



**BALTIMORE**

— DRUPALCON 2017 —

**Web Performance in 2017**

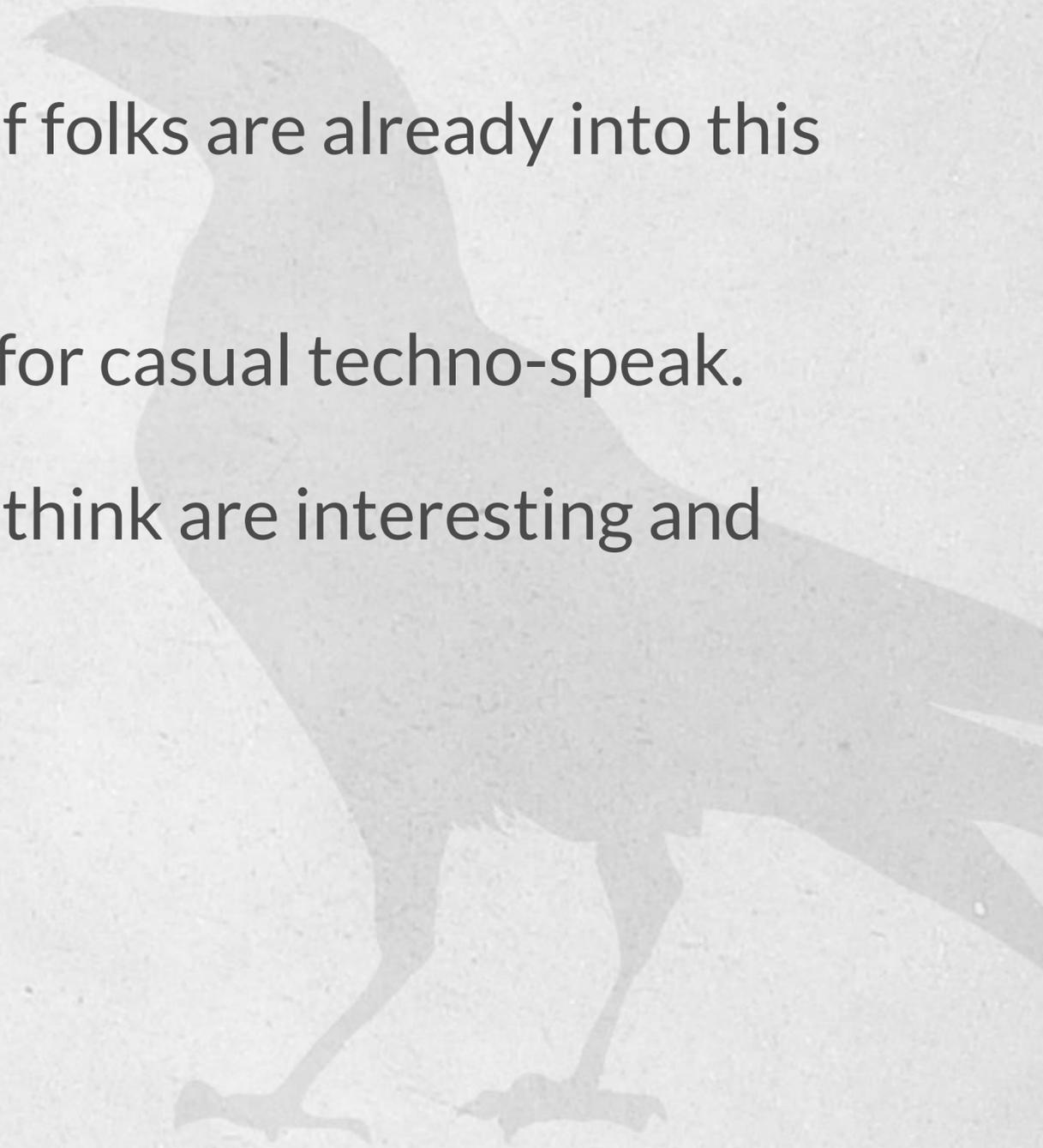
with @bighappyface

**Big thanks to DrupalCon Team 🙌**

**Big thanks to you 🙌**  
**(it's almost a wrap)**

# Please note

- This session assumes familiarity. I am speaking as if folks are already into this stuff.
- This session is marked as advanced. My apologies for casual techno-speak.
- This session is not exhaustive. I cover things that I think are interesting and important.



# The plan

1. Measurement
2. Networking (HTTP/Browsers)
3. UI (HTML/CSS)
4. Code (JS)

Q&A after each section to focus the interactions.



