

Making Web Apps
Lightning Fast @ Microsoft



极客邦科技 会议推荐2019

5月

QCon 北京

全球软件开发大会
大会: 5月6–8日
培训: 5月9–10日

QCon 广州

全球软件开发大会
培训: 5月25–26日
大会: 5月27–28日

6月

GTLC 上海
GLOBAL TECH LEADERSHIP CONFERENCE

技术领导力峰会
时间: 6月14–15日

GMTC 北京

全球大前端技术大会
大会: 6月20–21日
培训: 6月22–23日

ArchSummit 深圳

全球架构师峰会
大会: 7月12–13日
培训: 7月14–15日

QCon 上海

全球软件开发大会
大会: 10月17–19日
培训: 10月20–21日

GMTC 深圳

全球大前端技术大会
大会: 11月8–9日
培训: 11月10–11日

AiCon 北京

全球人工智能与机器学习大会
大会: 11月21–22日
培训: 11月23–24日

7月

10月

11月

12月

TGO鲲鹏会

汇聚全球科技领导者的高端社群

■ 全球12大城市

■ 850+高端科技领导者

使命
Mission

为社会输送更多优秀的
科技领导者

愿景
Vision

构建全球领先的有技术背景
优秀人才的学习成长平台



扫描二维码，了解更多内容

Program Manager

Microsoft, Microsoft Edge - Ecosystem, Seattle, WA

Maintainer

webpack

Core Team

Angular / angular-cli

Evangelist

Open Source Sustainability

Representative

NodeJS Foundation, Modules Group
W3C, WebAssembly CG





TheLarkInn ♂

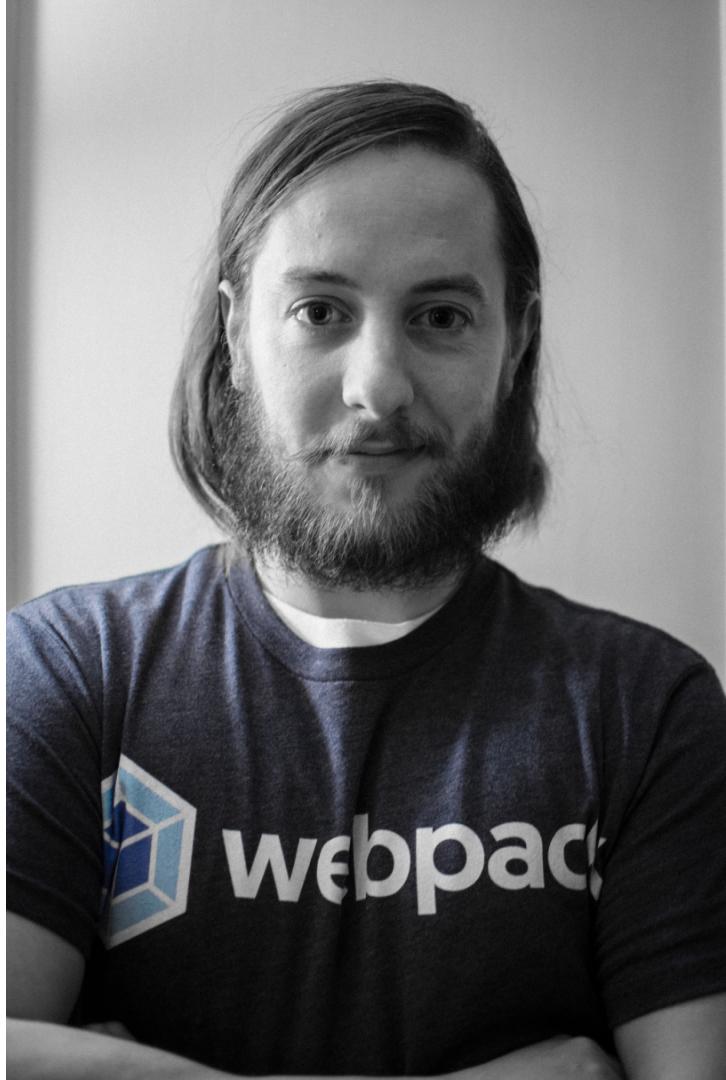
Scan QRCode to follow me



微博



微信



Background

Former Tech Support Rep. gone / rogue turned Software Engineer / Web Developer who got tired of never being able to really help the customer he served.

Languages: Ruby, Objective-C, Swift, Javascript.

Other: Woodworker, 🐓 farmer, IoT

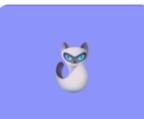
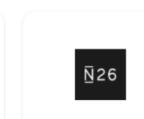
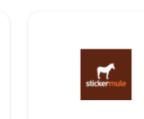


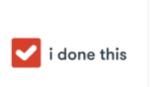
Objective

C-Programming

JS



 trivago trivago Engineering is a great place to learn, grow, and do great... SPONSOR Since August 2017 \$70,000 amount contributed	 ag-Grid Our mission is simple: Build the best Javascript datagrid in the ... SPONSOR Since March 2017 \$30,000 amount contributed	 Capital One	 Adobe	 slack Where Work Happens.	 PhotoEditorSDK	 VTEX We are creating the first ever commerce app platform!	 Frontend Masters JavaScript & Node.js front-end engineering courses	 X-Team Motivated developers, ready to join your team, http://x-team.com	 Alligator.io Front-End Web Development, Chewed Up
 Facebook Open Source Facebook Open Source Team	 Tipe Next Generation API-first CMS for developers.	 Webflow Webflow is a web design tool, CMS, and hosting platform in one.	 egghead.io	 keycdn Content delivery network crafted from the ground up with focus on ...	 Waffle.io Helping open source projects do project management!	 N26	 Rollbar Real-time error monitoring, alerting, and analytics for software...	 Sticker Mule Custom stickers that kick ass.	 Sebastian Software GmbH Experts for Webpack & React. Consulting Services from Germany.
 SPONSOR Since October 2017 \$5,000 amount contributed	 SPONSOR Since November 2016 \$4,522 amount contributed	 SPONSOR Since May 2017 \$3,600 amount contributed	 SPONSOR Since January 2017 \$3,500 amount contributed	 SPONSOR Since November 2017 \$2,751 amount contributed	 BACKER Since January 2017 \$1,400 amount contributed	 SPONSOR Since August 2017 \$1,400 amount contributed	 SPONSOR Since January 2018 \$1,400 amount contributed	 BACKER Since February 2017 \$1,300 amount contributed	 BACKER Since December 2016 \$1,225 amount contributed
 上线了 sxl.cn	 Sentry.io Sentry's real-time error tracking gives you insight into production ...	 airbnb	 5 minutes of React podc...	 peerigon We love Open Source and the Open Web!	 Accelerate Accelerate loves to sponsor user groups and open source communities! ...	 HubSpot We're on a mission to make the world more inbound.	 Icons8 Making the icons for front-end developers	 ZEIT https://zeit.co	 synedra IT GmbH
 BACKER Since June 2017 \$2,652 amount contributed	 SPONSOR Since January 2017 \$2,600 amount contributed	 SPONSOR Since October 2017 \$2,500 amount contributed	 BACKER Since March 2017 \$2,000 amount contributed	 BACKER Since October 2016 \$1,700 amount contributed	 BACKER Since March 2017 \$1,200 amount contributed	 SPONSOR Since March 2017 \$1,200 amount contributed	 SPONSOR Since March 2017 \$1,174 amount contributed	 BACKER Since December 2016 \$1,000 amount contributed	 SPONSOR Since February 2017 \$1,000 amount contributed

