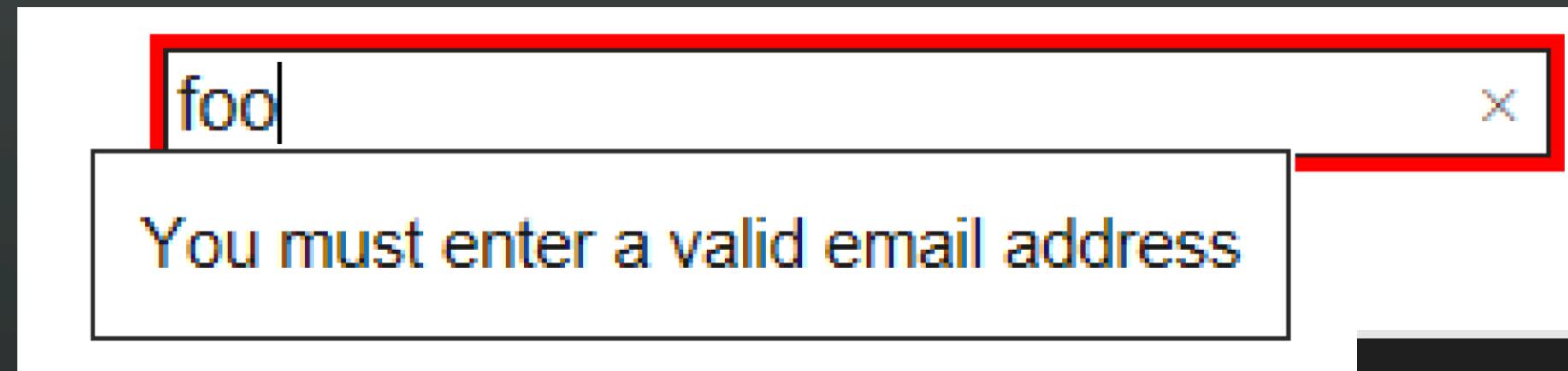
# Enhancing UX with markup

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



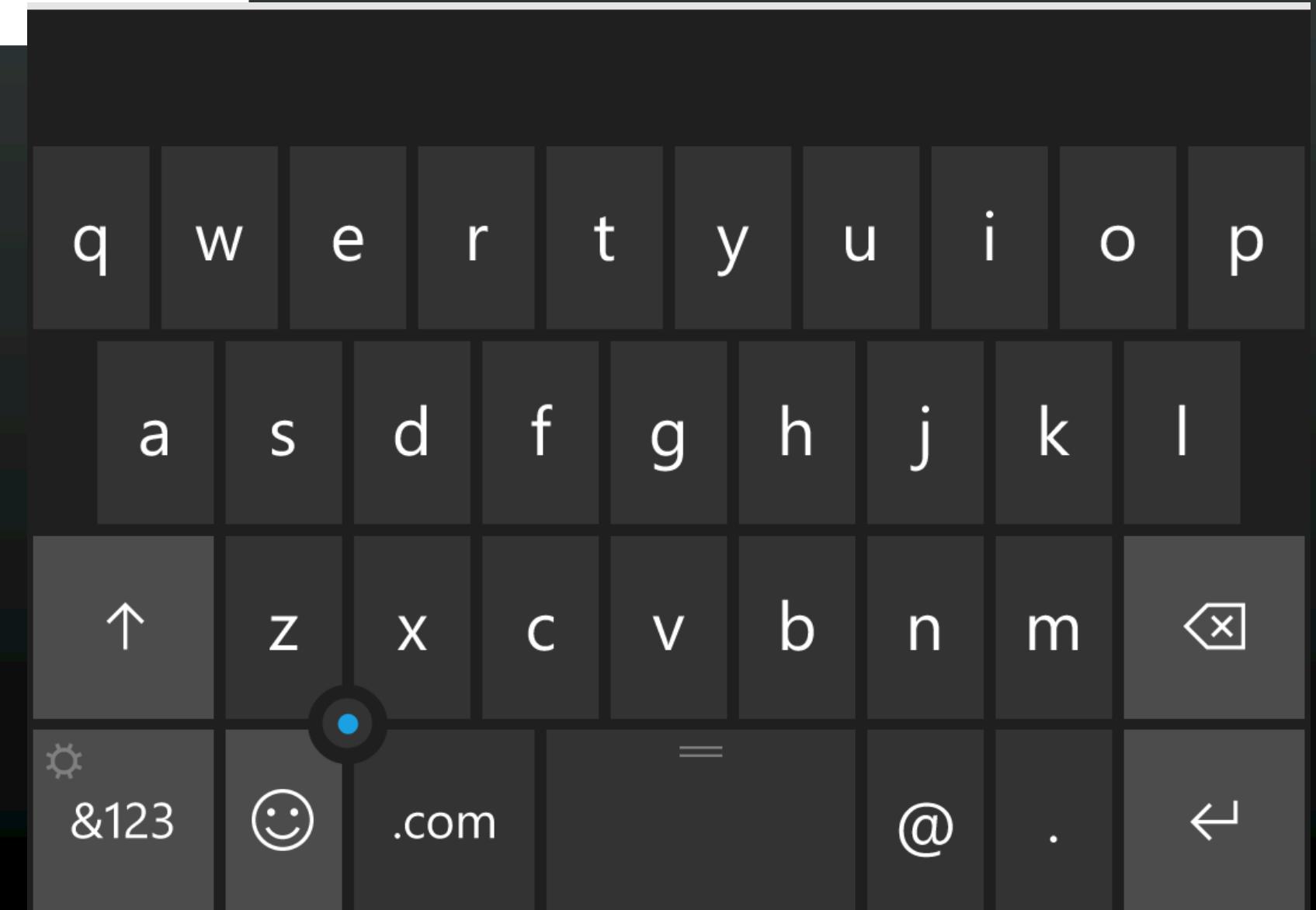
# Enhancing UX with markup

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



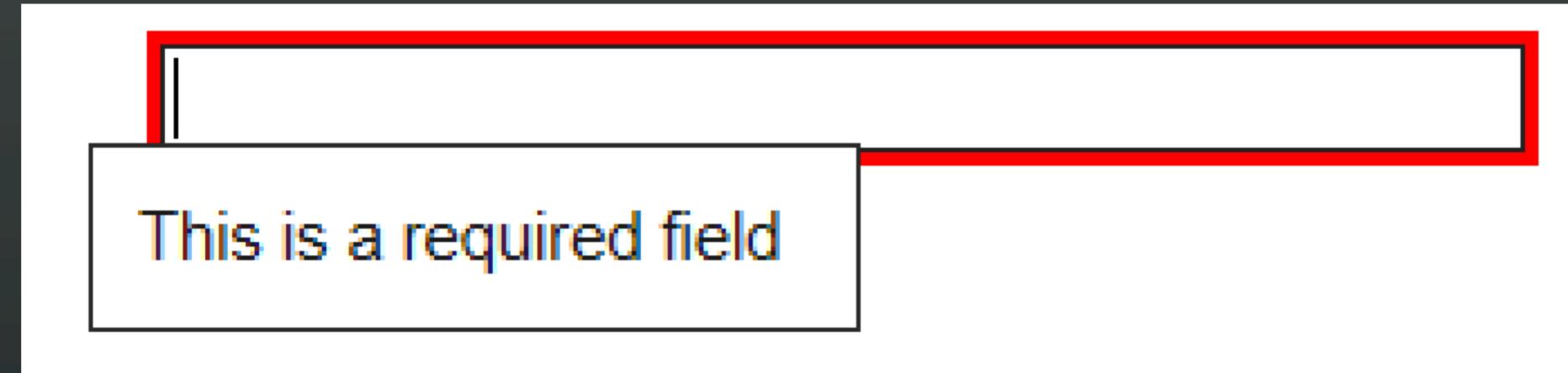
## Experience deltas

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

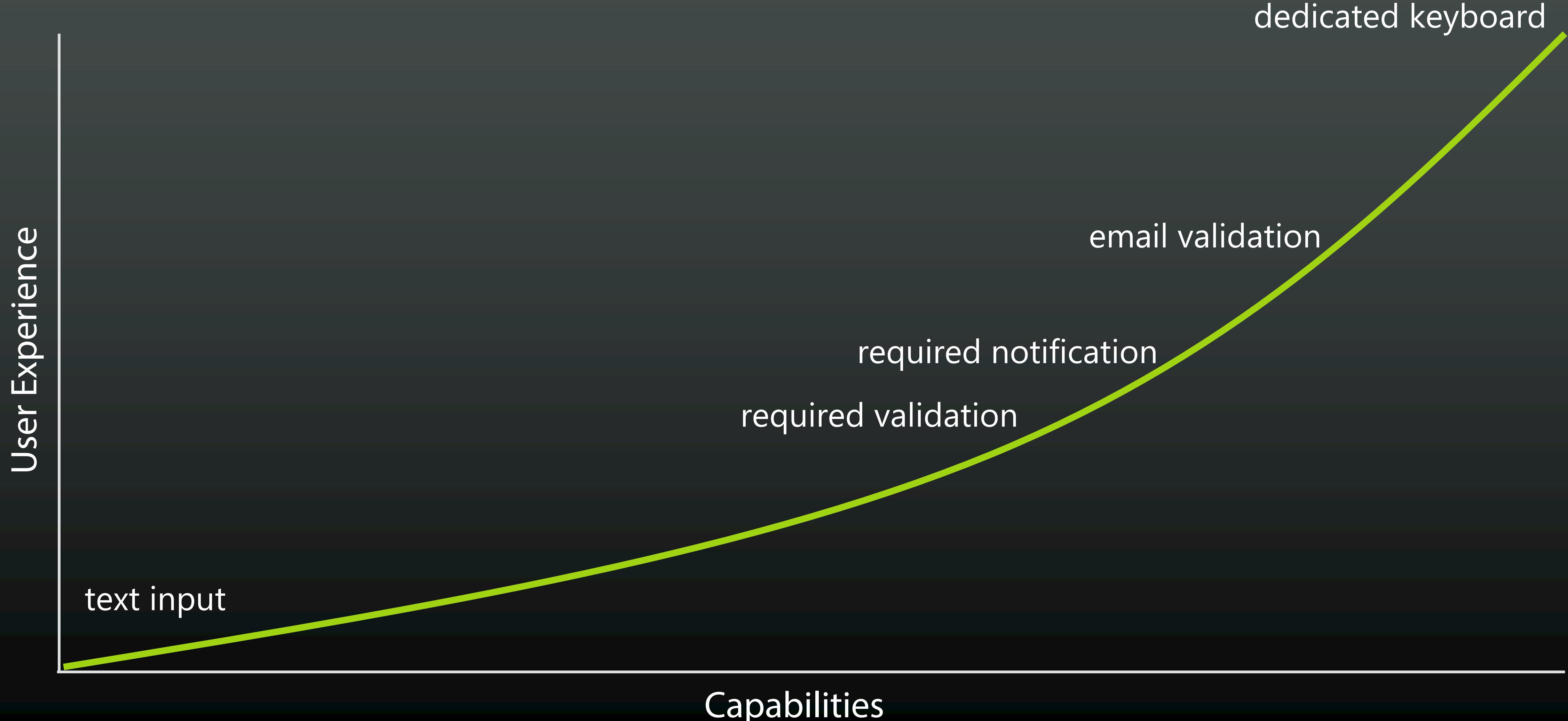
```
<input type="email" name="email" id="email"  
required aria-required="true">
```



## Experience deltas

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

# Enhance the experience



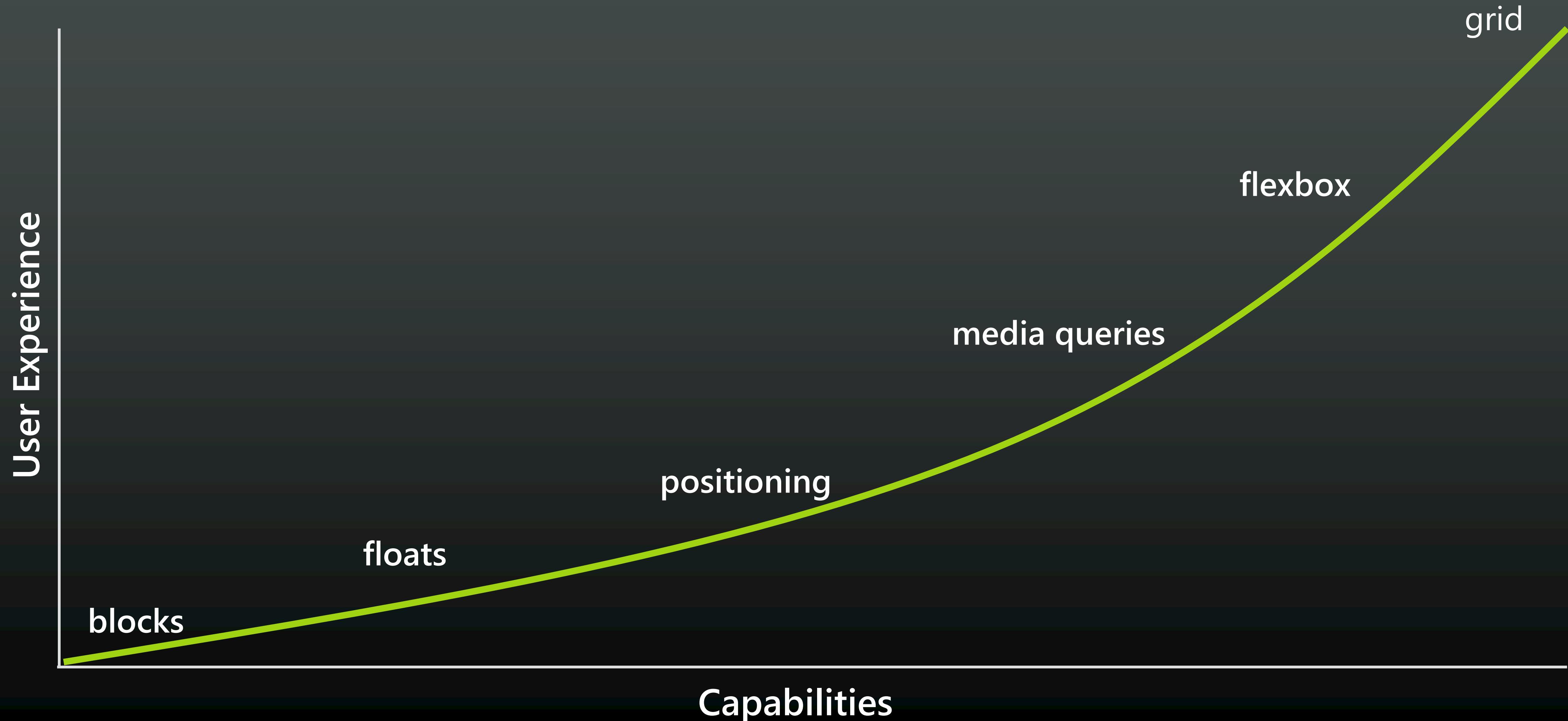


When you think of user experience as a continuum that scales with capabilities, a progressive approach to interfaces is both elegant and powerful.



# Step 3 Design in support of the core experience

# Enhance the experience



**Enhance!**

**ay!**



*Basic, but ok!*



**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

Proportion

Balance

Proximity

Contrast

Repetition

Emphasis

Rhythm

Gestalt

Unity

Harmony

White Space

Movement

# Tools for graphic design

Alignment

Balance

Contrast

Emphasis

Gestalt

Harmony

Movement

Proportion

Proximity

Repetition

Rhythm

Unity

White Space

# Alignment

The screenshot displays the Starbucks mobile application interface, illustrating various design alignment techniques:

- Visual Alignment:** A vertical orange line on the left margin aligns the Starbucks logo at the top, the "Order" section header, the "Menu" tab underline, and the "DRINKS" category header.
- Text Alignment:** Horizontal text elements like "ORDER", "CARDS", "GIFT", "STORES", and menu items are aligned to the left or right of the central content area.
- Image Alignment:** Product images are centered within their respective circular containers.
- Color Consistency:** The Starbucks green color palette is used consistently across the logo, text, and product images.
- Space Utilization:** The layout effectively uses white space to separate sections and maintain readability.

**UI Elements and Content:**

- Logo:** Starbucks Siren logo.
- Top Navigation:** ORDER, CARDS, GIFT, STORES, and a three-line menu icon.
- Section Header:** Order (Large, bold, dark blue).
- Tab Bar:** Menu (Underlined in green), Previous, Favorites.
- Category Header:** DRINKS (Dark blue).
- Item Cards:** Hot Coffees, Hot Teas, Hot Drinks, Frappuccino® Blended Beverages, Cold Coffees, Iced Teas, each featuring an image and text.