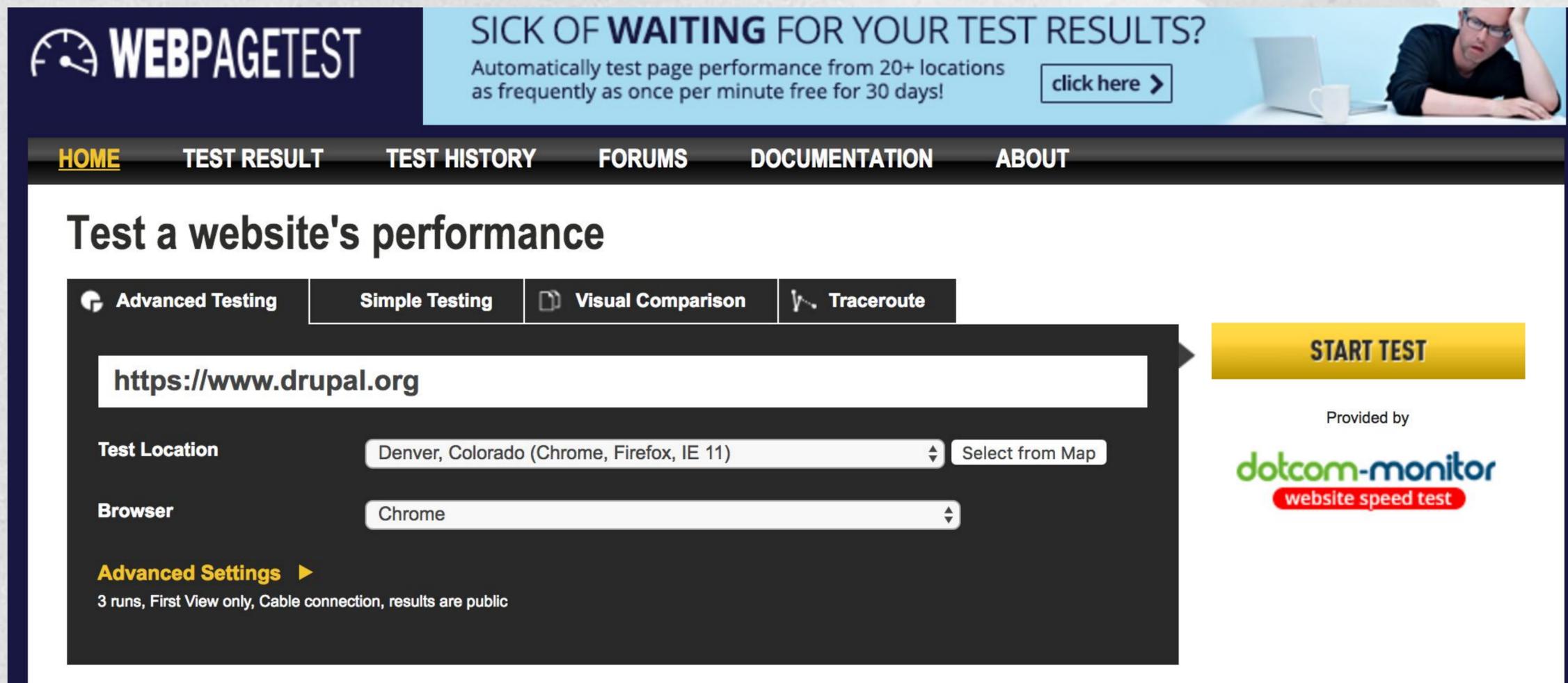


# Measurement

The background is a dark blue, monochromatic photograph of a waterfront city street. On the left and right sides, there are multi-story buildings with many windows. In the foreground, there is a body of water with a wooden dock extending into it. The overall scene is dimly lit, creating a moody and atmospheric effect.