 AMP Project	 SoftwarePlant	 We're a UX design agency in San Francisco.	 Modus Create	 Clevertech	 Open Listings Our mission is to make buying a home simple and affordable	 Uptrend Technology, Inc. We help companies transform great ideas into great products.	 Say Yup	 Lagged Play free games at lagged.com	 Freegames66.com
SPONSOR Since January 2018	BACKER Since January 2017	BACKER Since July 2017	SPONSOR Since November 2016	SPONSOR Since January 2017	SPONSOR Since December 2016	BACKER Since February 2017	BACKER Since April 2017	BACKER Since October 2017	BACKER Since November 2017
\$1,000 amount contributed	\$800 amount contributed	\$800 amount contributed	\$750 amount contributed	\$750 amount contributed	\$101 amount contributed	\$96 amount contributed	\$90 amount contributed	\$52 amount contributed	\$50 amount contributed
 JetRuby Agency YOUR DIGITAL FUTURE STARTS HERE	 Algolia Building search should be something to look forward to	 reBuy We love to give something back to the open source community :)	 Aviture Inc.	 Coinbase	 French Toasters LLC Software Engineering Consulting Company	 Cucumber Limited	 Indexed Web development build websites, webshops and SaaS tools	 Snaptortoise Web development, design and consulting services based out of Portland,...	 CodePilot.ai Dev team building "Google for Developers" an awesome search tool...
BACKER Since September 2017	BACKER Since November 2016	SPONSOR Since February 2017	SPONSOR Since February 2017	BACKER Since February 2018	BACKER Since March 2017	SPONSOR Since November 2017	BACKER Since December 2017	BACKER Since December 2017	SPONSOR Since February 2018
\$600 amount contributed	\$500 amount contributed	\$500 amount contributed	\$500 amount contributed	\$500 amount contributed	\$45 amount contributed	\$30 amount contributed	\$30 amount contributed	\$25 amount contributed	\$25 amount contributed
 Work & Co	 React Native Training Teaching cutting edge cross-platform application development to...	 i Done This More than 160,000 people use I Done This's easy daily check-ins ...	 Mixmax The future of professional communication	 DontPayFull	 Maxflow BVBA (BE 055...	 Priou	 Arti Villa	 Petagadget	 Elegant Media Melbourne Based iPhone, Android App and Web Development Agency
SPONSOR Since October 2016	BACKER Since May 2017	SPONSOR Since October 2016	SPONSOR Since January 2018	SPONSOR Since February 2018	BACKER Since October 2017	BACKER Since October 2017	BACKER Since October 2017	SPONSOR Since November 2017	SPONSOR Since December 2017
\$300 amount contributed	\$300 amount contributed	\$200 amount contributed	\$200 amount contributed	\$200 amount contributed	\$20 amount contributed	\$10 amount contributed	\$10 amount contributed	\$10 amount contributed	\$10 amount contributed



about budget contributors

contribute

Submit Expense



Backers

The following **Backers** are individuals who have contributed various amounts of money in order to help support webpack. Every little bit helps, and we appreciate even the smallest contributions.