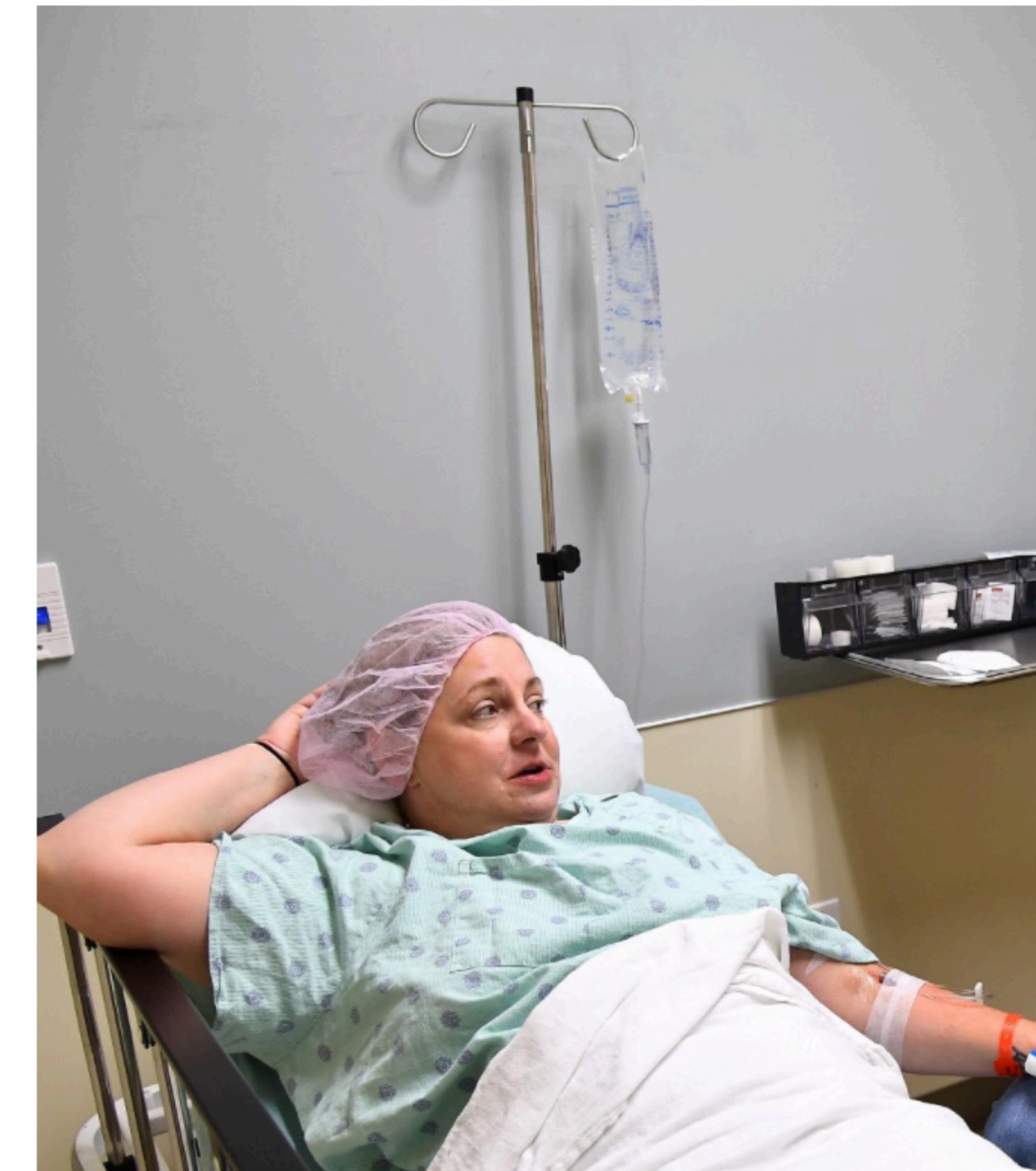
# Contrast

## Medium

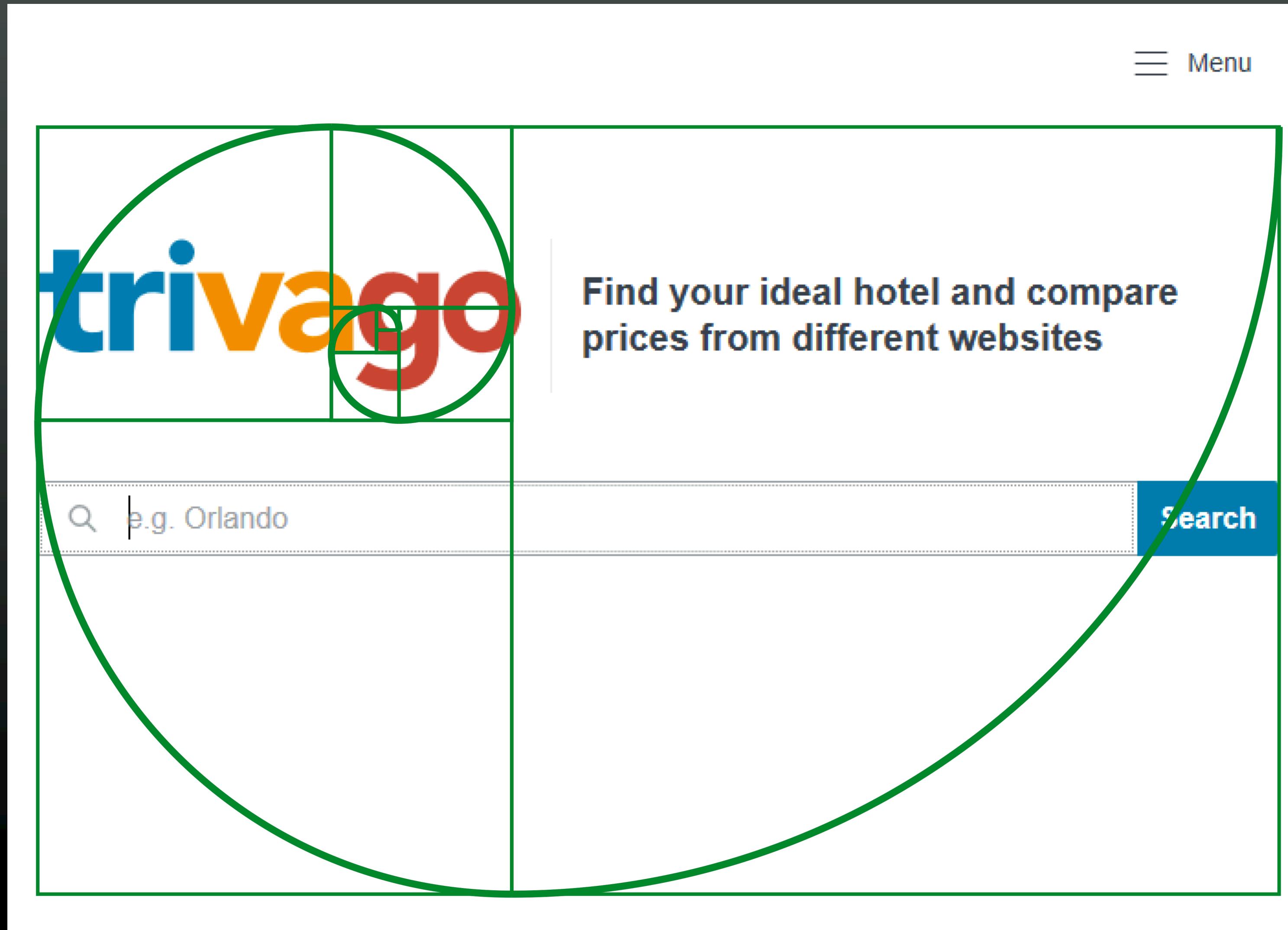
MEMBER FEATURE STORY

# Believing Women Means Believing Their Pain

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



# Proportion



# Proximity



The image shows a CarFax fox mascot on the left, wearing a white t-shirt with "CAR.FOX" printed on it. To the right is a sign with a blue border. At the top of the sign is a red price tag with the word "FREE" in white. Below the tag, the text "Create FREE Account" is displayed in a large, bold, blue font. There are two input fields: one for "EMAIL" containing "email@example.com" and one for "PASSWORD" with the placeholder "Enter your password". Below the password field is a list of requirements: "• Minimum 8 Characters", "• 1 Capital Letter", "• 1 Lowercase Letter", and "• 1 Number". At the bottom of the sign is a green button with the text "Create FREE Account" in white.

EMAIL

email@example.com

PASSWORD

Enter your password

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

Create FREE Account

# Rhythm

**Lorem ipsum dolor sit amet, consectetur adipisicing elit. Quasi reprehenderit sint  
  obcaecati reiciendis voluptas voluptate excepturi recusandae ab accusamus  
  deleniti facilis, illo placeat harum, iusto ratione. Ullam laborum voluptas et!**

24px

24px

72px

24px

24px

# This is a header

**Lorem ipsum dolor sit amet, consectetur adipisicing elit. Quasi reprehenderit sint  
  obcaecati reiciendis voluptas voluptate excepturi recusandae ab accusamus  
  deleniti facilis, illo placeat harum, iusto ratione. Ullam laborum voluptas et!**

