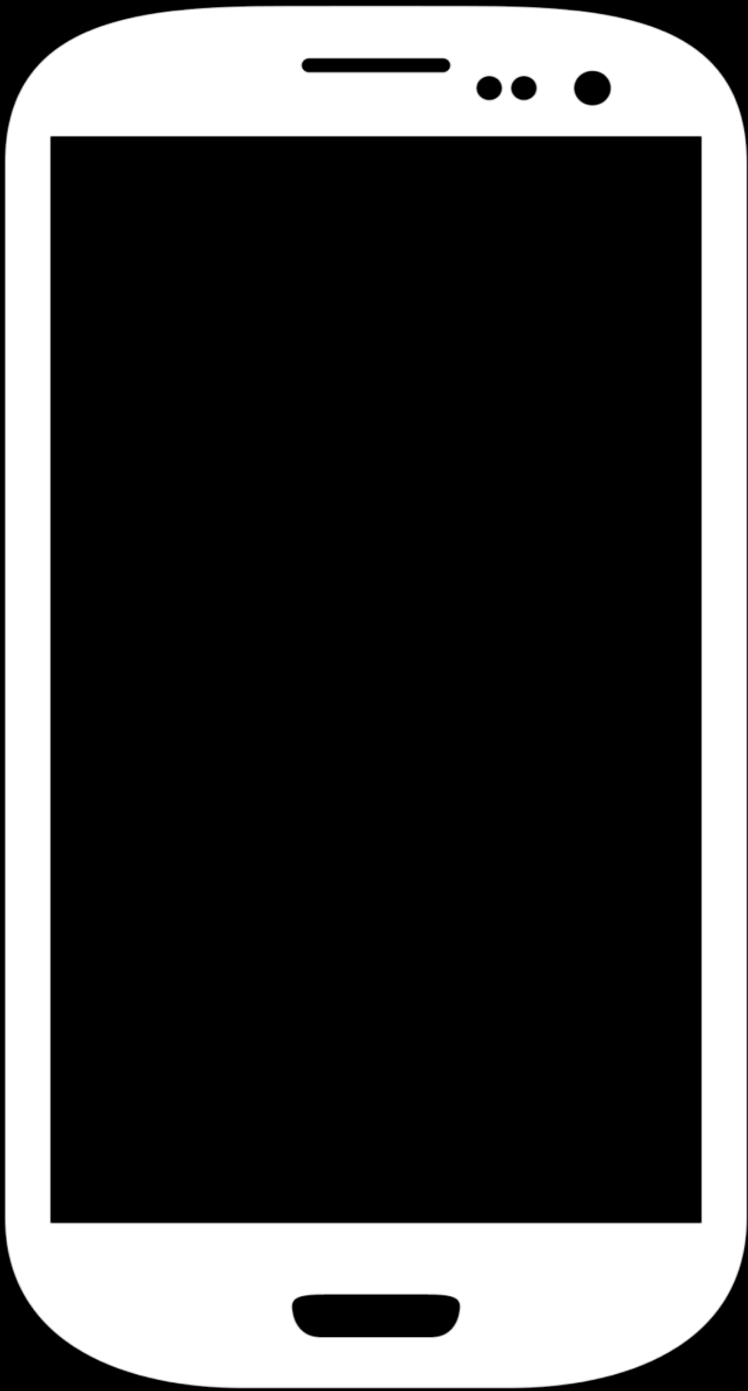




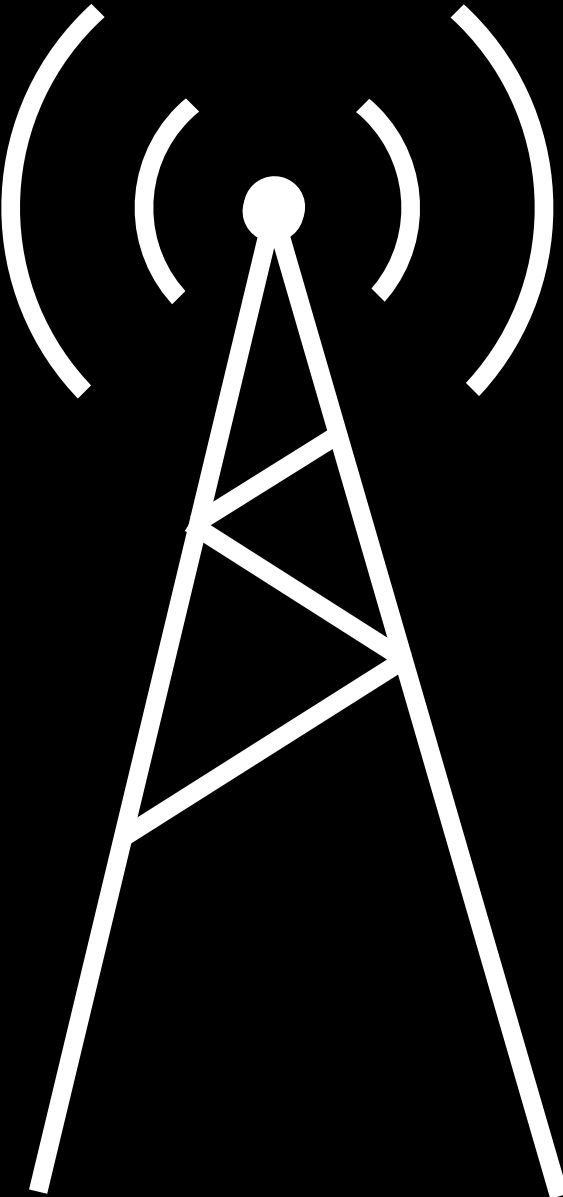
Improving Visitor Experience with Edge Computing

@AndyDavies, July 2020

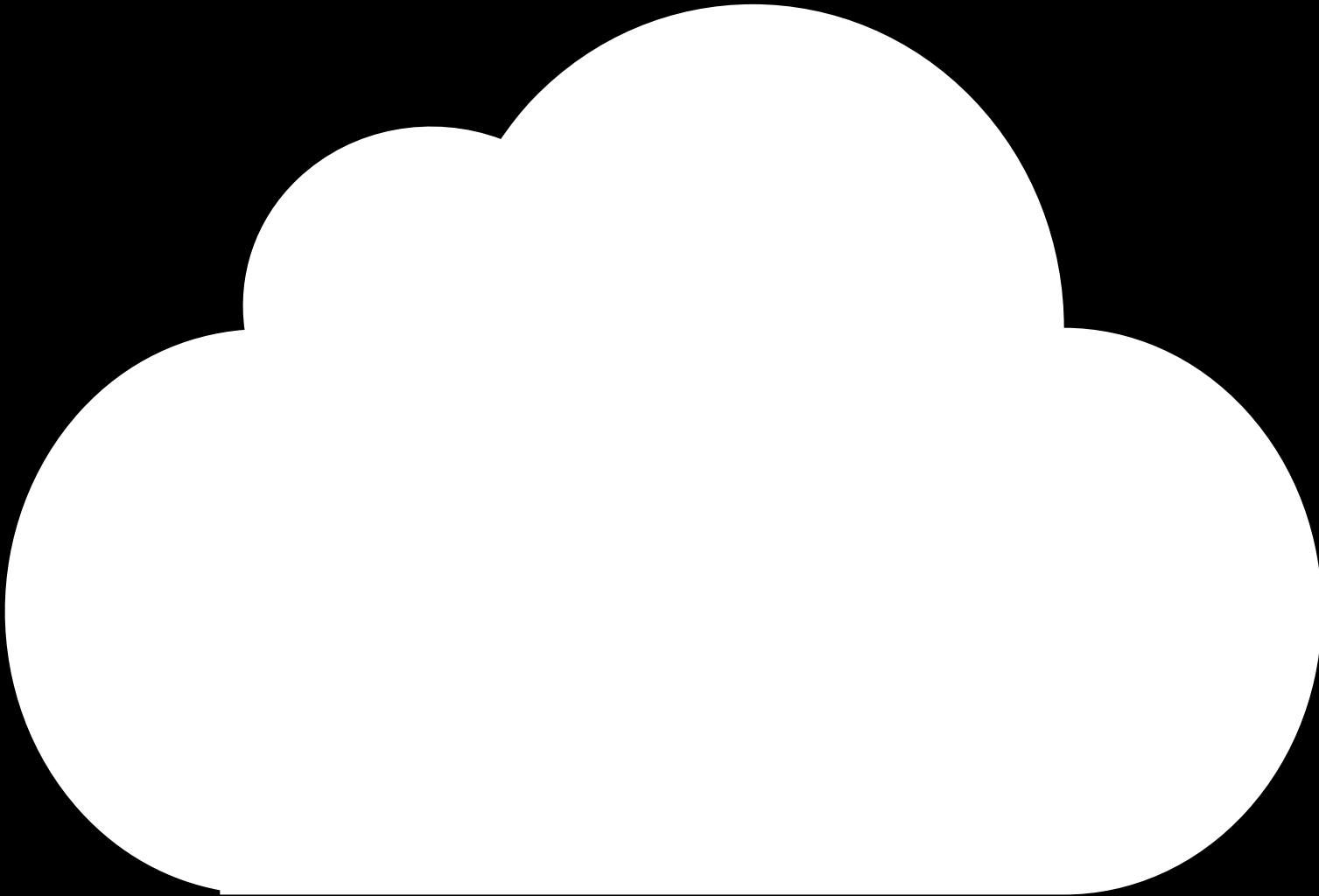
Where is the Edge?