BECOME A BACKER

Web Performance

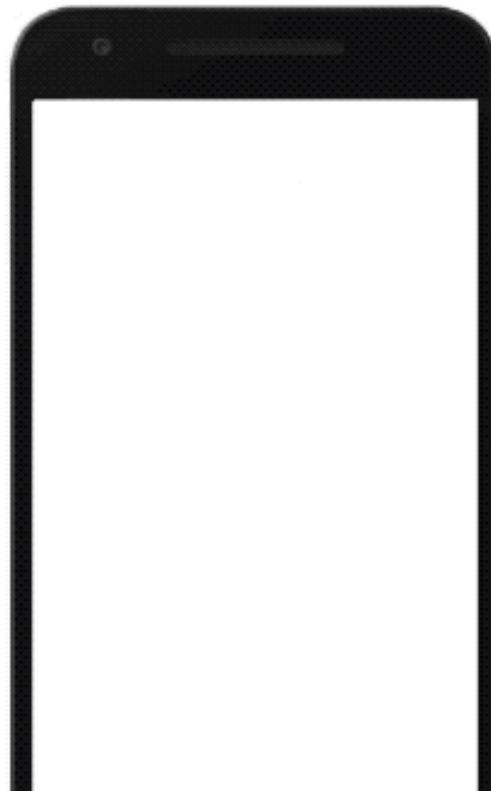
Interactivity

TIME TO INTERACTIVE

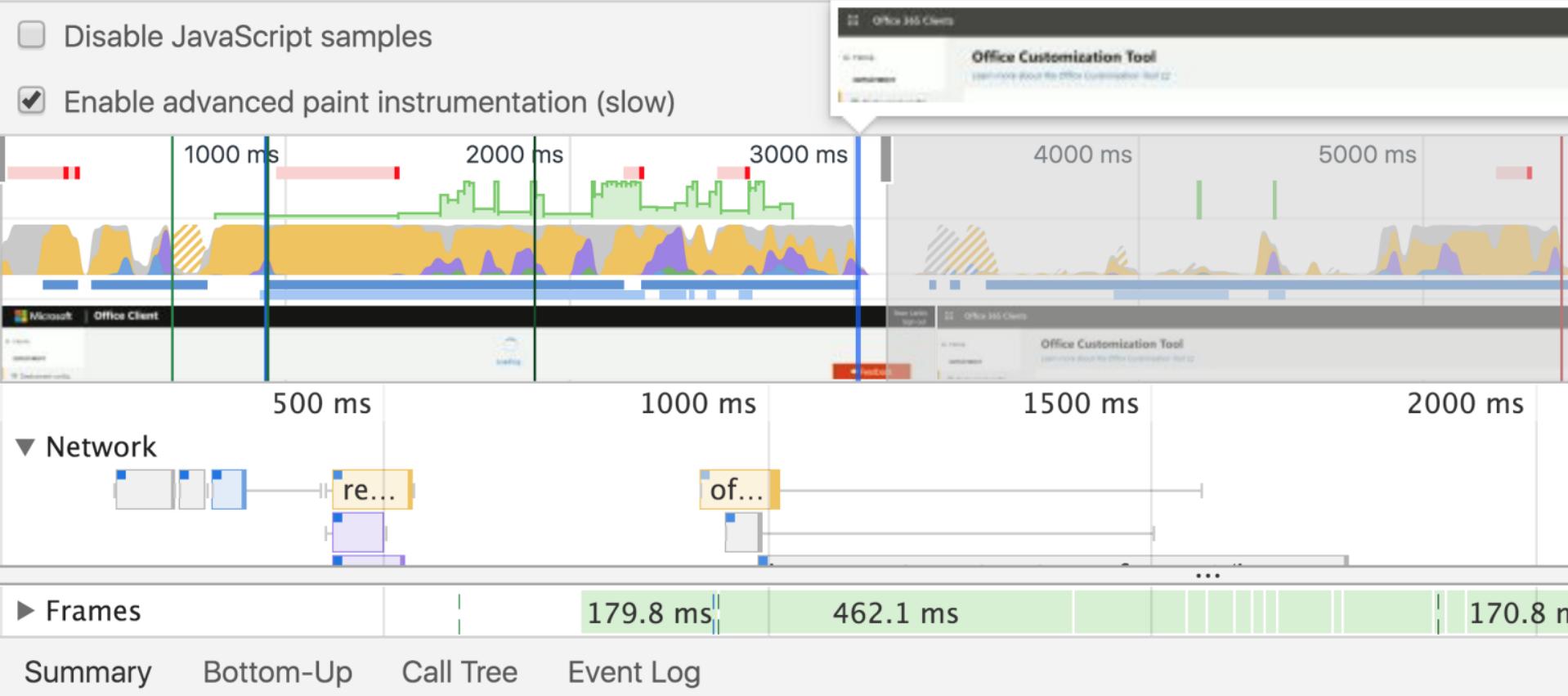
0s 00



0s 00



Initial Page Load



Top 3 Web Page Load Time Causes:

Amount of JavaScript For Initial Download

Amount of CSS For Initial Download

AMount of Network Requests on Initial Download

Goals:

<=200kb (UNCOMPRESSED) *Initial JavaScript [total]*

<=100kb (UNCOMPRESSED) *Initial CSS [total]*

HTTP: <= 6 Initial Network Calls

HTTP/2: <= 20 Initial Network Calls

90% Code Coverage (only 10% code unused)

Code Splitting

Code Splitting

code splitting

Microphone icon and magnifying glass icon.

All Videos News Shopping Images More Settings Tools

About 36,300,000 results (0.68 seconds)

code splitting - Webpack
<https://webpack.github.io/docs/code-splitting.html> ▾
This feature is called “code splitting”. It’s an opt-in feature. You can define split points in your code base. Webpack takes care of the dependencies, output files ...

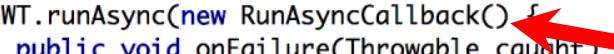


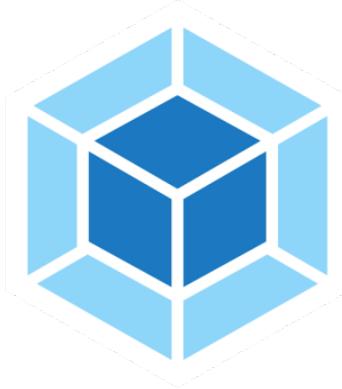
For example, here is the initial, unsplit Hello sample that comes with GWT:

```
public class Hello implements EntryPoint {  
    public void onModuleLoad() {  
        Button b = new Button("Click me", new ClickHandler() {  
            public void onClick(ClickEvent event) {  
                Window.alert("Hello, AJAX");  
            }  
        });  
    }  
}
```

Suppose you wanted to split out the `Window.alert` call into a separate code download. The following code accomplishes this:

```
public class Hello implements EntryPoint {  
    public void onModuleLoad() {  
        Button b = new Button("Click me", new ClickHandler() {  
            public void onClick(ClickEvent event) {  
                GWT.runAsync(new RunAsyncCallback() {  
                    public void onFailure(Throwable caught) {  
                        Window.alert("Code download failed");  
                    }  
  
                    public void onSuccess() {  
                        Window.alert("Hello, AJAX");  
                    }  
                });  
            }  
        });  
        RootPanel.get().add(b);  
    }  
}
```





webpack

Code Splitting

Process of splitting pieces of your code into async chunks [at build time]

How Does it
Work?

Two Types

Two Types

static

“dynamic”

Static

When to use:
“Heavy” JavaScript
Anything temporal
Routes

```
import Listener from './listeners.js';

const getModal = () => import('./src/modal.js');

Listener.on('didSomethingToWarrentModalBeingLoaded', () => {
  // Async fetching modal code from a separate chunk
  getModal().then((module) => {
    const modalTarget = document.getElementById('Modal');
    module.initModal(modalTarget);
  });
});
```

```
import Listener from './listeners.js';

const getModal = () => import('./src/modal.js');

Listener.on('didSomethingToWarrentModalBeingLoaded', () => {
  // Async fetching modal code from a separate chunk
  getModal().then((module) => {
    const modalTarget = document.getElementById('Modal');
    module.initModal(modalTarget);
  });
});
```