# Unity



**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](#)

# Unique design considerations

Screen size

Resolution

Brightness

Color density

User preference

Network speed & quality

Assistive technology

# Unique design considerations

Screen size

☞ Responsive layouts

Resolution

☞ SVG, responsive images

Brightness

☞ Contrast

Color density

☞ Color choice, media queries

User preference

Network speed & quality

☞ Responsive images, system fonts

Assistive technology

# Unique design considerations

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 (prefers-reduced-motion: reduce) { ... }
```

# Assistive technologies

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

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

<a href="#figure-3-3">Figure 3.3</a> 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](#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

Text Box

24px

Toggle Switch

Off

Toggle Switch

Off

Slider

Slider

Email

24px

City

Birth Year

24px

20px  
15px  
32px  
34px

Slider

Rating

Rating

11px

80px

11px

80px

20px  
4px

Telephone number

32px

24px

20px  
4px

State

32px

24px

32px

80px

80px

80px

80px

Microsoft

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Provide space around interactive elements

Consider what  
your design  
leaves unsaid

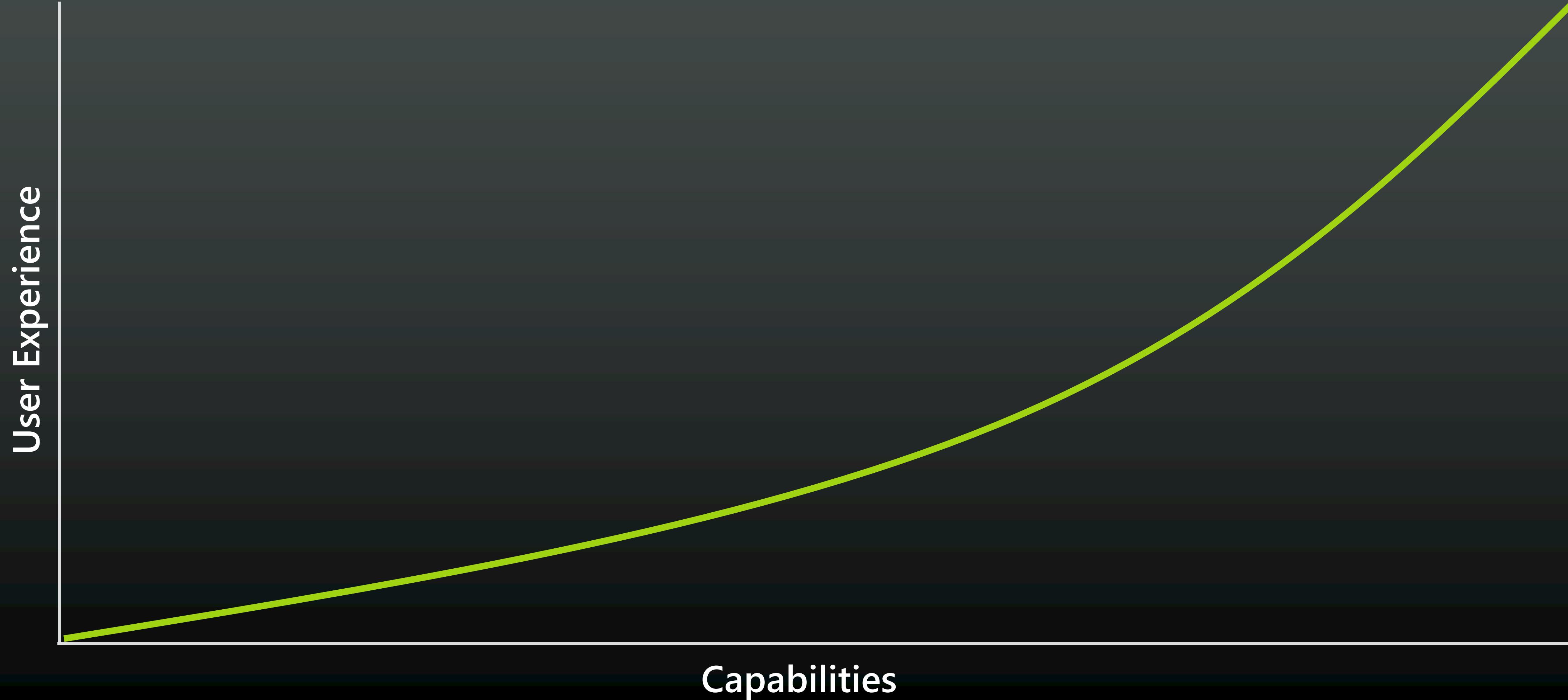
<a href="#">Finish Reading</a>

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</a>

# 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);  
}
```

Older browsers without RGBa support, ignore the second rule

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);  
}
```

Modern browsers with RGBa support, overwrite the first rule

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

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

(That selects h1s that have adjacent sibling paragraphs.)

## 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

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

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

## 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.

# Beware the comma!

```
div:hover .extra-stuff,  
div:focus-within .extra-stuff {  
  
    /* reveal it */  
  
}
```

# Beware the comma!

```
div:hover .extra-stuff,  
div:focus-within .extra-stuff {  
    /* reveal it */  
}
```

Browsers that don't support :focus-within

# Beware the comma!

```
div:hover .extra-stuff,  
div:focus-within .extra-stuff {  
  
    /* reveal it */  
  
}
```

Browsers that do support :focus-within

# Enhancing design in CSS

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

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

# Enhancing design in CSS

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

Browsers without media query support ignore the block

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;  
  }  
}
```

Browsers with media query support  
apply it

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.

# Enhancing design in CSS

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

Browsers that don't grok @supports  
ignore the block

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;  
  }  
}
```

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

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;  
  }  
}
```

Browsers that understand  
@supports and grid apply it

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.