Device?



Network?



Cloud?

Akamai Introduces New Cloudlets To Simplify The Development And Delivery Of Fast And Secure Multi-Screen Web Experiences

Cambridge, MA | September 29, 2014

Fully self-serviceable business logic for the Akamai Intelligent Platform improves developer time to market, infrastructure scale and page load times.

Akamai Technologies, Inc. (NASDAQ: AKAM), the leading provider of cloud services for delivering, optimizing and securing online content and business applications, today announced availability of Cloudlets, extensions to Akamai solutions that are designed to speed time to market for developers and offload infrastructure demand, each providing a specific and useful functionality that is accessed via the Akamai Intelligent Platform™.

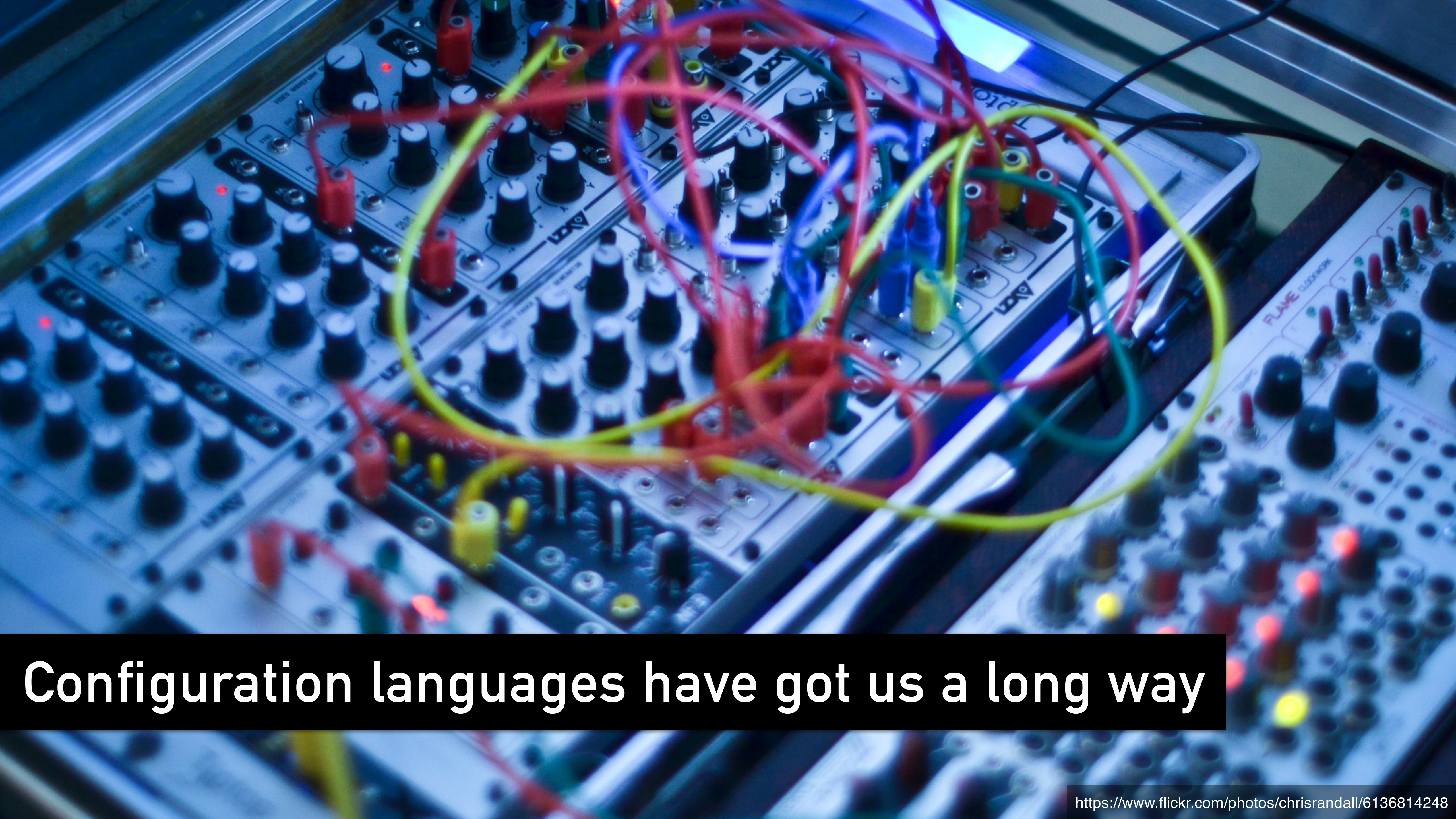
Instead of relying on resource intensive internal or third-party IT projects, Cloudlets allow customers to do more with the Akamai Intelligent Platform, in a way that is self-serviceable, alleviating the need for further infrastructure investment or the development of custom tooling. By offloading business logic to one of the world's most pervasive, performant and scalable delivery networks, as well as incorporating "click to buy" and "click to development,

Edge computing isn't really a new concept

Akamai Cloudlets are being introduced with the availability of Edge Redirector, Visitor Prioritization and Image Converter. The company plans to continue to introduce new Cloudlets regularly, ultimately forming a marketplace of extensions where customers can choose which capabilities are best suited to help simplify the development and delivery of their web sites and applications.



Safely deploying customer code has been a challenge



Configuration languages have got us a long way



But what could we do with greater power and flexibility?

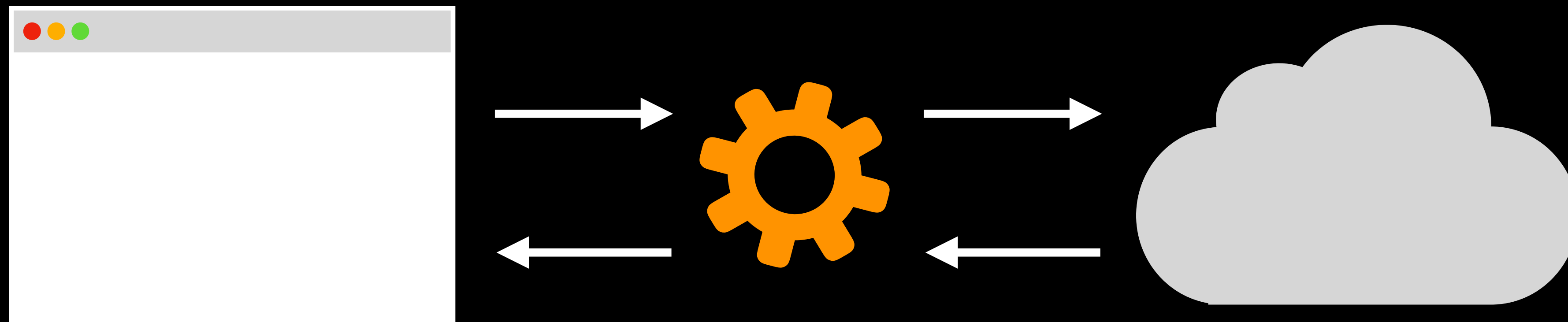
Advantages of processing at the edge

- Faster responses as endpoint is closer to the visitor
- Reduced load at the origin
- Orchestrate data from 3rd-parties