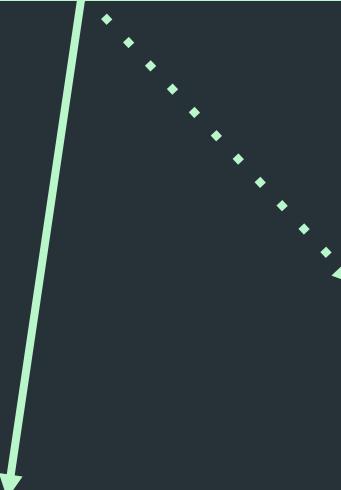
Always returns a Promise

app.js

Async:
Sync: —→

modal.js

listeners.js



Async:
Sync: —→

app.js

modal.js

listeners.js

Async:
Sync: —→

app.js

bundle.js

0.chunk.js

modal.js

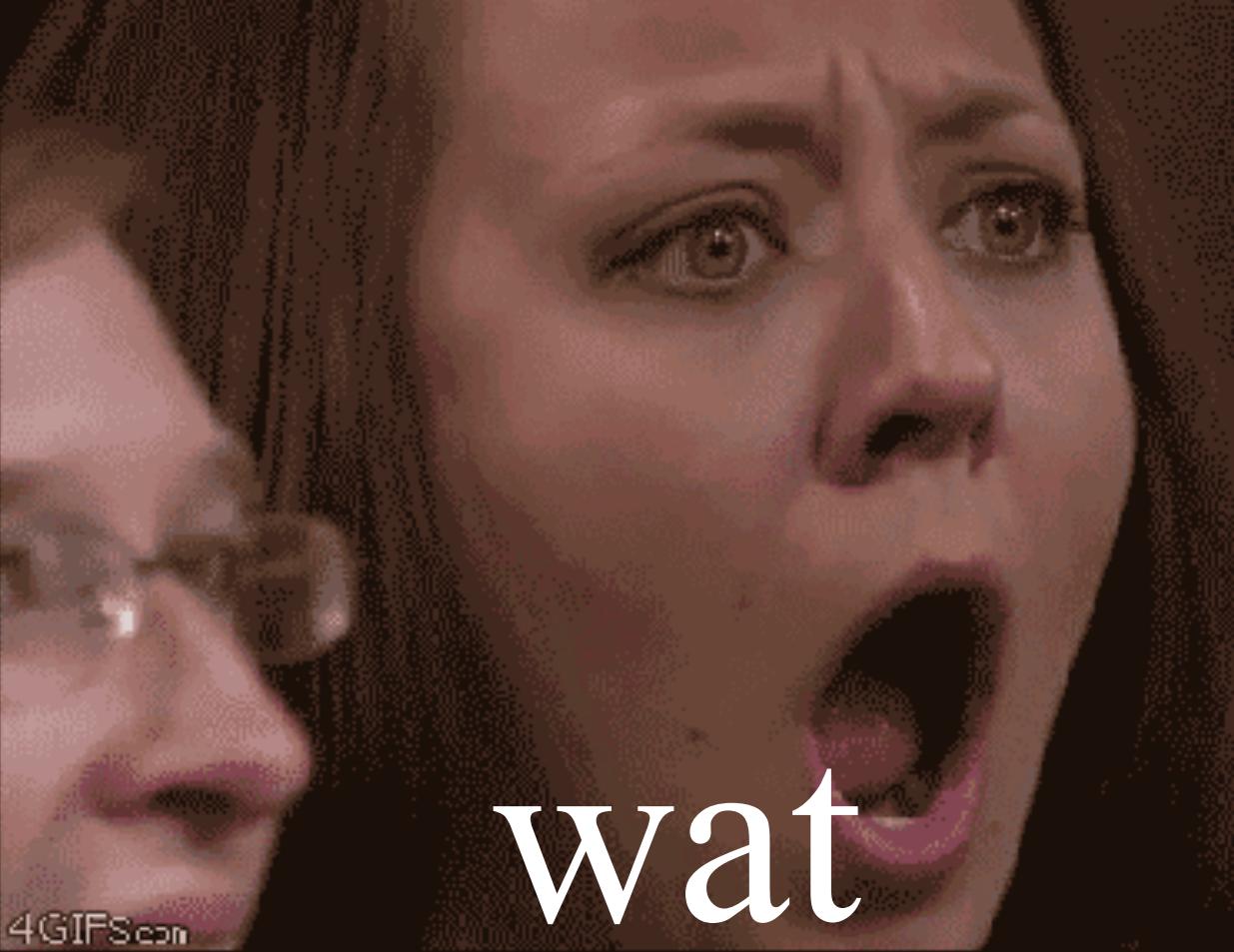
listeners.js

“Dynamic”

```
const getTheme = (themeName) => import(`./src/themes/${themeName}`);  
  
// Using `import()` 'dynamically'  
if (window.feeling.stylish) {  
  getTheme("stylish").then((module) => {  
    module.applyTheme();  
  });  
} else if (window.feeling.trendy) {  
  getTheme("trendy").then((module) => {  
    module.applyTheme();  
  });  
}  
}
```

```
const getTheme = (themeName) => import(`./src/themes/${themeName}`);  
  
// Using `import()` 'dynamically'  
if (window.feeling.stylish) {  
  getTheme("stylish").then((module) => {  
    module.applyTheme();  
  });  
} else if (window.feeling.trendy) {  
  getTheme("trendy").then((module) => {  
    module.applyTheme();  
  });  
}  
}
```

*Loading an async bundle based on runtime
conditions*

A close-up photograph of a woman's face. She has wide eyes, a slightly open mouth, and her hands are raised near her head, suggesting surprise or alarm. Her hair is dark and curly.

wat

Breakdown

```
const getTheme = (themeName) =>  
|   import(`./src/themes/${themeName}`);
```

```
const getTheme = (themeName) =>  
  import(`./src/themes/${themeName}`);
```

partial path

expression

directory

resolvable

Context

Module

ContextModule!!!

```
const getTheme = (themeName) =>  
  import(`./src/themes/${themeName}`);
```

```
▲ src  
  ▲ themes  
    JS hipster.js  
    JS sheek.js  
    JS stylish.js  
    JS trendy.js  
    JS vintage.js
```

*“Hey webpack! Find me all modules
in this partial path”*



When to use:
AB Testing
Theming
Convenience

Real world?!

[Home](#)

Case Studies

[Office Anayltics](#)

Edge WebPerf Journal

Edge WebPerf Journal team works with internal Microsoft partners and helps identifies areas of impact and opportunities for their web applications. We then take these reports, convert it into externally facing blog posts / resources on WebPerf and Architecture for the greater JavaScript and Web development community.

Last Updated: 4/18/2019, 1:51:21 AM

[Office Anayltics →](#)

Office Customization Tool

Learn more about the Office Customization Tool [↗](#)

[Import](#)[Export](#)

Deployment settings

Products and releases

Architecture

Which architecture do you want to deploy?

- 32-bit
 64-bit

Products*

Which products and apps do you want to deploy?