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!**

**ay!**



*Basic, but ok!*



**Gridbyexample**

**Progressive Enhancement**

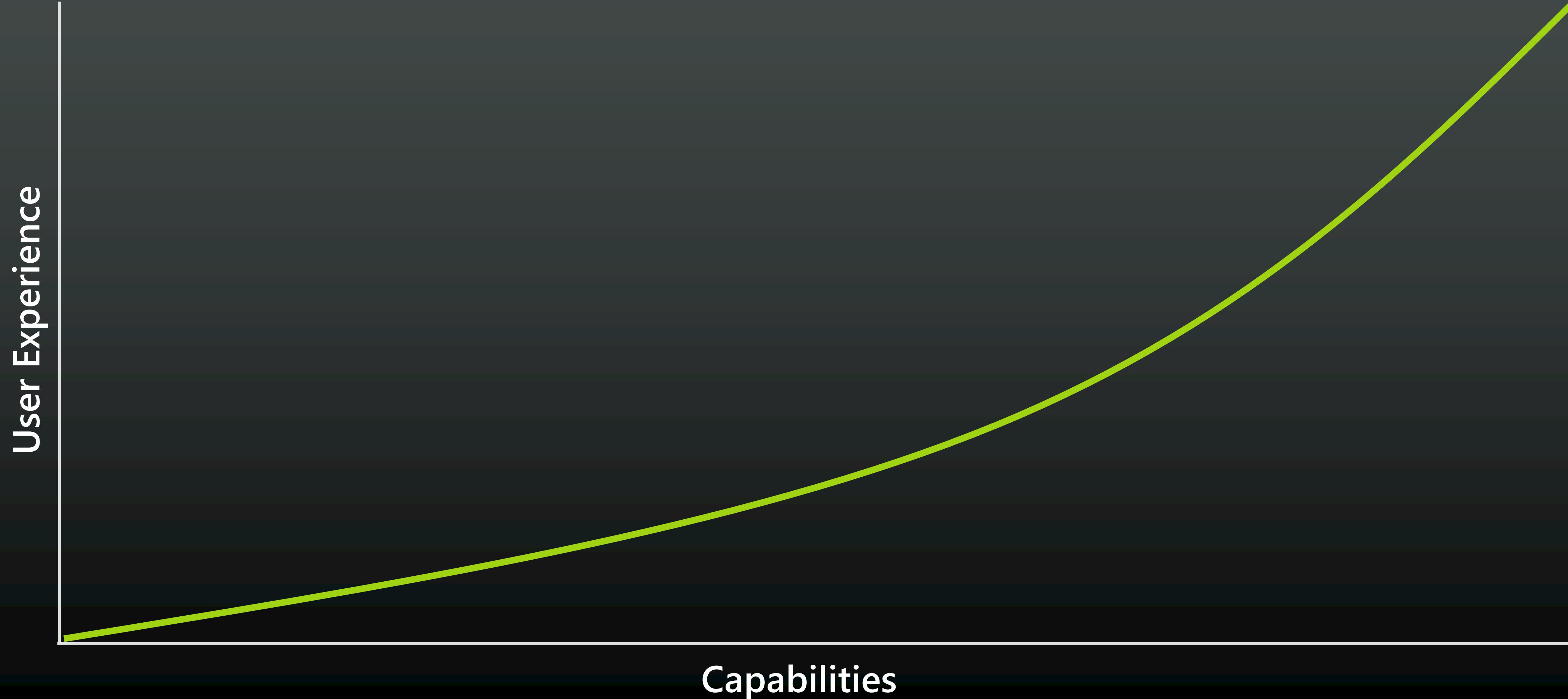
**Grid Garden**

# 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

## Simplified Mobile-first Responsive Example

Primary

Secondary

“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%;  
    }  
}
```

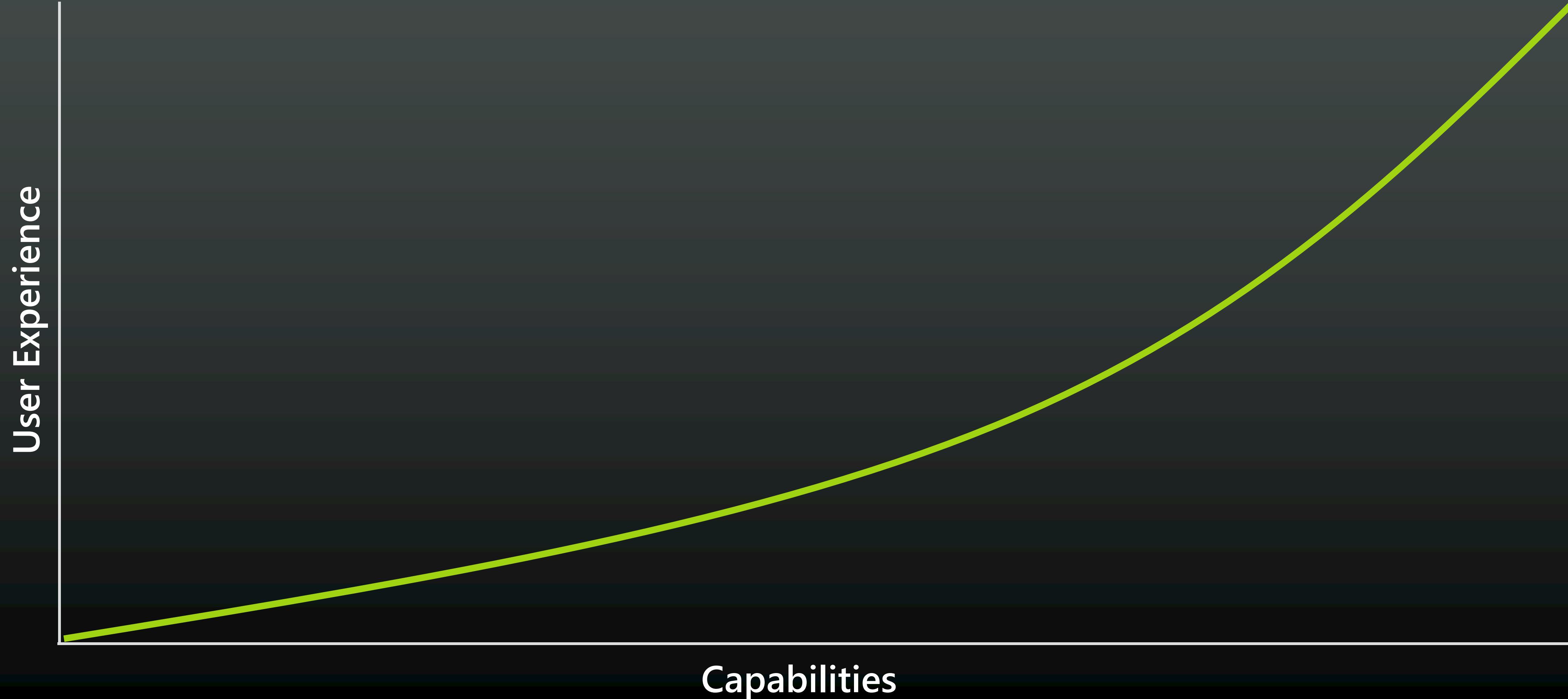
“Mobile first”

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

# Also “mobile first”

- Selectively deliver advances 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 clear blue sky with scattered white clouds. In the center-right, the Washington Monument stands tall and slender. To its left is the large, rectangular Reflecting Pool, which reflects the sky and the surrounding green lawns. The foreground is filled with many people walking on paved paths and sitting on the grass. On the far left, there's a small white kiosk or information booth. The overall scene is a bright, sunny day in a popular national park.

Step 4