Improvements in several areas made it feasible

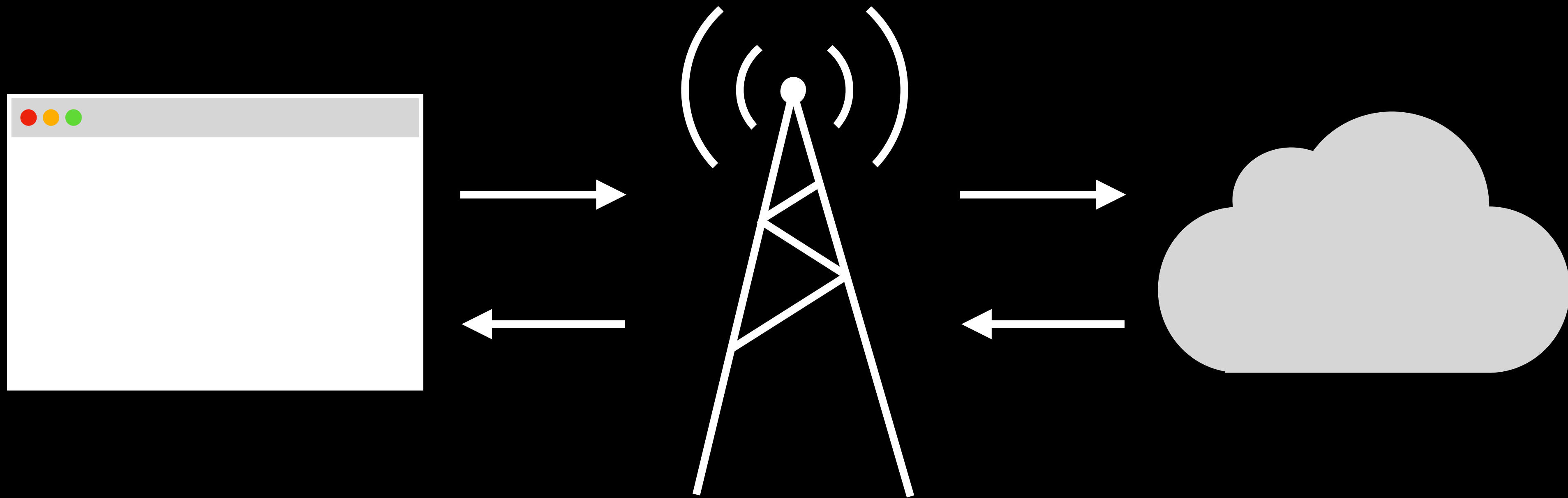
- ServiceWorker API provided a model for programmable proxies
- Overhead of isolation between processes reduced
- Serverless programming became common

Service Workers are in-browser network proxy...



...can intercept and rewrite both requests and responses

Edge Workers are a similar concept...



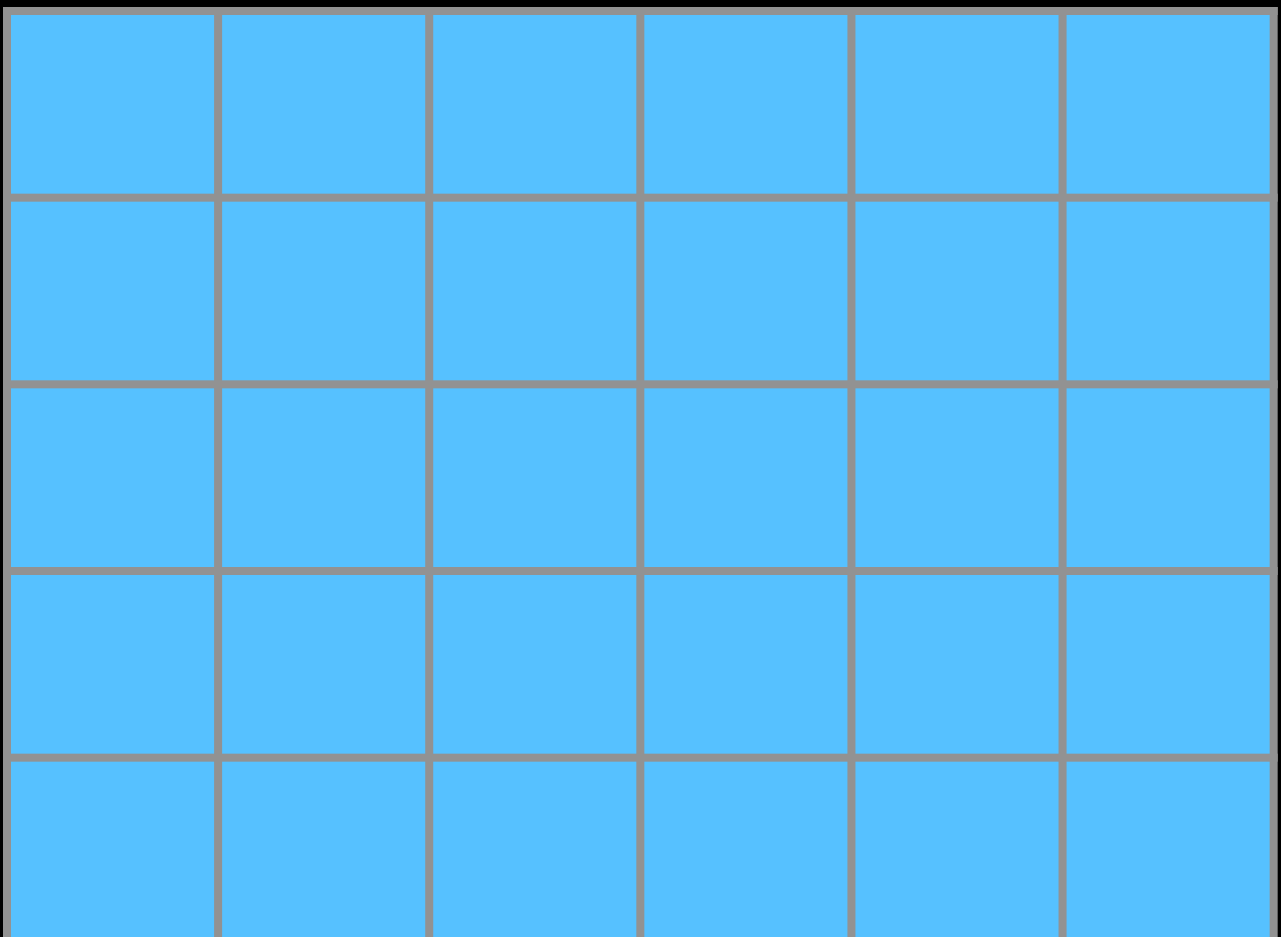
...it's just the proxy is in a different place

New isolation techniques reduced resource overhead

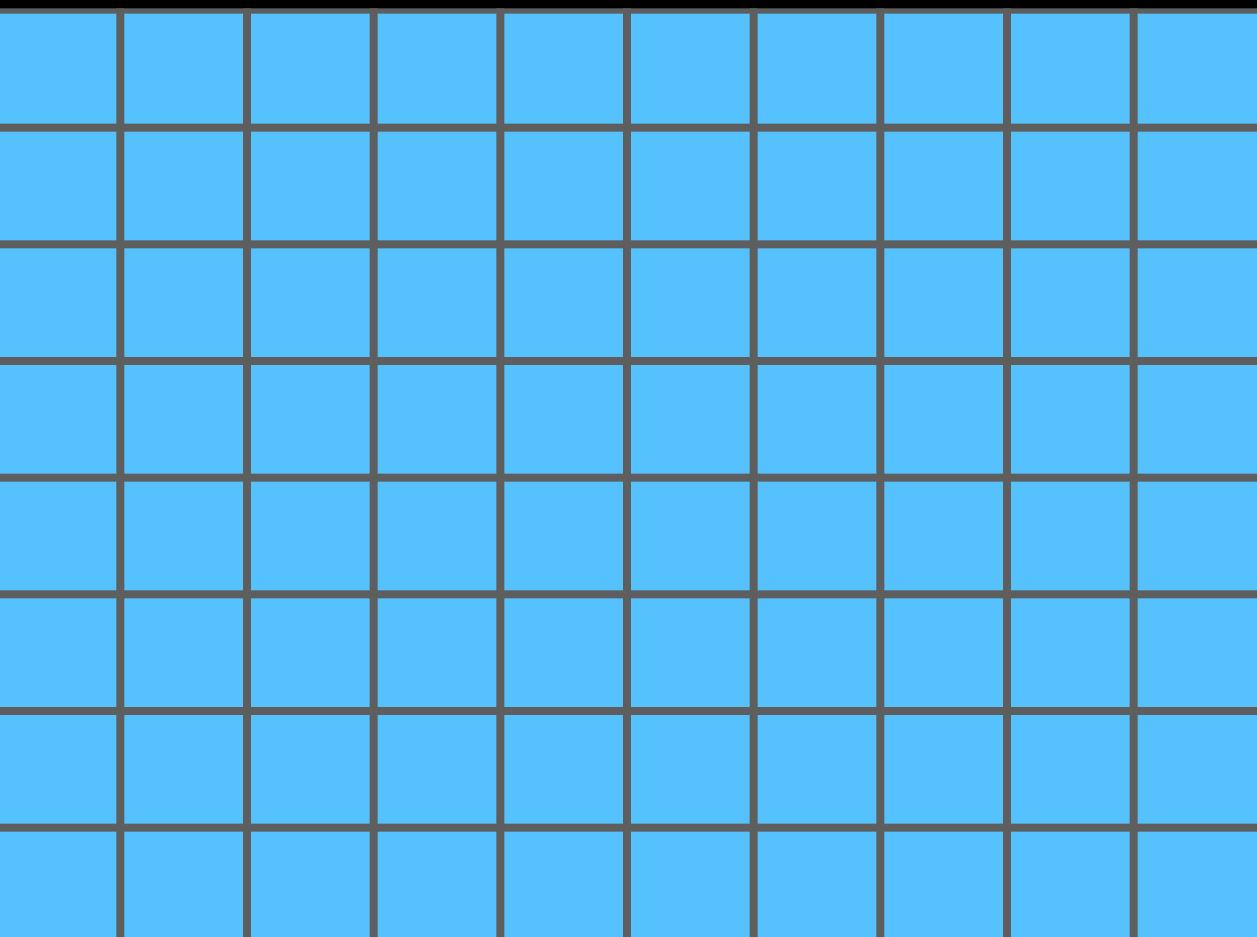
- Micro Virtual Machines (VMs)
- V8 Isolates
- Web Assembly (WASM)