Office Suites

Select Office Suites product

Visio

Select Visio product

Project

Select Project product

Additional Products

Configured settings

General

Provide your organization name to set the Company property on Office documents

Not configured

Provide a description for this configuration for documentation purposes

Not configured

Products

Not configured

Architecture

64-bit

Languages

Installation options

Update channel

Not configured

Version to deploy

Not configured

Fallback to CDN

On

Show installation to user

Full

Feedback

What is config.office.com?

Config.Office.Com is a critical collection of Azure based, M365 UX and Services assets with focus on our Office 365 Enterprise customers and their ability to adopt and stay up-to-date and compliant with Office 365 ProPlus, Business Premium, and other M365 commercial offerings. **Config.Office.Com** is designed to be a cross platform Office Client as a Service solution (Win32, Office for Mac, Web (i.e. WAC), and Mobile), including a stand-alone website and the UX and services foundation to deliver **Office 365 Client Admin Center, Desktop Analytics, ConfigMan (SCCM), Intune, and M365 Admin Center** integration, and the foundation for integration with other 3rd party manageability solutions such as JAMF.

[Home](#)

Case Studies

Office Analytics

Overview

Measure [how it affects the user]

Profile [the primary cost]

Diagnose [the Unoptimized Behavior]

Identify [Root Cause]

Attempt[ed Fixes]

Results

Overview

Reason for Outreach

The OXO Manageability team had noticed that there were some considerable issues with their web application load times. In addition, they were interested in being able to upgrade to [webpack](#) 4.

Architecture & Technologies

- Single Page Application (SPA)
- ReactJS
- TypeScript



Home

Case Studies

Office Analytics

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Measure [how it affects the user]

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Diagnose [the Unoptimized Behavior]

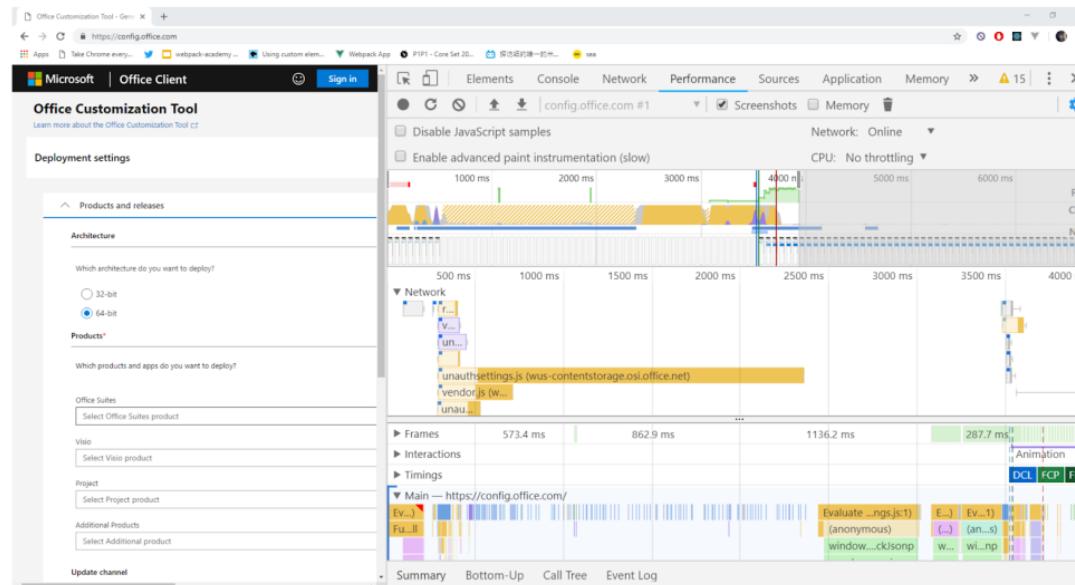
Identify [Root Cause]

Attempt[ed Fixes]

Results

Measure [*how it affects the user*]

Timings



Measurement	Broadband	3G (Fast)
First Meaningful Paint (FMP)	4106 ms	20072 ms
Time to Interactive (TTI)	4253 ms	21335 ms

[Home](#)

Case Studies

Office Analytics

Overview

Measure [how it affects the user]

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Diagnose [the Unoptimized Behavior]

Identify [Root Cause]

Attempt[ed Fixes]

Results

Code Coverage [Usage]

URL	Type	Total Bytes	Unused Bytes	
https://wus-contentstorage.osi.office.net/flux/uxbuild.../unauthsettings.js	JS	16 228 ...	1 446 0.0 %	
https://wus-contentstorage.osi.office.net/flux/uxbuilds/19.221.../vendor.js	JS	2 059 0...	1 348 428 65.1 %	
https://wus-contentstorage.osi.office.net/flux/uxbuilds/19.22... /unauth.js	JS	452 435	318 578 70.4 %	
https://wus-contentstorage.osi.office.net/.../officebrowserfeedback.min.js	JS	316 307	253 814 80.2 %	
https://wus-contentstorage.osi.office.net/flux/uxbuild.../unauth-styles.css	CSS	314 563	307 982 97.9 %	
https://wus-contentstorage.osi.office.net/flux/uxbuilds/19... /resources.js	JS	301 356	0 0 %	
https://wus-contentstorage.osi.office.net/flux/uxbuilds... /vendor-styles.css	CSS	6 295	5 026 79.8 %	
https://config.office.com/	JS	3 733	0 0 %	

2.1 MB of 18.8 MB bytes are not used. (11%)

NOTE: The report here states 2.1 MB of 18.8 MB are not used, but this is a bug in Dev Tools! The top asset says totaling ~16 MB is marked 0% and therefore isn't getting added to the total coverage numbers.

Unused JavaScript / CSS	Total JavaScript / CSS	Waste Percentage
18.2 MB	18.8 MB	97%