# Improve the core experience with JavaScript

A wide-angle photograph of the Washington Monument and the Reflecting Pool in Washington D.C. The image shows the long, rectangular reflecting pool stretching towards the monument. On either side of the pool are rows of trees and paved walkways where many people are walking or sitting. The Washington Monument is a tall, thin obelisk in the background. The sky is blue with some white clouds.

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

The background image shows the Washington Monument standing tall against a blue sky with scattered white clouds. In the foreground, the long, rectangular Reflecting Pool stretches towards the monument. The pool's surface is calm, reflecting the sky. On either side of the pool, there are green lawns and rows of trees. Many people are walking along the paths around the pool and the base of the monument. The overall scene is a clear, sunny day.

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

Sadly, that's not the case  
with JavaScript

# Got 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?

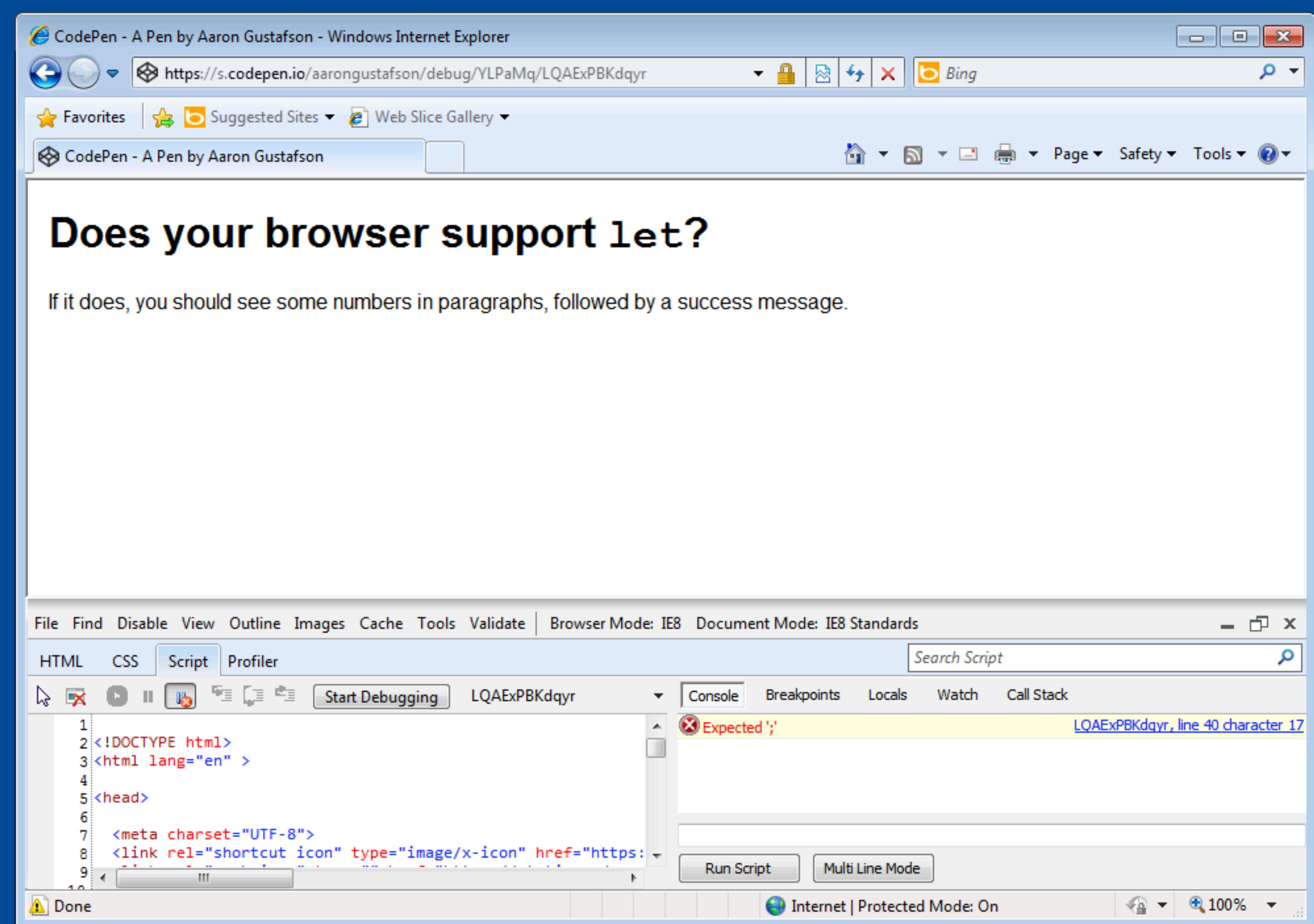