Resource requirements vary by approach

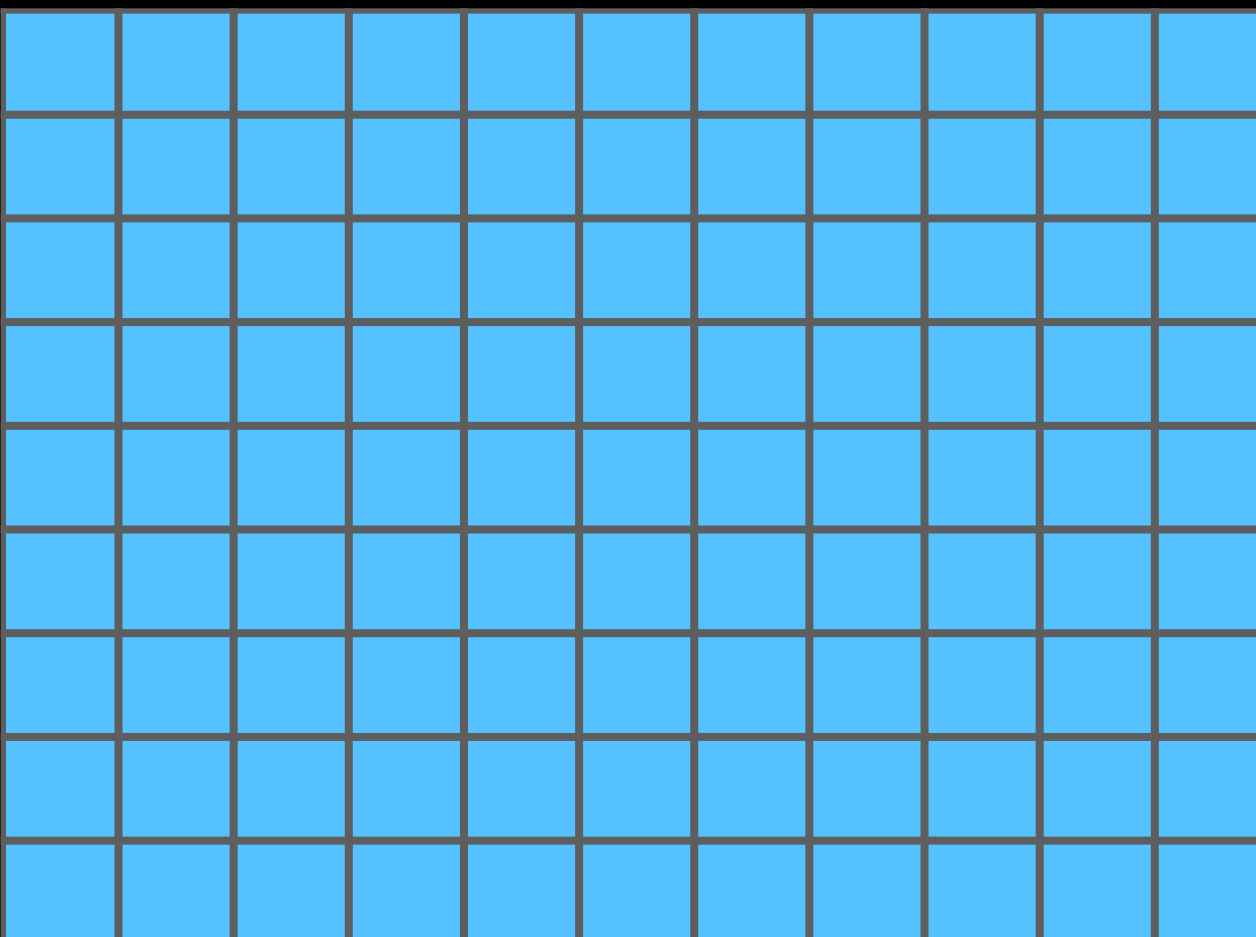
Virtual Machines



V8 Isolates



Web Assembly



Reducing overhead

Some approaches are faster than others

	Virtual Machine	V8 Isolates	Web Assembly
Resource Consumption	High	Low	Low
Startup Time	< 125ms (just for VM)	< 5ms	< 40μs
Runtime Overhead	High	Low	Low
Language(s)	BYO	JavaScript / WASM	C, Rust, Go, AssemblyScript

Using JavaScript makes it very familiar

```
// Hello World Example

export function onRequest(request) {
  request.respondWith(
    200, {},
    '<html><body><h1>Hello World From Akamai EdgeWorkers</h1></body></html>' );
}

export function onResponse(request, response) {
  response.setHeader('X-Hello-World', 'From Akamai EdgeWorkers');
}
```

Using JavaScript makes it very familiar

```
// Hello World Example

addEventListener('fetch', event => {
  event.respondWith(handleRequest(event.request))
})

/**
 * Fetch and log a request
 * @param {Request} request
 */
async function handleRequest(request) {
  return new Response('Hello worker!', { status: 200 })
}
```

YMMV with other languages (Rust for example)

```
#[macro_use]
extern crate http_guest;

use http_guest::{Request, Response};

pub fn user_entrypoint(_req: &Request<Vec<u8>>) -> Response<Vec<u8>> {
    Response::builder()
        .status(200)
        .body("Hello, world!".as_bytes().to_owned())
        .unwrap()
}

guest_app!(user_entrypoint);
```

Either executed as binary on VM, or compiled to WASM

Text representation of WASM looks something like this

```
(module
  (type $t0 (func (param i32) (result i32)))
  (func $add_one (export "add_one") (type $t0) (param $p0 i32) (result i32)
    get_local $p0
    i32.const 1
    i32.add)
  (table $T0 1 1 anyfunc)
  (memory $memory (export "memory") 17))
```

Note: this is an example NOT the code from the previous slide

WASI

The WebAssembly System Interface

WASI is a modular system interface for WebAssembly. As described in [the initial announcement](#), it's focused on security and portability.

WASI is being standardized in [a subgroup of the WebAssembly CG](#). Discussions happen in [GitHub issues](#), [pull requests](#), and [bi-weekly Zoom meetings](#).

For a quick intro to WASI, including getting started using it, see [the intro](#)

WASI allows WASM to access system functions

and [Rust](#). The resulting `.wasm` modules can be run in any WASI-compliant runtime.

For more documentation, see the [documents guide](#)

Managed and deployed as code

What might we do with these new capabilities?



Search or jump to...

Pull requests Issues Marketplace Explore



akamai / edgeworkers-examples

Watch 17 Unstar 13 Fork 5

Code Issues Pull requests Actions Wiki Security Insights

Branch: master

Go to file

Add file

Code

dctheobald committed 143154d on 21 Apr 61 commits 1 branch 0 tags

folder	a-b-test	Add A/B testing example (#16)	3 months ago
folder	commerce-categories	Fix spelling typo	7 months ago
folder	conference-details	Update formatting of examples and their READMEs	8 months ago
folder	cookie-accrual	Update formatting of examples and their READMEs	8 months ago
folder	cookie-geolocation	Correcting README file for cookie-geolocation	3 months ago
folder	empty-cart	Initial commit.	3 months ago

About

EdgeWorkers Examples – This repository contains practical examples, that can be used as a starting point for Akamai EdgeWorkers.