DevTools - config.office.com/

Elements Console Network Performance Sources Application Memory Security Audits AdBlock React

jquery.js content.index.js unauth-styles.css:formatted officebrowserfe...n.js:formatted vendor.js:formatted unauthsettings.js:formatted

```
5342
5343     valueName: "cipherChaining",
5344     inputType: "dropdownList",
5345     id: "L_ConfigureCNGCipherChainingModeDropID"
5346   },
5347   name: "L_ConfigureCNGCipherChainingMode",
5348   displayName: "CNG 暗号チェーン モードを構成する",
5349   explainText: "このポリシー設定では、使用する暗号チェーン モードを構成できます。このポリシー設定を有効にした場合、指定した暗号チェーン モードが適用されます。このポリシー設定を有効にした場合、指定した暗号チェーン モードが適用されます。",
5350   tags: ["L_Cryptography", "L_Security", "L_PowerPointOptions", "L_MicrosoftOfficePowerPoint"],
5351   application: "ppt16",
5352   key: "software\\microsoft\\office\\16.0\\powerpoint\\security\\crypto"
5353 },
5354   parentCategory: {
5355     ref: "L_Cryptography"
5356   },
5357   supportedOn: {
5358     ref: "windows:SUPPORTED_Windows7"
5359   },
5360   elements: {
5361     items: [
5362       {
5363         valueName: "cipherkeybits",
5364         minValue: 0,
5365         minValueSpecified: !0,
5366         maxValue: 1e6,
5367         maxValueSpecified: !0,
5368         inputType: "decimalTextBox",
5369         caption: "暗号キーの長さ",
5370         id: "L_SetCNGCipherKeyLengthSpinID"
5371       }
5372     ],
5373     name: "L_SetCNGCipherKeyLength",
5374     displayName: "CNG 暗号キーの長さを設定する",
5375     explainText: "このポリシー設定では、暗号キーを作成する際に使用するバイト数を構成できます。この数値は 8 の倍数に切り捨てられます。このポリシー設定を有効にした場合、指定したキー ビー",
5376     tags: ["L_Cryptography", "L_Security", "L_PowerPointOptions", "L_MicrosoftOfficePowerPoint"],
5377     application: "ppt16",
5378     key: "software\\microsoft\\office\\16.0\\powerpoint\\security\\crypto"
5379 },
5380   parentCategory: {
5381     ref: "L_Cryptography"
5382   },
5383   supportedOn: {
5384     ref: "windows:SUPPORTED_Windows7"
5385   },
5386 }
```

LOCALES!!!

```
// locAppSettingsUtils.ts lines 0-20
```

```
import * as OfficeSettings from "../../common/resources/settings-office-en-us-helix.json";
import * as AccessSettings from "../../common/resources/settings-access-en-us-helix.json";
import * as ExcelSettings from "../../common/resources/settings-excel-en-us-helix.json";
import * as OneNoteSettings from "../../common/resources/settings-onent-en-us-helix.json";
import * as OutlookSettings from "../../common/resources/settings-outlk-en-us-helix.json";
import * as PowerPointSettings from "../../common/resources/settings-ppt-en-us-helix.json";
import * as ProjectSettings from "../../common/resources/settings-proj-en-us-helix.json";
import * as PublisherSettings from "../../common/resources/settings-pub-en-us-helix.json";
import * as VisioSettings from "../../common/resources/settings-visio-en-us-helix.json";
import * as WordSettings from "../../common/resources/settings-word-en-us-helix.json";
import * as OfficeSettings_de from "../../common/resources/de/settings-office-de-de-helix.json";
import * as AccessSettings_de from "../../common/resources/de/settings-access-de-de-helix.json";
import * as ExcelSettings_de from "../../common/resources/de/settings-excel-de-de-helix.json";
import * as OneNoteSettings_de from "../../common/resources/de/settings-onent-de-de-helix.json";
import * as OutlookSettings_de from "../../common/resources/de/settings-outlk-de-de-helix.json";
import * as PowerPointSettings_de from "../../common/resources/de/settings-ppt-de-de-helix.json";
import * as ProjectSettings_de from "../../common/resources/de/settings-proj-de-de-helix.json";
import * as PublisherSettings_de from "../../common/resources/de/settings-pub-de-de-helix.json";
import * as VisioSettings_de from "../../common/resources/de/settings-visio-de-de-helix.json";
import * as WordSettings_de from "../../common/resources/de/settings-word-de-de-helix.json";
```

```
/**
```

```
* This is repeated 200 times for each locale, region, and product!!
```

```
*/
```

// locAppSettingsUtils.ts lines 112-153

```
export class LocAppSettingsUtils {
```

```
    public static getAppSettingsFileForLoc = (language: any): any => {
```

```
        let officeSettings: any;
```

```
        let accessSettings: any;
```

```
        let excelSettings: any;
```

```
        let oneNoteSettings: any;
```

```
        let outlookSettings: any;
```

```
        let pptSettings: any;
```

```
        let publisherSettings: any;
```

```
        let projectSettings: any;
```

```
        let visioSettings: any;
```

```
        let wordSettings: any;
```

```
        switch (language) {
```

```
            case 'de':
```

```
            {
```

```
                officeSettings = OfficeSettings_de;
```

```
                accessSettings = AccessSettings_de;
```

```
                excelSettings = ExcelSettings_de;
```

```
                oneNoteSettings = OneNoteSettings_de;
```

```
                outlookSettings = OutlookSettings_de;
```

```
                pptSettings = PowerPointSettings_de;
```

```
                publisherSettings = PublisherSettings_de;
```

```
                projectSettings = ProjectSettings_de;
```

Case Studies

Office Analytics

Overview

Measure [how it affects the user]

Profile [the primary cost]

Diagnose [the Unoptimized Behavior]

Identify [Root Cause]

Attempt[ed Fixes]

Results

```
// deploymentSettingsContainer.tsx

<div>
    /** ...other markup here... */
    <GenericExpander
        expanderLabel={this.props.resources.applicationAndPreferencesSettings}
        isComplete={this.state.isAppComplete}
        isHidden={this.state.isAppHidden}
        expanderStateChanged={({hidden: boolean}) => {
            this.resetExpanders();
            this.setState({ isAppHidden: hidden });
        }}
        isDisabled={this.areExpandersDisabled()}
        id="applicationAndPreferencesSettings"
        className="applicationAndPreferencesSettingsExpander"
    >
        <NextExpanderDecoraterContainer
            buttonClicked={() => this.setState({ isAppHidden: true })}
            resources={this.props.resources}
            isLastComponent={true}
        >
            <ApplicationSettingsContainerV2 onVisit={() => this.setState({ isAppComplete: true })}
        </NextExpanderDecoraterContainer>
    </GenericExpander>
</div>
```

HIDDEN BY
DEFAULT!

If we look closely at the React components wrapped around our `ApplicationSettingsContainerV2`, we notice that the `GenericExpander` has a default state of `{isAppHidden: hidden}`. This means that not only do we not need to load locales we aren't using, but also the entire `ApplicationSettingsContainerV2` and its dependencies (`LocAppSettingsUtils`) doesn't need to be loaded at all for the initial page load.

Diagnose [*the Unoptimized Behavior*]

So far, we have identified that **the amount of JavaScript this page was shipping** was the **primary contributor** to the delay in web page **interactivity**.