# Measurement IS performance

# WebPageTest



The screenshot shows the WebPageTest website interface. At the top left is the logo with a speedometer icon and the text 'WEBPAGETEST'. To the right is a banner with the text 'SICK OF WAITING FOR YOUR TEST RESULTS?' and 'Automatically test page performance from 20+ locations as frequently as once per minute free for 30 days!' with a 'click here' button. Below the banner is a navigation menu with links: HOME, TEST RESULT, TEST HISTORY, FORUMS, DOCUMENTATION, and ABOUT. The main content area has the heading 'Test a website's performance' and four tabs: 'Advanced Testing' (selected), 'Simple Testing', 'Visual Comparison', and 'Traceroute'. A text input field contains 'https://www.drupal.org'. Below it are dropdown menus for 'Test Location' (Denver, Colorado (Chrome, Firefox, IE 11)) and 'Browser' (Chrome). A 'START TEST' button is on the right. At the bottom left, there is an 'Advanced Settings' link and a summary of settings: '3 runs, First View only, Cable connection, results are public'. The 'dotcom-monitor website speed test' logo is also visible.

free and awesome

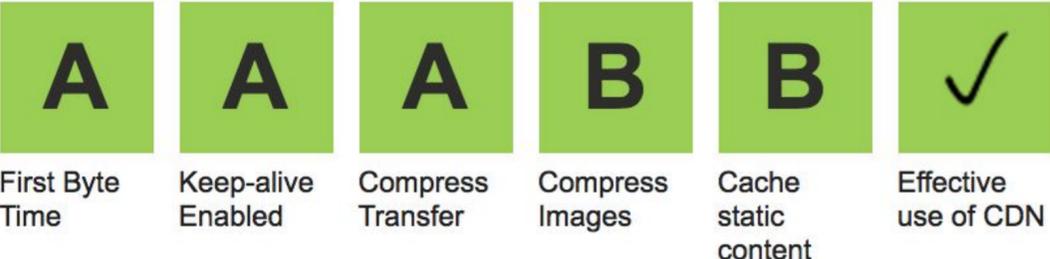
# WebPageTest

## Web Page Performance Test for

<https://www.drupal.org>

From: Denver, Colorado USA - Chrome - Cable  
4/26/2017, 9:05:41 PM

[Need help improving?](#)



- Summary
- Details**
- Performance Review
- Content Breakdown
- Domains
- Processing Breakdown
- Screen Shot

Tester: CO-WEBPAGETEST-192.199.248.78

[Export HTTP Archive \(.har\)](#)