Readme

Apache-2.0 License

Releases

No releases published

Contributors 5

Many examples...

https://github.com/akamai/edgeworkers-examples

What activities can be moved from...

...the origin to the edge?

...the client to the edge?

Examples

- More responsive user interactions
- Preserving privacy
- Proxying 3rd Parties
- Experiment with Performance Optimisations

Responsive User Interactions

All sections



News Feed

Kits

Paints

Books

Magazines

...

Updates

Stash manager



Scale modeling database

Explore our massive database of kits, reviews, books, walkarounds, articles... »



Stash management

Manage your collection of kits, aftermarket sets, books, magazines & paints. »



Marketplace

Compare prices of 25 online shops and 5000 private sales. »



Events calendar

Plan your next visits to hobby shows, contests or workshops near you. »



Social networking

Follow, connect and interact with our scale modelers community. »

ship*... (45967)

"ship" (3625)

Battleship Bismarck-class | ship* (1204)

Battleship Yamato-class | ship* (1038)

Submarine Type VII | ship* (939)

Battleship Iowa-class | ship* (831)

Aircraft carrier Essex-class | ship* (606)

Ocean liner Olympic-class | ship* (600)

Destroyer Fletcher-class | ship* (595)

Aircraft carrier Deck | ship* (575)

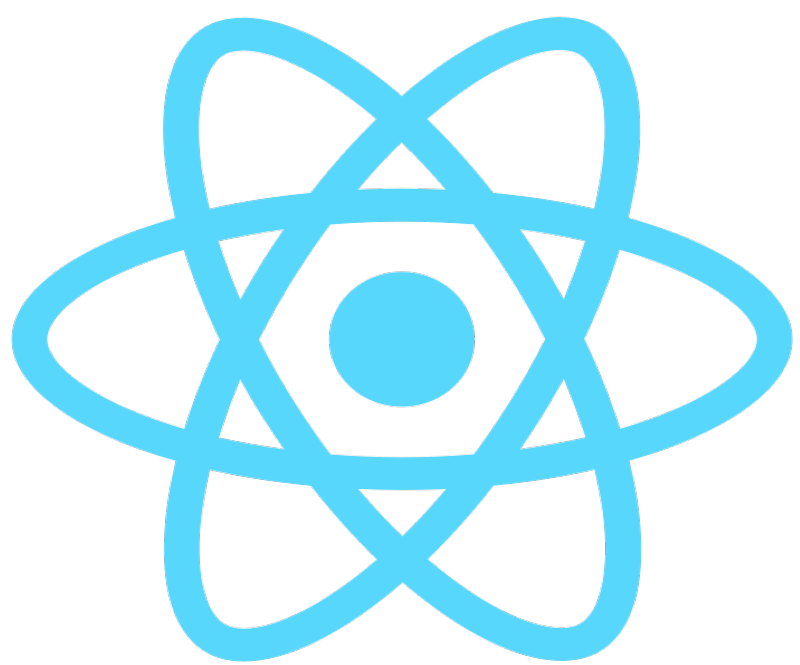
Browser status bar: 187 files, 1.54 MB, 5.4min, 6 messages, 2 errors, 0 warnings

Developer tools tabs: Elements, Network, Sources, Storage, Console, Layers, Graphics

Search: search | All | Document | CSS | Image | Font | JS | XHR | Other | Group Media Requests | Preserve Log | Import | Export

Name	Domain	Type	Status	Initiator	Priority	Transfer Size	Time	
searchac.php	www.scalemates.c...	xhr	200	LLD9T-Q4R...	Medium	781 B	20.4ms	500.0ms
searchac.php	www.scalemates.c...	xhr	200	LLD9T-Q4R...	Medium	843 B	80.3ms	
searchac.php	www.scalemates.c...	xhr	200	LLD9T-Q4R...	Medium	896 B	73.2ms	

Clientside frameworks rely on fast APIs



3rd Parties as Content



Reviews

5.0

Overall rating



Based on 2 reviews

5.0 Design

5.0 Features

5.0 Performance

★★★★★2

Write a review

Highest to Lowest Rating

★★★★★ MuKhu · 18 days ago

For a budget smartphone, I'm impressed.

I've had this phone a few days and so far it is quick to boot-up, easy to navigate and not too much of a chore to setup. The camera is excellent, compared to my previous phone which was good. Battery life seems reasonable after a day of setting up, phone calls and texting, I didn't feel the battery (read more)

Yes, I'd recommend this product

Was this review helpful?

Yes (807)

No (58)

[Report as inappropriate](#)

★★★★★ surside · 13 days ago

Great Phone!

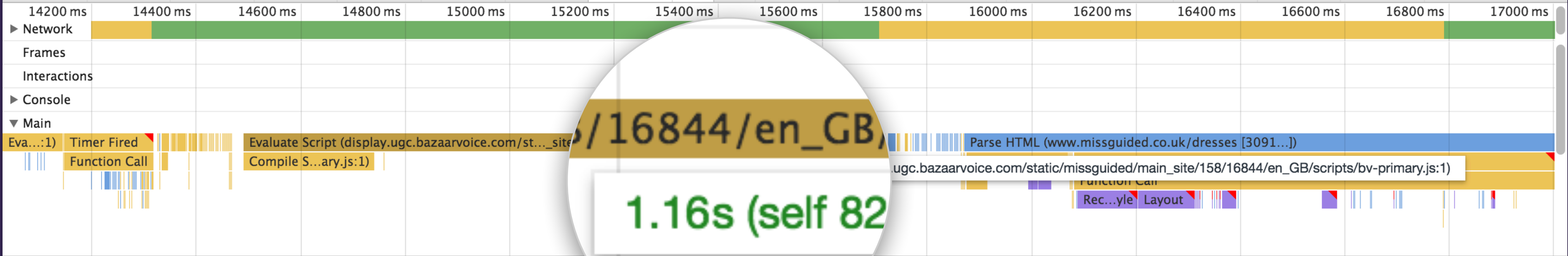
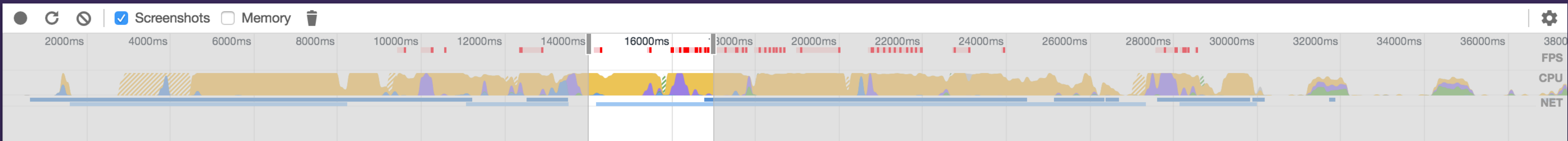
Was this review helpful?

Yes (112)

No (23)

[Report as inappropriate](#)