1

2

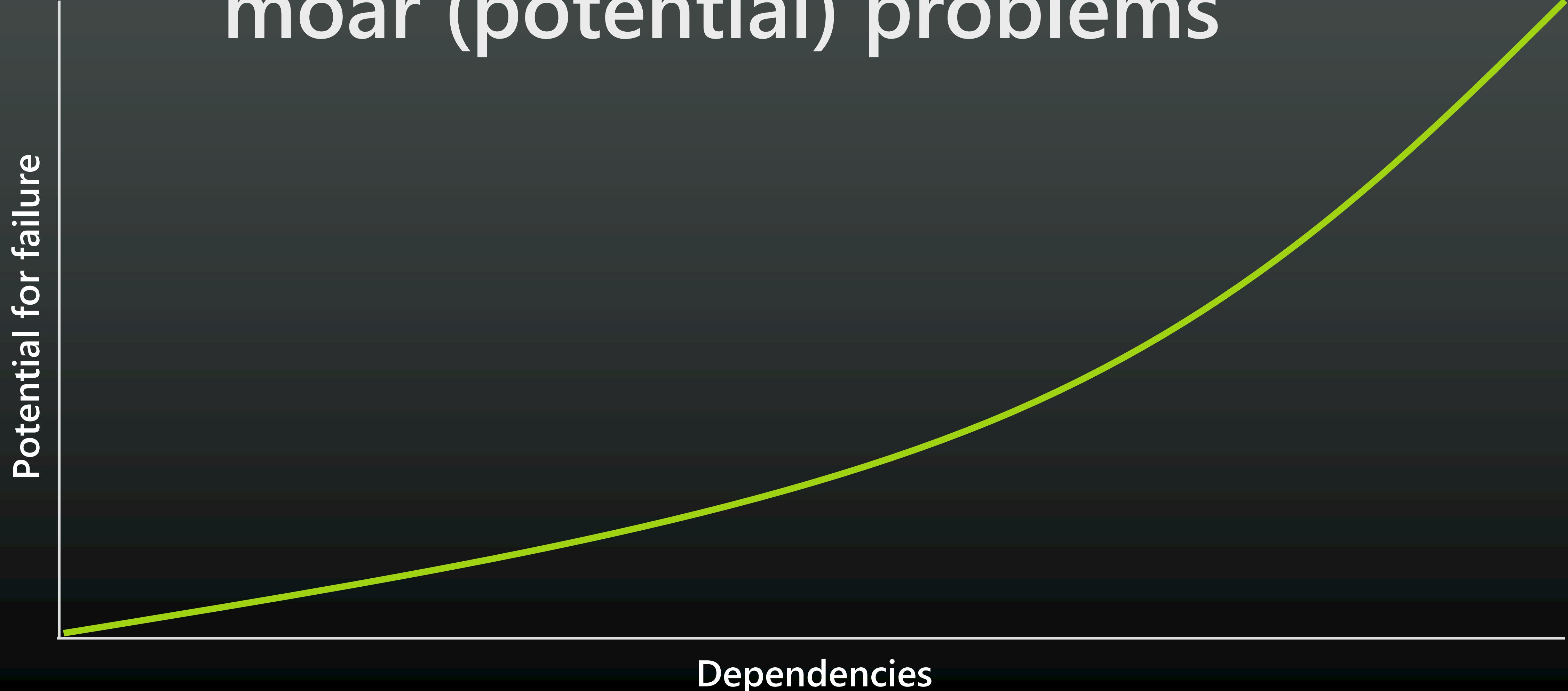
3

4

Success!



# Moar dependencies, moar (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 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.

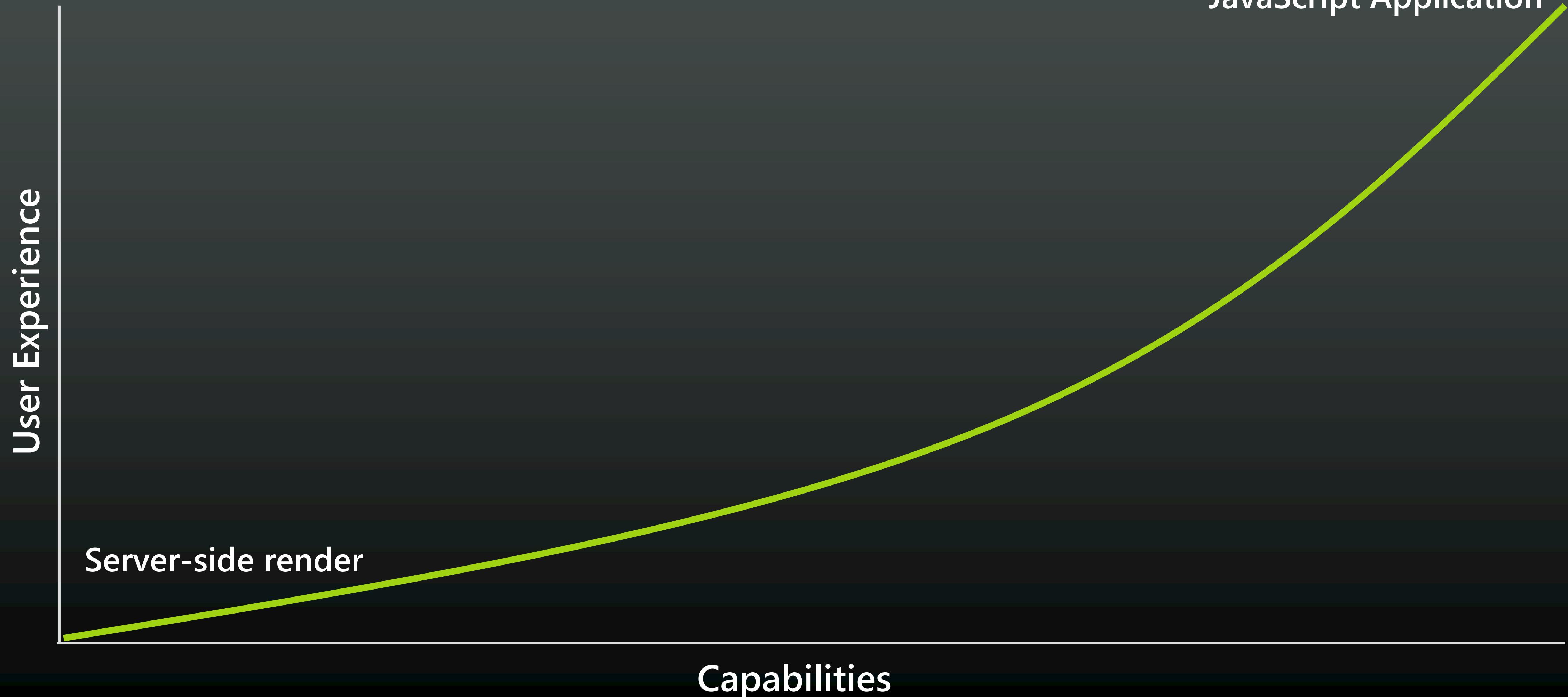
## Why jQuery made sense early on

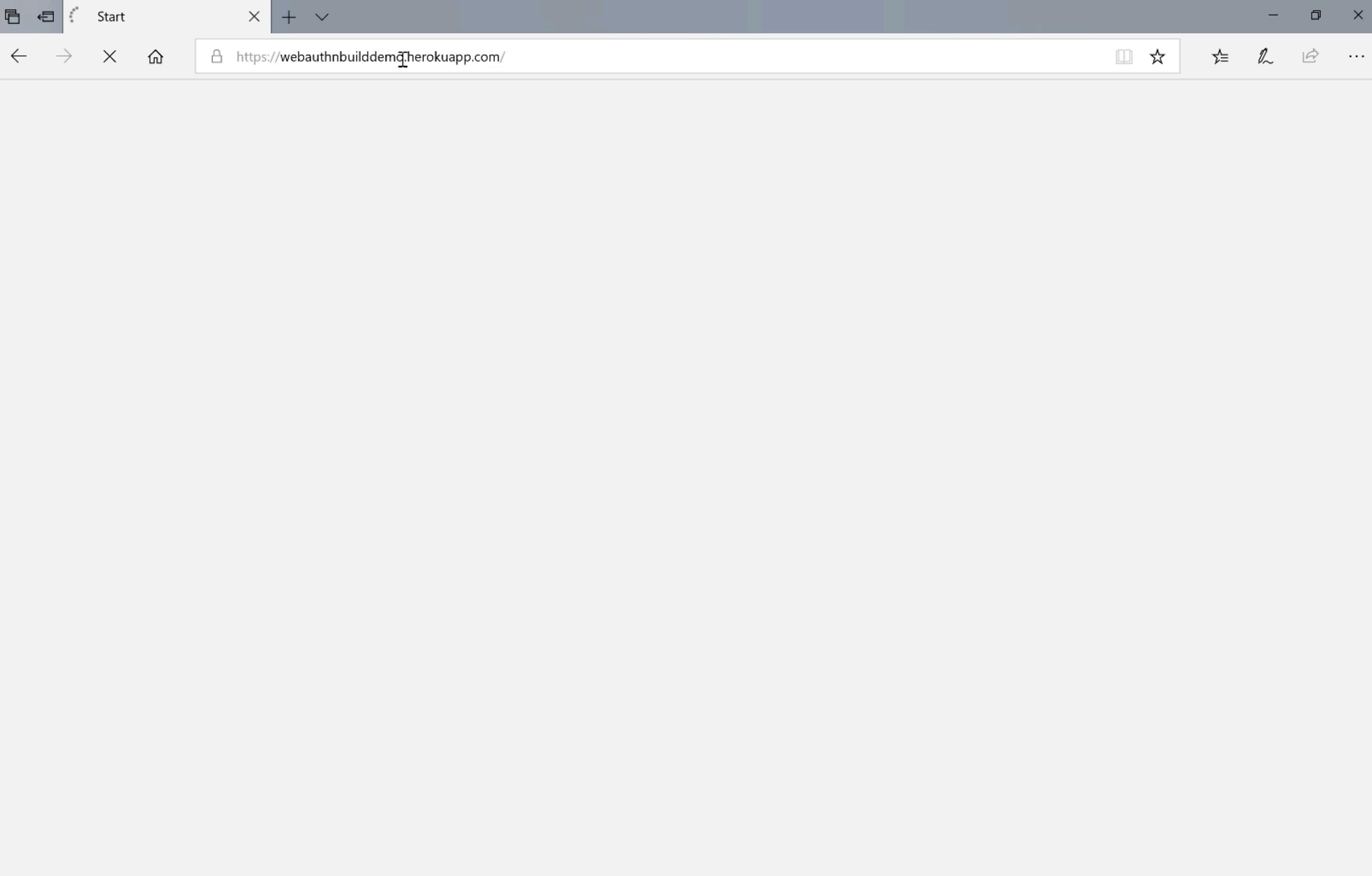
GitHub.com pulled in [jQuery 1.2.1](#) as a dependency in late 2007. For a bit of context, that was a year before Google released the first version of their Chrome browser. There was no standard way to query DOM elements by a CSS selector, no standard way to animate visual styles of an element, and the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

We can and should use JavaScript,  
but thoughtfully & intentionally



# Enhance the experience

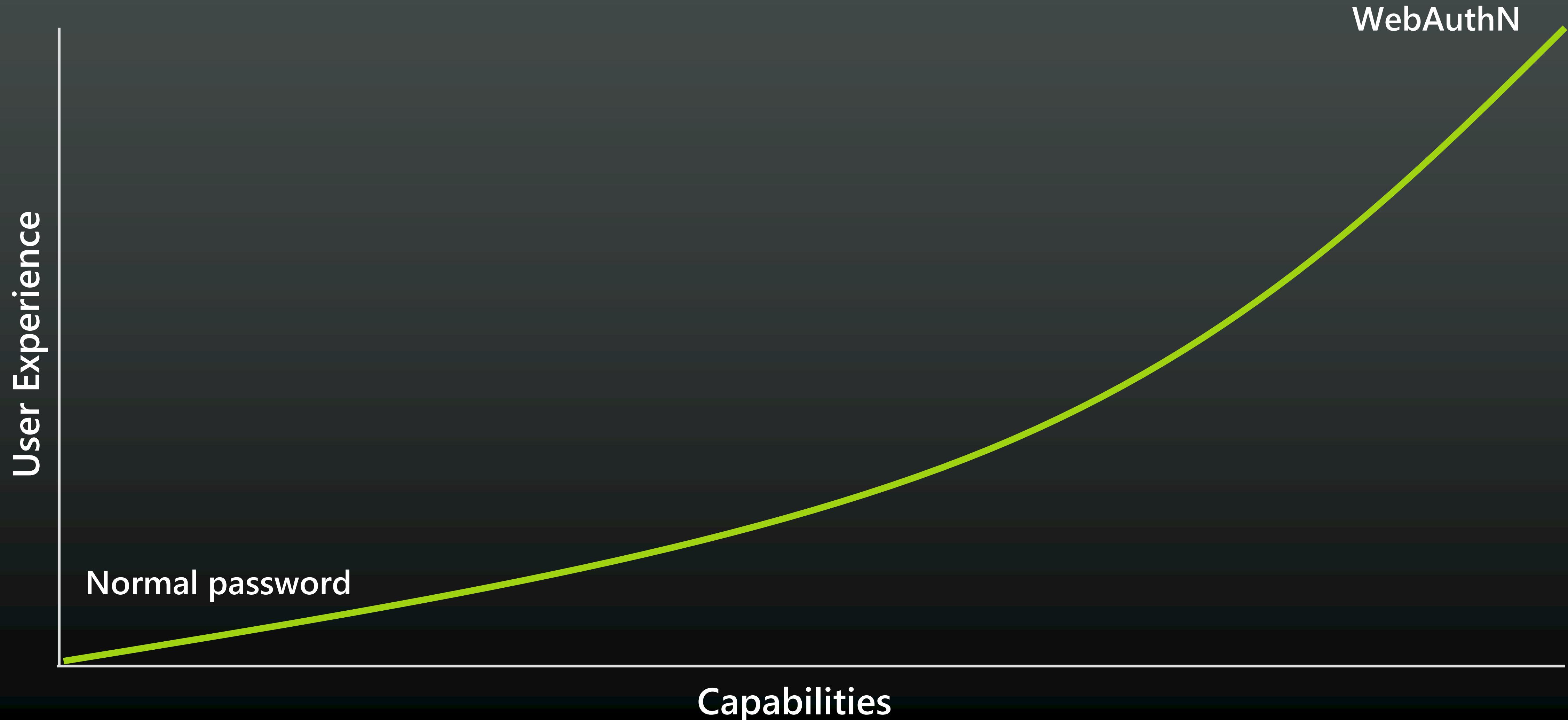




# Detecting support

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

# Enhance the experience



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



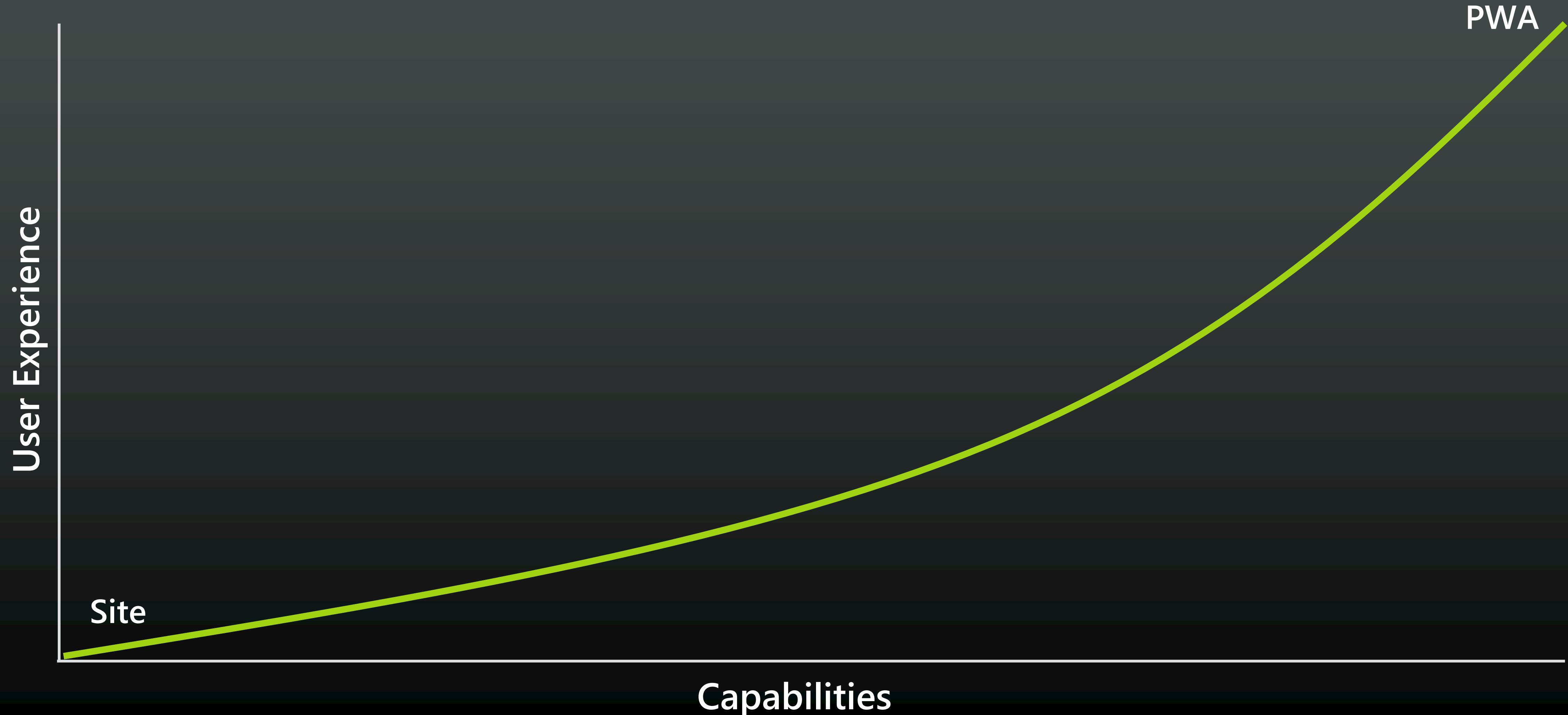