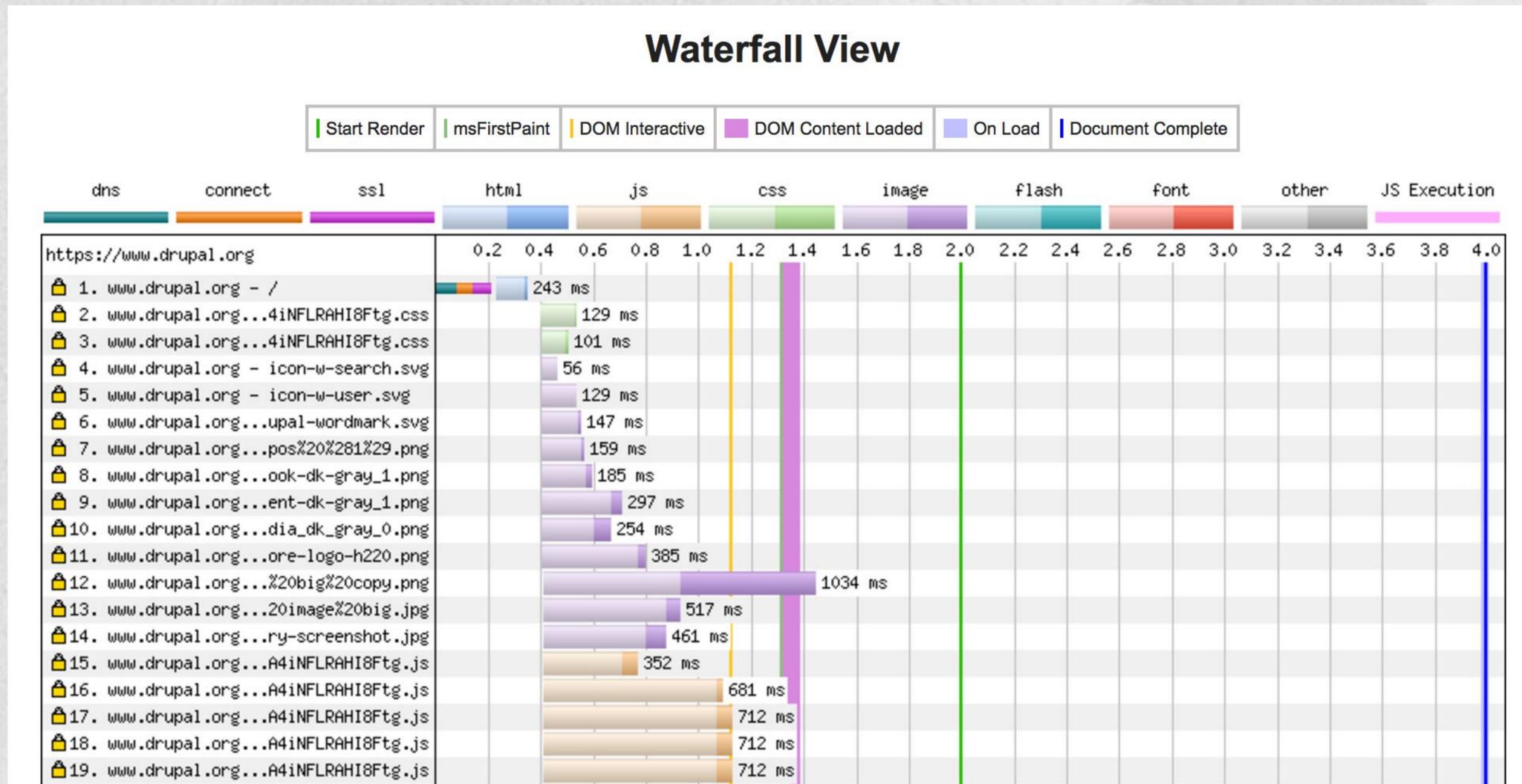
First View only  
Test runs: 3

|                             | Load Time | First Byte | Start Render | Visually Complete | Speed Index | Result (error code) | Document Complete |          |          | Fully Loaded |          |          |              |
|-----------------------------|-----------|------------|--------------|-------------------|-------------|---------------------|-------------------|----------|----------|--------------|----------|----------|--------------|
|                             |           |            |              |                   |             |                     | Time              | Requests | Bytes In | Time         | Requests | Bytes In | Certificates |
| First View ( <u>Run 1</u> ) | 3.988s    | 0.332s     | 1.994s       | 2.300s            | 2003        | 0                   | 3.988s            | 62       | 1,001 KB | 4.056s       | 63       | 1,007 KB | 54 KB        |

| RUM First Paint | <u>domInteractive</u> | <u>domContentLoaded</u>  | <u>loadEvent</u>         |
|-----------------|-----------------------|--------------------------|--------------------------|
| 1.309s          | 1.117s                | 1.320s - 1.383s (0.063s) | 3.976s - 3.978s (0.002s) |

clear metrics and reporting

# WebPageTest



killer waterfall

# WebPageTest

HOME **TEST RESULT** TEST HISTORY FORUMS DOCUMENTATION ABOUT

Tested From: Denver, Colorado USA - Chrome - Cable

1: www.drupal.org (Edit)

| Time      | 1.0s  | 1.5s  | 2.0s                | 2.5s             |
|-----------|-------|-------|---------------------|------------------|
| Progress  | 0%    | 0%    | 99%                 | 100%             |
| Thumbnail | Blank | Blank | Partial Drupal page | Full Drupal page |

Export filmstrip as an image...

Slow Motion

Create Video

Advanced customization options...

| Thumbnail Size                         | Thumbnail Interval                       | Comparison End Point                               |
|--|--|--|
| <input type="radio"/> Small            | <input type="radio"/> 0.1 sec            | <input checked="" type="radio"/> Visually Complete |
| <input type="radio"/> Medium           | <input checked="" type="radio"/> 0.5 sec | <input type="radio"/> Last Change                  |
| <input checked="" type="radio"/> Large | <input type="radio"/> 1 sec              | <input type="radio"/> Document Complete            |
|  | <input type="radio"/> 5 sec              | <input type="radio"/> Fully Loaded                 |

recording!!!

# WebPageTest



## WebPagetest Documentation

**Navigation**

- ▼ **Using WebPagetest**
  - Quick Start Guide
  - ▶ Metrics
  - Result Codes
  - Scripting
  - Custom Metrics
- ▼ **Developer Interfaces**
  - RESTful APIs**
  - Batch Library
  - Batch Processing Command-line tool
  - Raw Test Results
- ▼ **Private Instances**
  - Locations
  - Web Page Replay
  - ▶ Node.js Agent
- ▼ **System Design**
  - Overview
  - WebPagetest Relay
  - Mobile Testing
- ▼ **Other Resources**
  - Optimization Resources
  - Hosting a Test Location
  - 2011 FCC Broadband Data
- ▼ **Developer Information**
  - Developer FAQ
  - Code Guidelines
  - Code Review
  - ▶ Design Docs
  - Async JS

[Developer Interfaces >](#)

## RESTful APIs

**Contents**

- [1 Submitting test requests](#)
  - [1.1 Parameters](#)
  - [1.2 Specifying connectivity](#)
  - [1.3 XML response](#)
  - [1.4 Samples](#)
- [2 Check test status](#)
- [3 Getting test results](#)
  - [3.1 Sample](#)
- [4 Cancelling Tests](#)
- [5 Location information](#)

### Submitting test requests

You can submit tests to pagetest either by doing a POST or a GET to <http://www.webpagetest.org/runtest.php>

In response you will either get redirected to the results page or you will get an xml response (depending on if xml was requested).