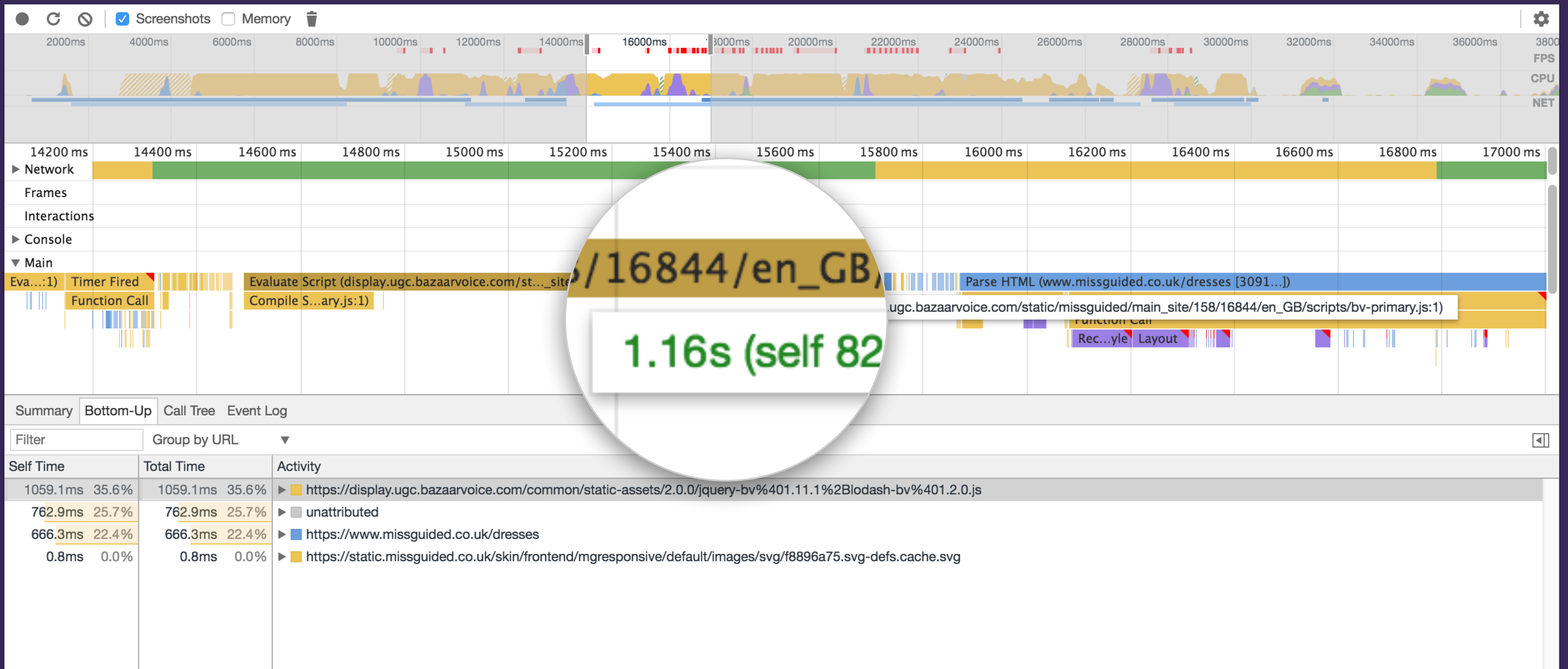
Reviews are essential to the buying experience



Summary Bottom-Up Call Tree Event Log

Filter Group by URL

Self Time	Total Time	Activity
1059.1ms 35.6%	1059.1ms 35.6%	https://display.ugc.bazaarvoice.com/common/static-assets/2.0.0/jquery-bv%401.11.1%2Blodash-bv%401.2.0.js
762.9ms 25.7%	762.9ms 25.7%	unattributed
666.3ms 22.4%	666.3ms 22.4%	https://www.missguided.co.uk/dresses
0.8ms 0.0%	0.8ms 0.0%	https://static.missguided.co.uk/skin/frontend/mgresponsive/default/images/svg/f8896a75.svg-defs.cache.svg



How could an edge worker mitigate this issue?

Move client-side experimentation to the edge

Most AB / MV Testing services rely on large JavaScript bundles

- Delays while downloading
- Delays while executing
- Often use 'anti-flicker' scripts to hide the page while it reflows

Moving the experimentation off the client reduces these issues

But...

Move client-side experimentation to the edge

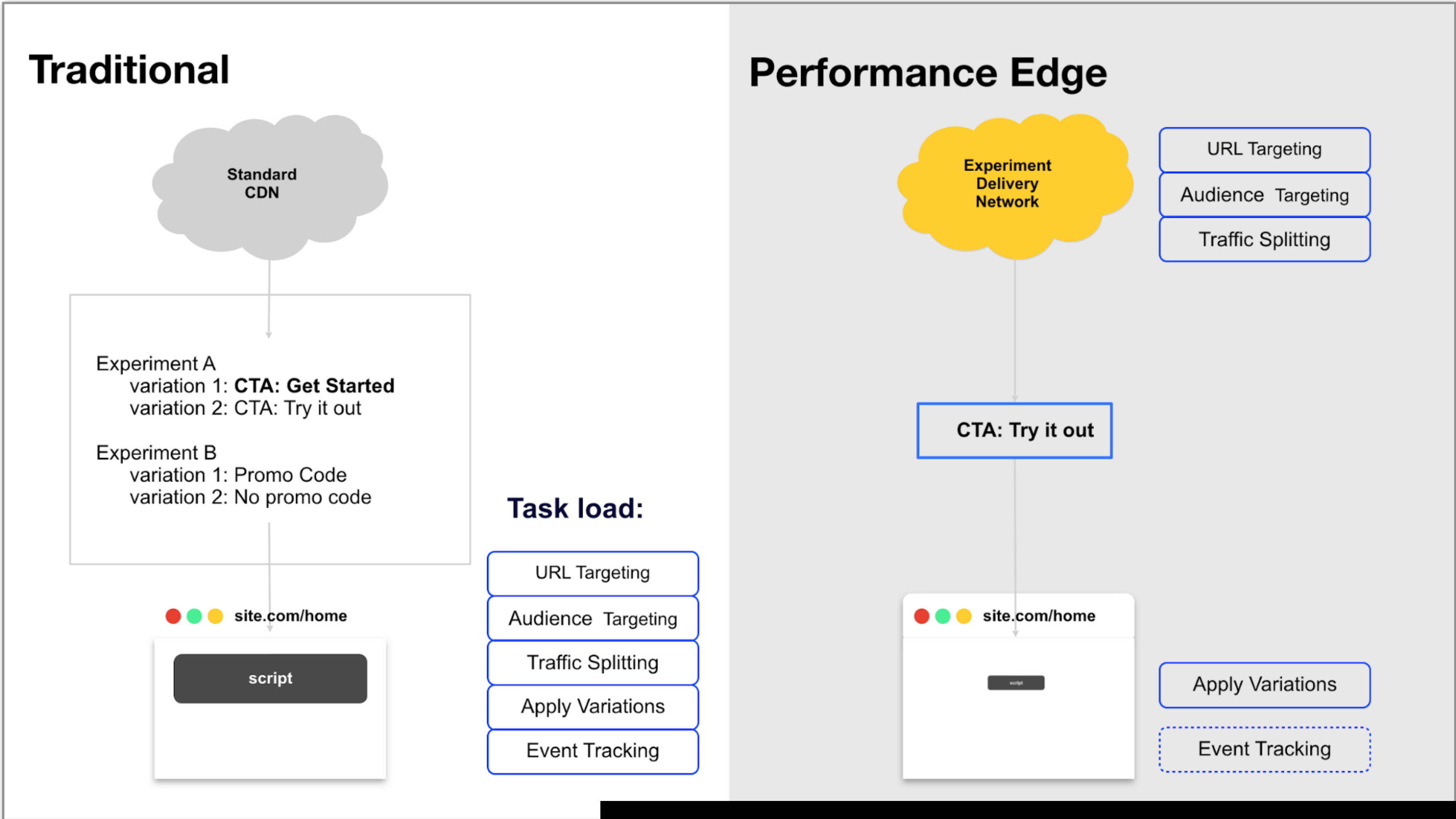
AB / MV Testing services are not just a large JavaScript bundle!

They also provide

- Cohort management
- Experiment creation
- Analytics

What do we need to solve these challenges with edge workers?

Optimizely supports moving snippet processing at edge



<https://man.gl/optimizely-experimenting-at-the-edge>

Many other client-side 3rd-parties slow the experience

- Personalisation
- Faceted search
- Chat
- Feedback

Could implementing these at the edge improve that?

Preserving Privacy

Advertising & Promotion

Grid of logos for Advertising & Promotion, including sub-sections like Mobile Marketing, Display & Programmatic Advertising, and Search & Social Advertising.

Content & Experience

Grid of logos for Content & Experience, including sub-sections like Video Marketing, Content Marketing, and Optimization, Personalization & Testing.

Social & Relationships

Grid of logos for Social & Relationships, including sub-sections like Call Analytics & Management, Social Media Marketing & Monitoring, and Influencers.

Commerce & Sales

Grid of logos for Commerce & Sales, including sub-sections like Retail, Proximity & IoT Marketing, Sales Automation, Enablement & Intelligence, and Affiliate Marketing & Management.

Data

Grid of logos for Data, including sub-sections like Audience/Marketing Data & Data Enhancement, Dashboards & Data Visualization, and Business/Custom Intelligence & Data Science.

Management

Grid of logos for Management, including sub-sections like Talent Mgmt, Product Mgmt, Budgeting & Finance, and Projects & Workflow.

How many tags are collecting visitor data?

Grid of logos for Video Advertising and PR.

Grid of logos for CMS & Web Experience Management.

Grid of logos for CRM and Ecommerce Platforms & Carts.