# Registering a Service Worker

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

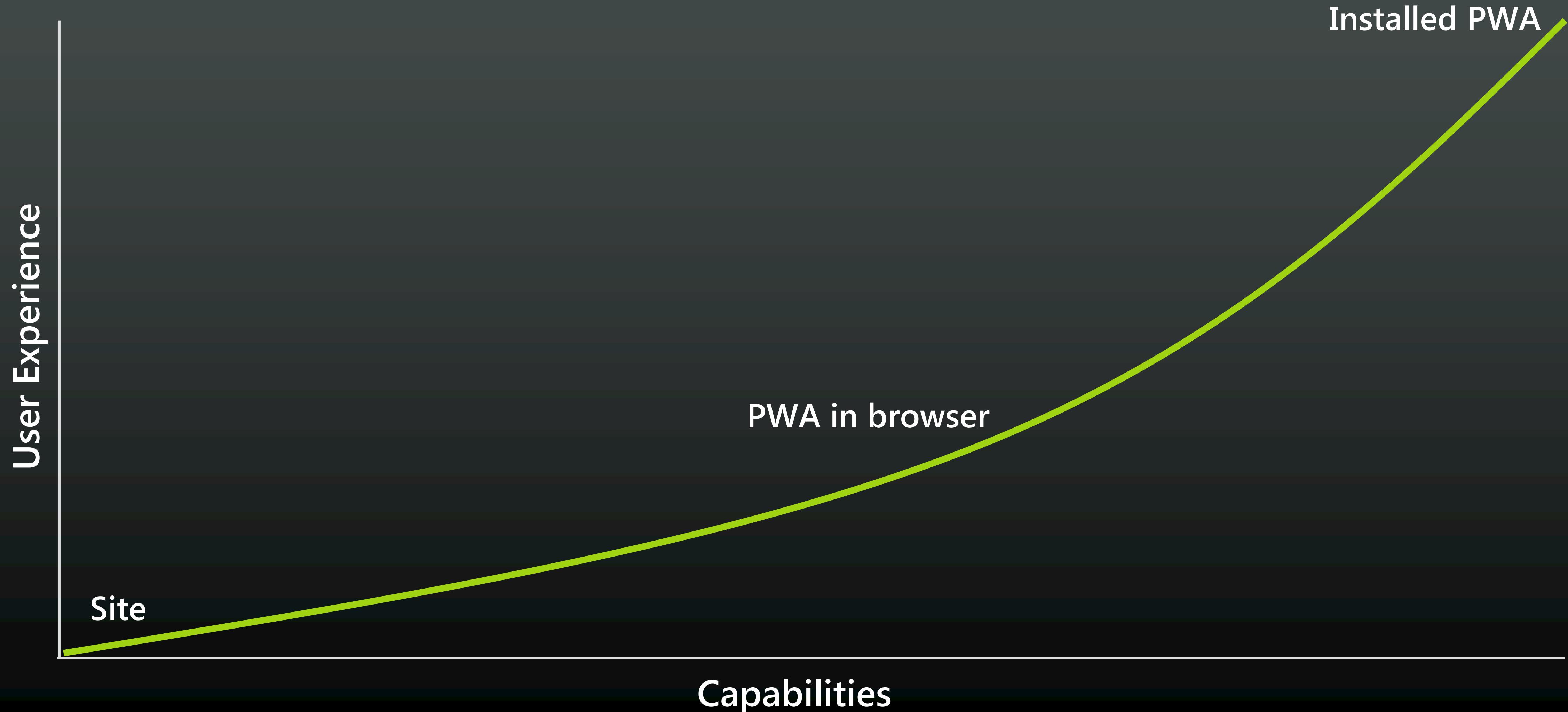
# Object detection FTW!

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

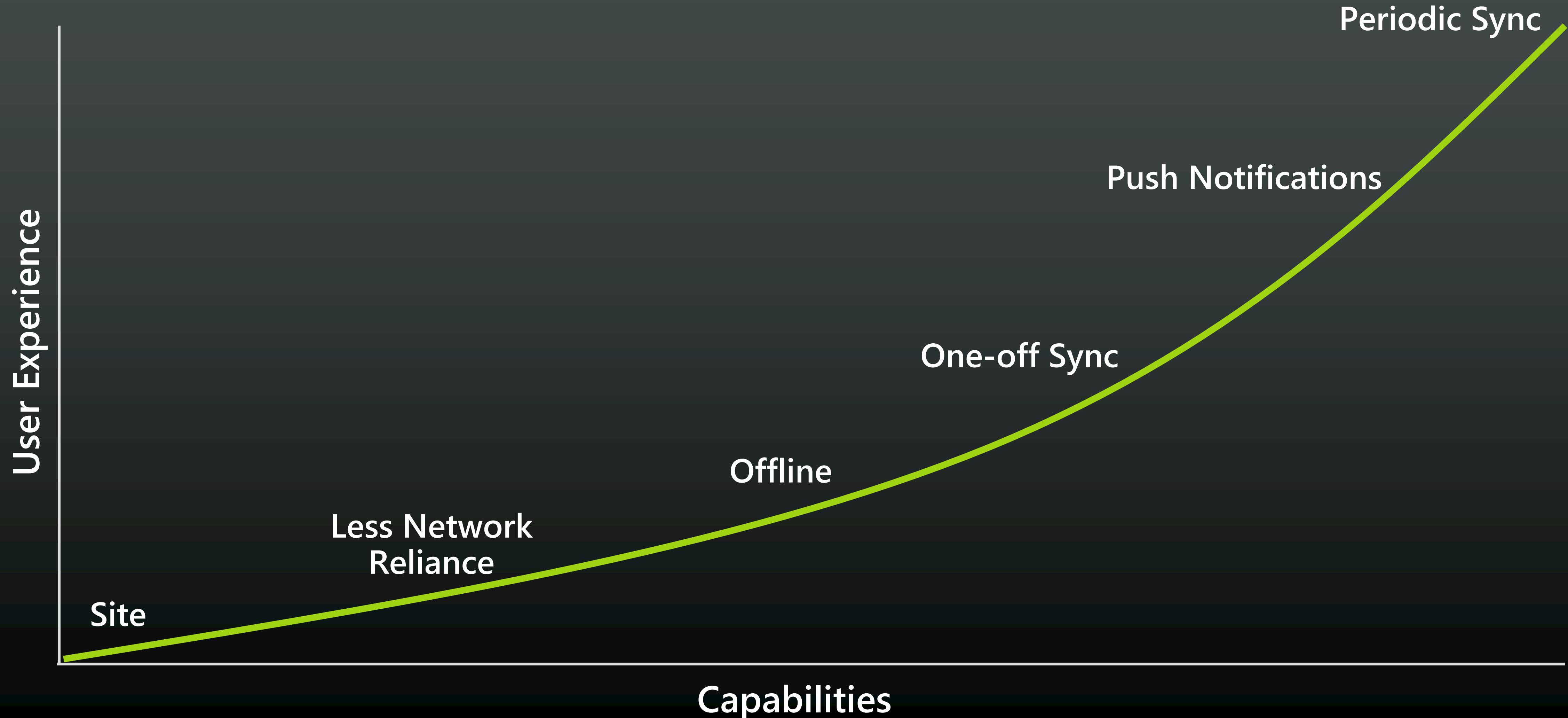
# Enhance the experience



# Enhance the experience



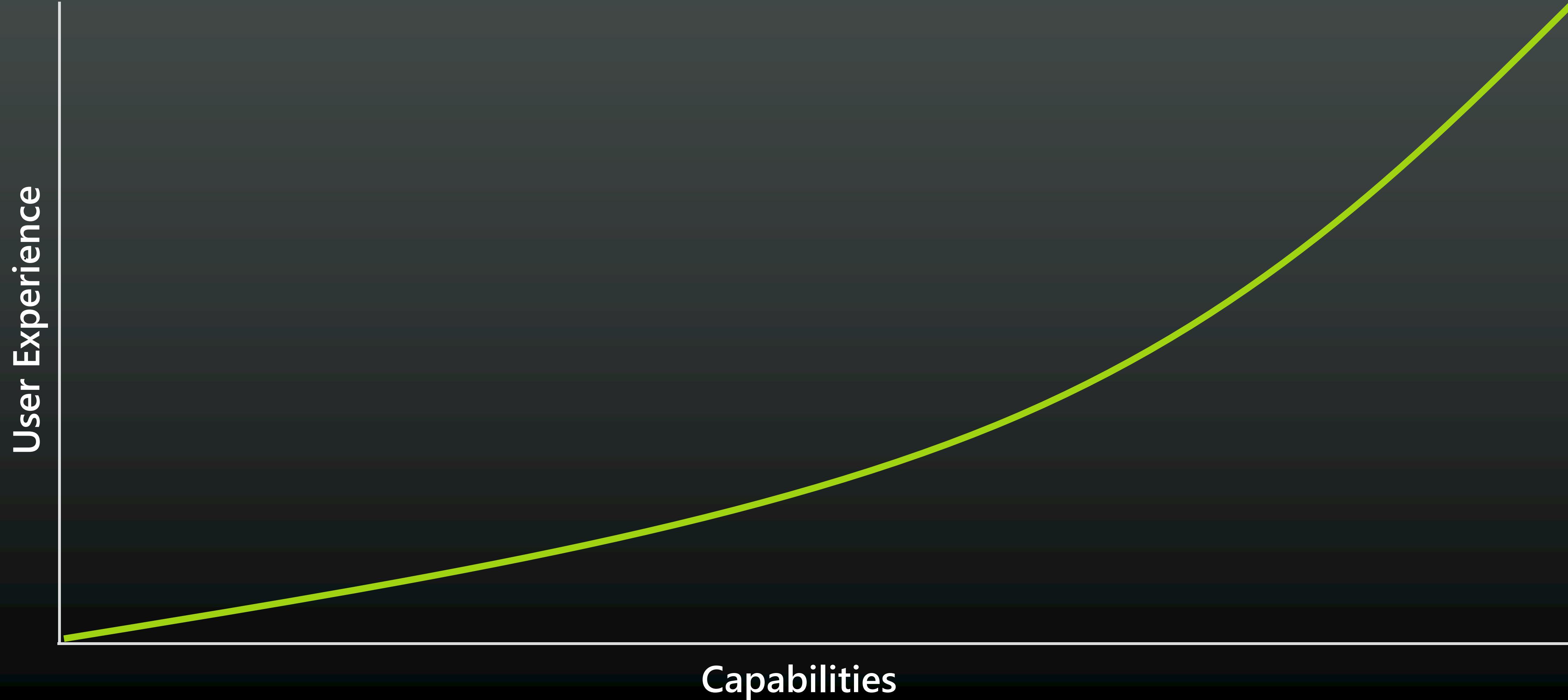
# Enhance the Service Worker



A wide-angle photograph of the Washington Monument and the Reflecting Pool in Washington D.C. The image shows the long, rectangular reflecting pool stretching towards the monument. On either side of the pool are rows of trees and green lawns. The Washington Monument is a tall, thin obelisk in the background. The sky is blue with scattered white clouds. In the foreground, there are many people walking on the paved areas around the pool.

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



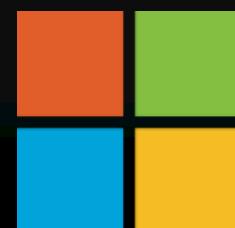
# Focus Design

# Markup JavaScript



# Thank you!

@AaronGustafson  
[aaron-gustafson.com](http://aaron-gustafson.com)  
[noti.st/AaronGustafson](http://noti.st/AaronGustafson)



Microsoft