Since JavaScript is the **most expensive resource to load** for web pages today, it was very peculiar to see 97% of this JavaScript/CSS *not used* to render the initial experience.

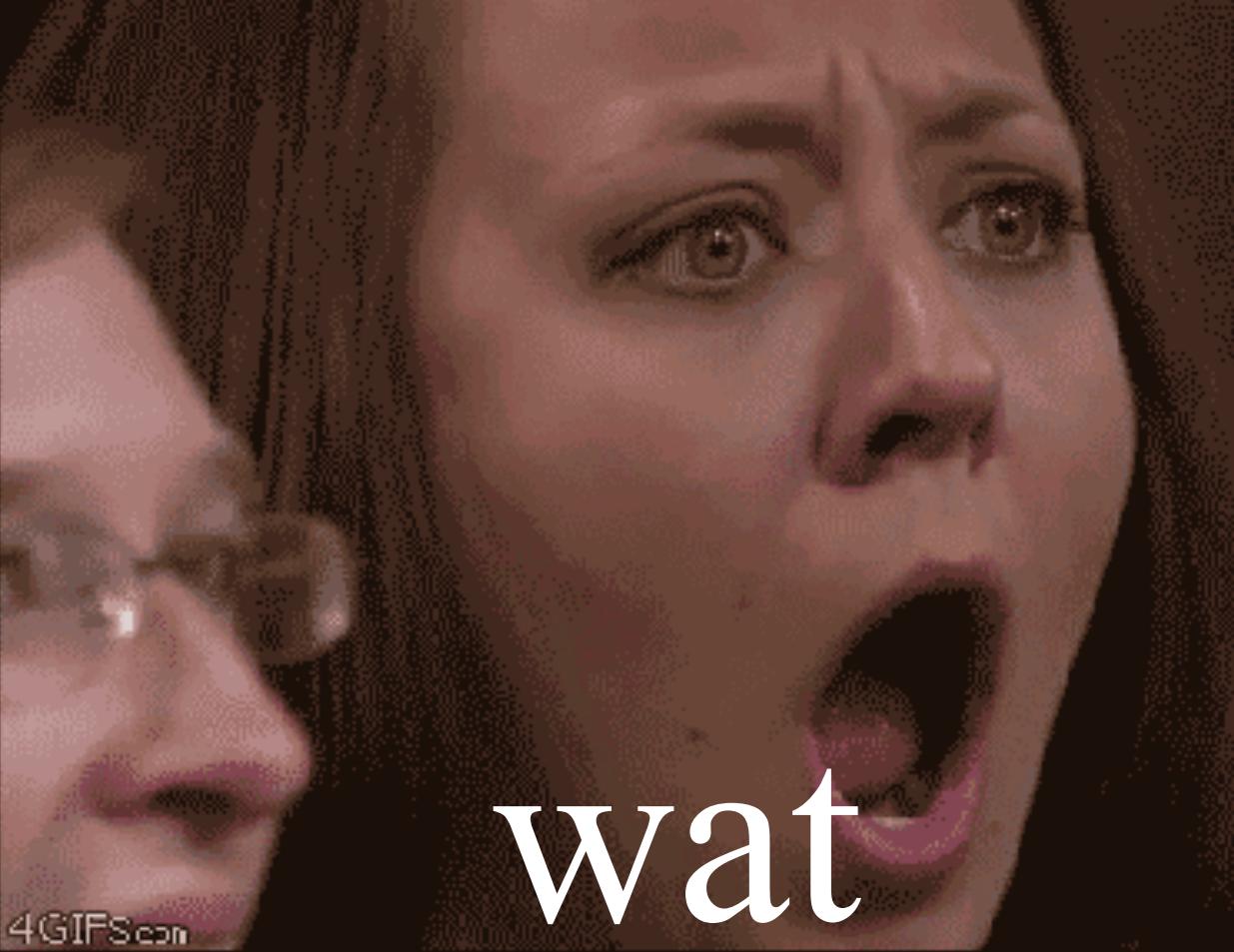
Identify [Root Cause]

Tooling Synopsis

The build system here used, [REDACTED]. [webpack](#)↗ is currently the second most used OSS JavaScript [REDACTED] across Microsoft.



Root Cause: webpack!

A close-up photograph of a woman's face. She has wide eyes, a slightly open mouth, and her hands are raised near her head, suggesting surprise or alarm. Her hair is dark and curly.

wat

Pitfalls

When you use the `import` statement, you are linking that JavaScript module into a single JavaScript bundle.

However any time you `import` a file into your application, you are telling webpack: *"Hey, webpack, I need this functionality in my initial bundle.* This is a common practice for engineers who are new to tools like webpack, or new to the size constraints of web development; engineers tend to freely `import` anything regardless of its usage (which is acceptable in systems languages).

Root Cause:
Engineers?

Attempt[ed Fixes]

To **code-split** one must replace `import` with `import()`. A single `import` refactor might look something like this:

```
// import * as WordSettings_de from "../../common/resources/de/settings-word-de-de-helix.ts"
const WordSettingsDe = () => import("../../common/resources/de/settings-word-de-de-helix.ts")
```

This informs webpack to do the following:

*"Take any module that I have loaded with `import()` and separate it (and its dependencies) into its own JavaScript bundle. Then **only** when this function is called, perform a JSONP fetch of this file, and return a `Promise` with the module as the default export."*

```
// locAppSettingsUtils.ts
```

```
const getLanguageJSON = (  
    language: string,  
    locale: string,  
    productName: string  
) => import(  
`./common/resources/${language}/${locale}/settings-${productName}-helix.json`  
);
```

```
export class LocAppSettingsUtils {  
    public static getAppSettingsFileForLoc = (language: any): Promise<any> => {  
        let locale: string = languageMap[language];  
        /**  
         * For each product  
         /  
        return Promise.all([  
            getLanguageJSON(language, locale, "office").then(settings => {  
                officeSettings = settings.default;  
            }),  
            ...  
        ]);  
    }  
}
```

But Sean...

Negating Network Cost

Service Workers!



Service Workers

Adding a [service worker](#) (SW) can negate this cost by using the SW cache to preload async/lazy-loaded bundles off-thread. Luckily there are multiple tools that help accomplish this today that integrate directly with webpack:

- [Workbox](#)
- [Offline Plugin](#)

REMEASURE

	BEFORE		AFTER	
	Broadband	3G (Fast)	Broadband	3G (Fast)
First Meaningful Paint (FMP)	4106 ms	20072 ms	948 ms	10174 ms
Time to Interactive (TTI)	4253 ms	21335 ms	1493 ms	10471 ms
Unused Code <i>Unused / Used (%)</i>	<i>18.3MB / 18.8MB (97%)</i>		<i>1.9MB / 2.8MB (69%)</i>	

Why should I
care?