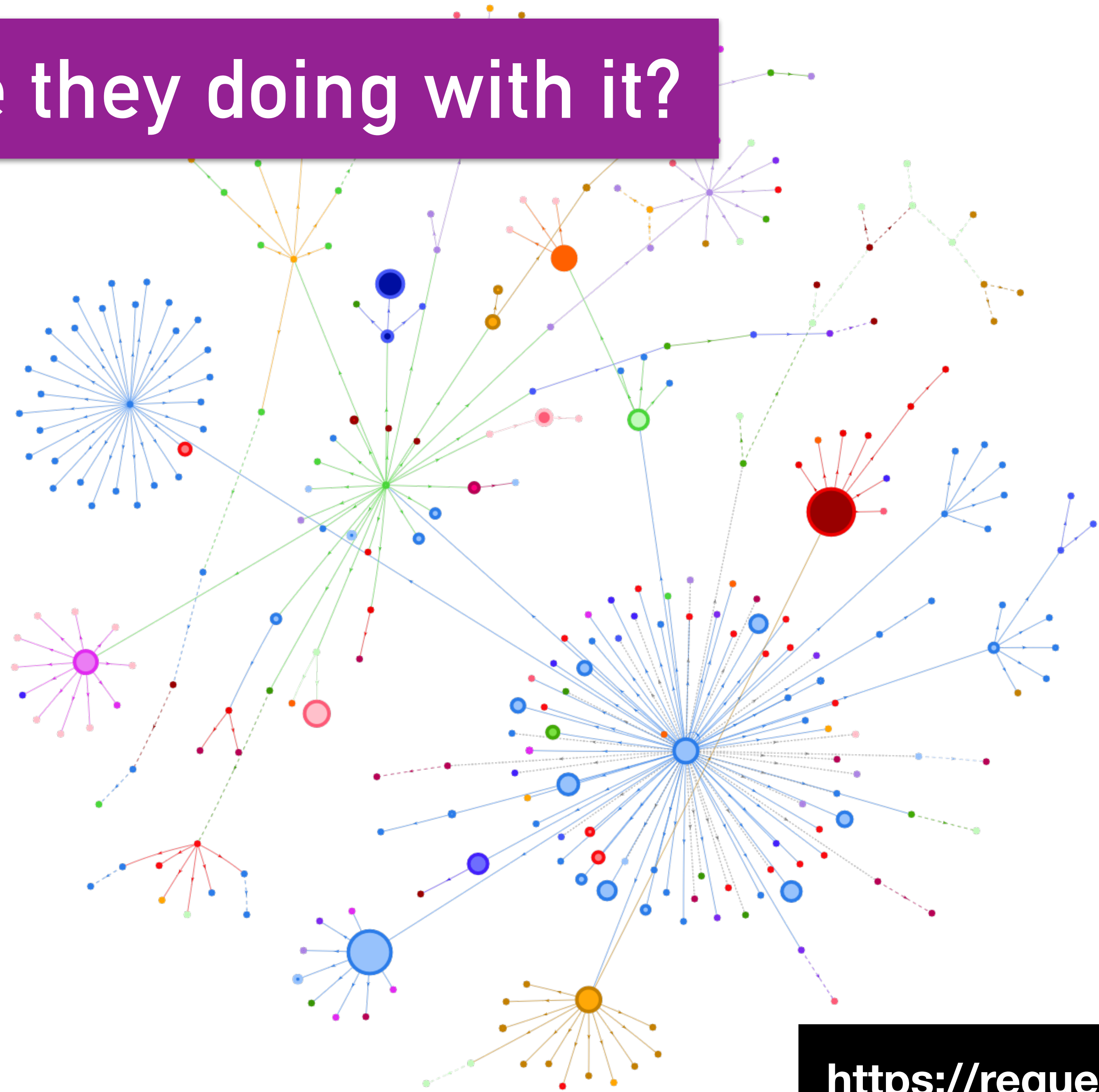
Grid of logos for Ecommerce Marketing and Gov, Compliance & Privacy.

Grid of logos for DMP, Customer Data Platform, and Agile & Lean Mgmt.

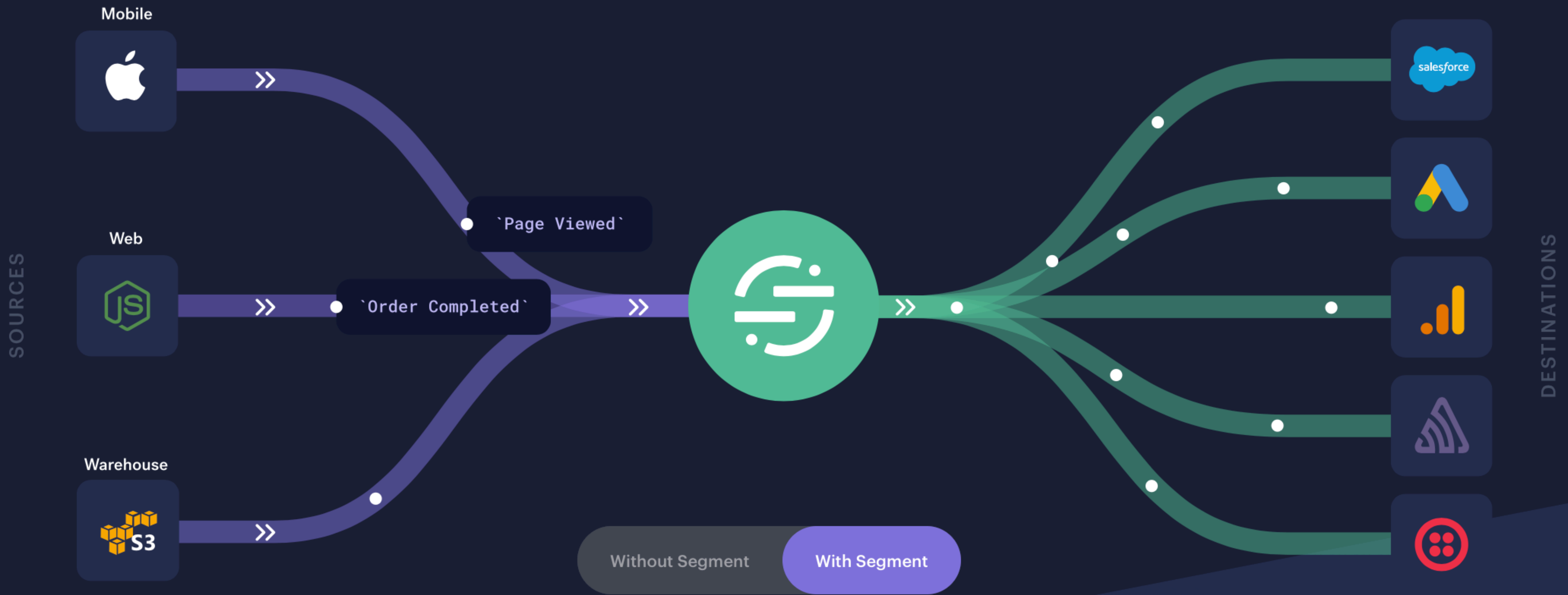
Grid of logos for Projects & Workflow and Agile & Lean Mgmt.

https://man.g/chiefmartec-supergraphic-2019

And what are they doing with it?



<https://requestmap.herokuapp.com>



Preserve privacy by proxying analytics

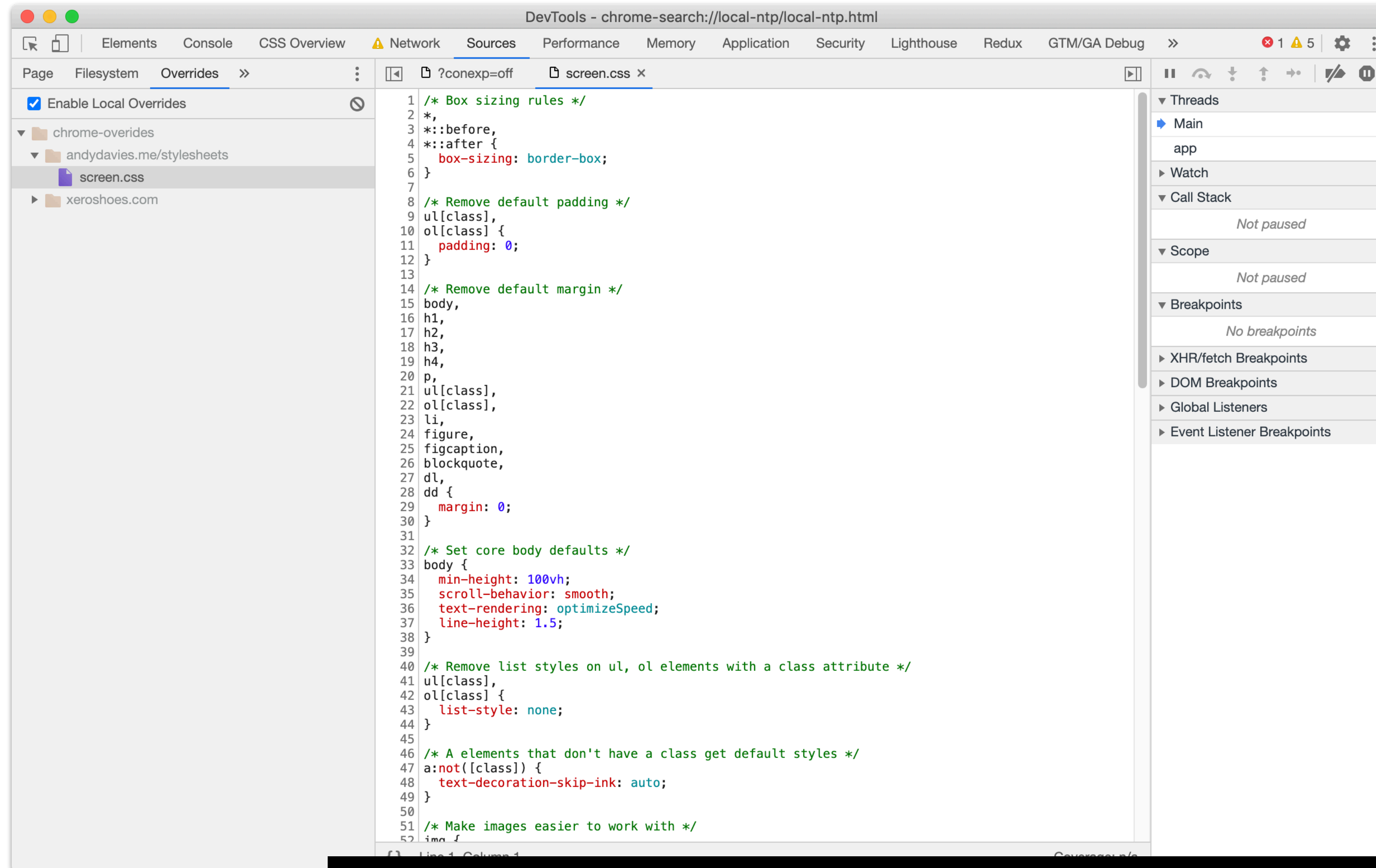
Join the 20,000+ companies using the Segment platform



Cookie consent at the edge?

How do we get 3rd-Party Tags to offer their features via the edge?

Experiment with Performance Optimisations



DevTools give us the ability to experiment with code locally



Search or jump to...

Pull requests Issues Marketplace Explore



pmeenan / cf-workers

Watch 14

Unstar 80

Fork 12

Code Issues 5 Pull requests Actions Projects Wiki Security Insights

Branch: master cf-workers / optimization-pack / optimization-pack.js / <> Jump to

Go to file

pmeenan Changed the content proxying to use a specified prefix, added support...

Latest commit f0a34bb on 15 Mar 2019 History

1 contributor

1174 lines (1085 sloc) | 39.5 KB

Raw Blame

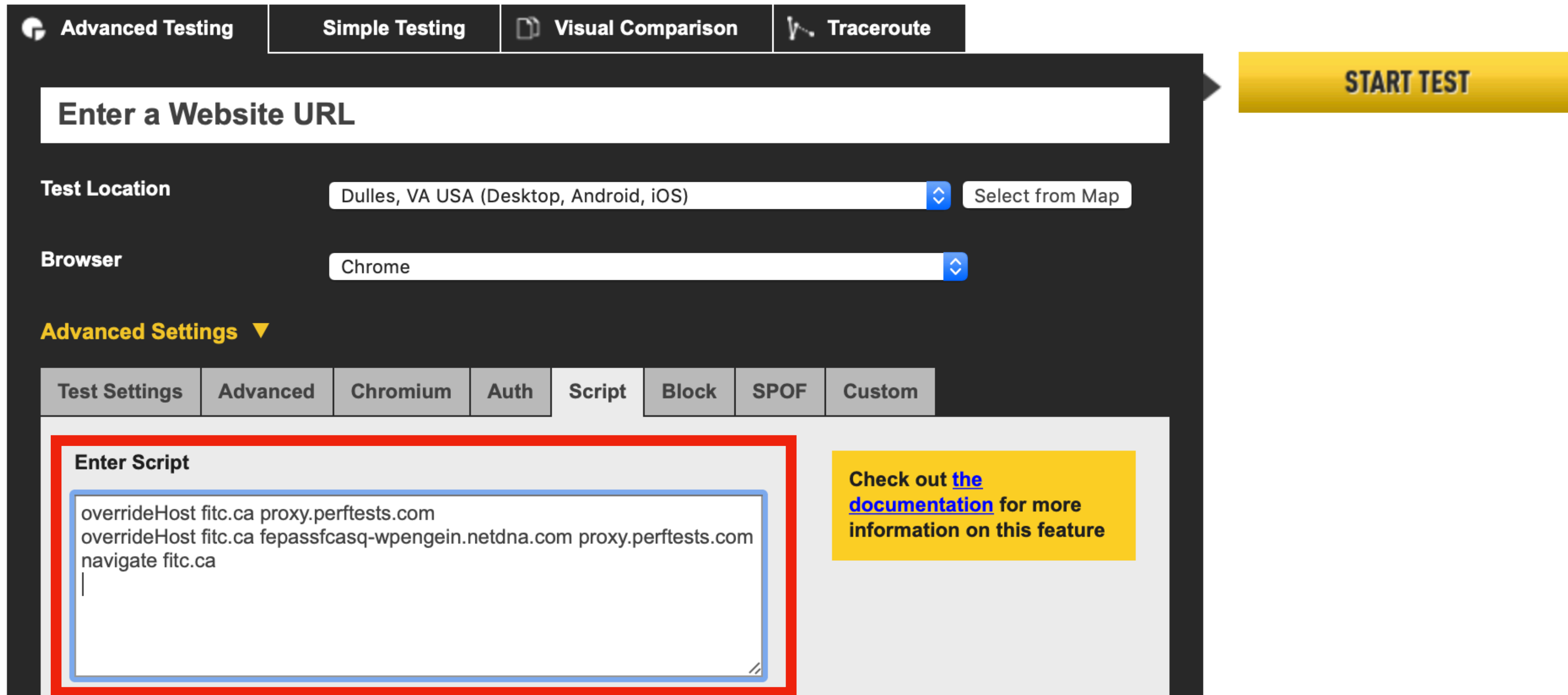
```
1 // Enabled optimization features
2 ENABLE_PROXY_THIRD_PARTY = true;
3 ENABLE_GOOGLE_FONTS = true;
```

Create a proxy to rewrite the page

```
4 // ... (commented out)
5 // ... (commented out)
6 // ... (commented out)
7 // ... (commented out)
8 email: "", // From https://dash.cloudflare.com/profile
9 key: "", // Global API Key from https://dash.cloudflare.com/profile
10 zone: "" // "Zone ID" from the API section of the dashboard overview page https://dash.cloudflare.com/
11 };
12
13 // Default cookie prefixes for bypass when HTML edge cache is enabled
14 const DEFAULT_BYPASS_COOKIES = [
```

https://github.com/pmeenan/cf-workers

Use proxy via overrideHost in WebPageTest script



Advanced Testing | Simple Testing | Visual Comparison | Traceroute

Enter a Website URL

Test Location: Dulles, VA USA (Desktop, Android, iOS) | Select from Map

Browser: Chrome

Advanced Settings ▾

Test Settings | Advanced | Chromium | Auth | **Script** | Block | SPOF | Custom

Enter Script

```
overrideHost fitc.ca proxy.perftests.com
overrideHost fitc.ca fepassfcasq-wpenginein.netdna.com proxy.perftests.com
navigate fitc.ca
```

Check out [the documentation](#) for more information on this feature

START TEST

<https://www.slideshare.net/patrickmeenanan/getting-the-most-out-of-webpagetest>

Where's the appropriate place to carry out the work?

Some workloads may be unsuitable for network edge

- Machine Learning on device may be better for privacy reasons
- Overhead of uploading client generated data may be prohibitive
- What needs to remain on the origin?

Challenges

Technical

- Debugging, profiling code in environments we don't control

Mindset

- It's new, many services are still in beta, need to think about how we architect our services

Closing Thoughts

Edge computing gives us new capabilities to improve our site's reliability, and our visitors experience and privacy

Vendors are adopting slightly different approaches

We haven't worked out how to make the most of them yet

@andydavies

hello@andydavies.me

<http://noti.st/andydavies>