Why...

The future of web is mobile

The average mobile website takes 14 seconds
to get interactive

load less code => interactive faster.

Faster load times mean more chances for engagement

We saw a correlation between slow mobile sites and high bounce rates. When sites load slowly, users are more likely to abandon the page — every time a user leaves your site, you lose traffic to monetize.

Imagine you're headed to a museum to see the hot new exhibit, and you have a choice between waiting in the longer regular line or the fast-moving VIP line. You'll want to pick the shorter VIP line, of course. Meanwhile, if the regular line is too long, it might convince you to turn around and go home if it's your only option.

It's the same with mobile speed. **Creating a fast and smooth mobile web experience keeps users engaged.** Quick sites make people more likely to click through to more pages, reading further to consume more content.

Sites that loaded in 5 seconds vs 19 seconds were observed to have:



60% greater
pageviews per visit²¹



35% lower
bounce rates²²

21. Google Data, Aggregated, anonymized Google Analytics data from a sample of mWeb sites opted into sharing benchmark data, n=3.8K, Global, March 2016

22. Google Data, Aggregated, anonymized Google Analytics data from a sample of mWeb sites opted into sharing benchmark data, n=2.8K, Global, March 2016



Sites that loaded within 5 seconds vs 19 seconds were observed to have:



70% longer average sessions²⁵



25% higher viewability²⁶

25. Google Data; Aggregated, anonymized Google Analytics data from a sample of mWeb sites opted into sharing benchmark data, n=3.5K, Global, March 2016

26. DoubleClick for Publishers; Google Active View ad viewability for 10.7K mWeb homepage domains with >70% measurable ad viewability, Global, February 2016

Less time spent waiting means more time on site

We also found a correlation between mobile speed and both pageviews per session and session lengths. And as people spend more time on the site, ad viewability also likely increases, as display ads must be on the screen for one full second to be considered viewable.²³ In a world where advertisers place more emphasis on viewable impressions, this is an important metric for publishers to track.

These metrics are important but publishers ultimately care about revenue. While there are several factors impacting revenue, our model projects that publishers whose mobile sites load within 5 seconds earn up to **2X greater mobile ad revenue** than those whose sites load within 19 seconds.²⁴

23. For more information on what it means for something to be considered viewable, visit the [DoubleClick for Publishers help section](#).

24. Google Data, Aggregated, anonymized Google Analytics and DoubleClick AdExchange data from a sample of mWeb sites opted into sharing benchmark data, n=4.5K, Global, June 2015 - May 2016



77% of mobile sites take longer than 10 seconds to load on 3G networks

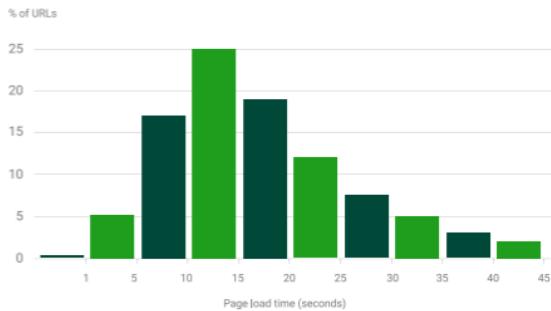


19 seconds is the average load time for mobile sites on 3G networks

Measuring mobile sites

You could finish washing your hands faster than the time it takes most sites to load on a 3G or 4G connection.⁷ Three out of four mobile sites we analyzed took 10 seconds or longer to load.⁸ And that's just homepages. Leaf pages — which constitute the majority of web content — tend to be almost half as slow.⁹

Average load times are even slower. On 3G networks, the average load time for a homepage is 19 seconds.¹⁰ You could go up 60 floors in one of the world's fastest elevators¹¹ and still be waiting for a single page to load. **On a 4G network the average time isn't much better: 14 seconds.¹²**



7. CBS, "95 percent of people wash their hands improperly. Are you one of them?", June 2012

8. Webpagetest.org. Sampled 11.8K global mWeb homepage domains loaded using a fast 3G connection timing first view only (no cached resources), February 2016

9. Webpagetest.org. Sampled 11.8K global mWeb homepage domains loaded using a fast 3G connection timing first view only (no cached resources), February 2016

10. Webpagetest.org. Sampled 11.8K global mWeb homepage domains loaded using a fast 3G connection timing first view only (no cached resources), February 2016

11. Business Insider, "Asian Skyscrapers Dominate A New List Of The World's Fastest Elevators", January 2013

12. Webpagetest.org. Sampled 11.8K global mWeb homepage domains loaded using a fast 3G connection timing first view only (no cached resources), February 2016

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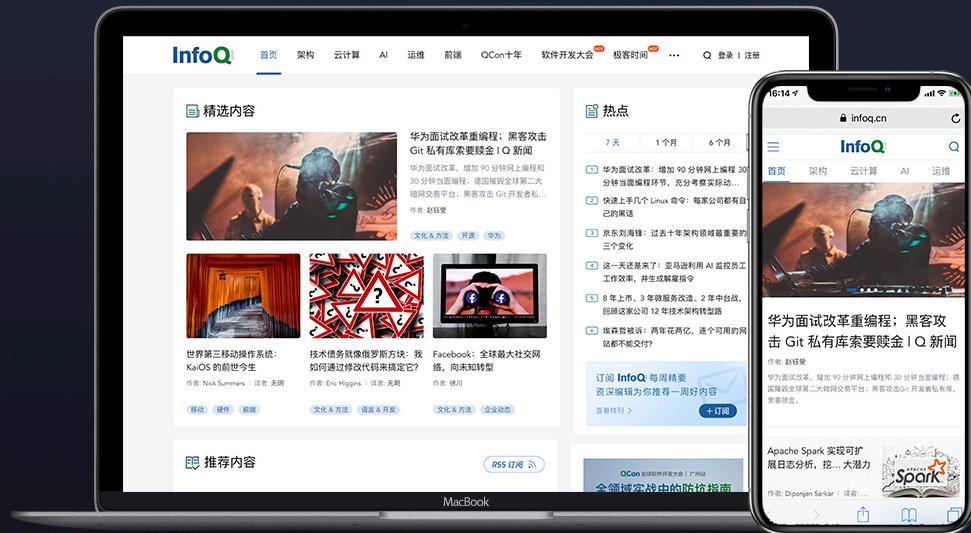


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