### Parameters

| Parameters |          |                    |
|------------|----------|--------------------|
| Parameter  | Required | Description        |
| url        | required | URL to be tested   |
| label      | optional | Label for the test |

very handy API

# WebPageTest

Some key metrics that are important to you.

1. SpeedIndex (calculated metric -- target < 1000)
2. First Paint (reported by browser)
3. Start Render (capture showing non-blank frame)
4. Visually Complete (a.k.a. End Render)
5. Document Complete Metrics (when the DOM is processed)
6. Fully Loaded Metrics (when all is said and done)

<https://sites.google.com/a/webpagetest.org/docs/using-webpagetest/metrics>



**Great WPT plug. What's the point?**





**Metrics can be monitored  
Monitoring can be automated**

# Performance budget

Budgets make it possible to set constraints and alert when thresholds are breached. It's a really good idea.

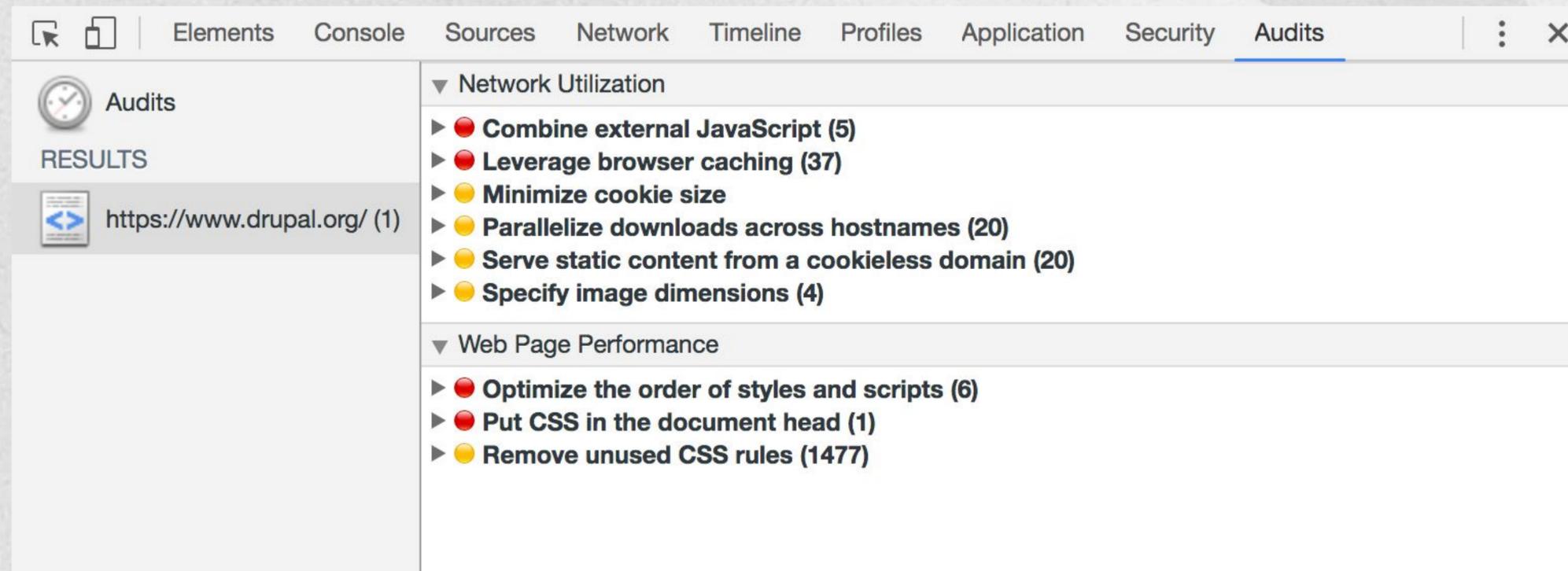
Some options:

1. WPT private instance with some automation
2. NPM packages (varying methods)
3. Services ([dynatrace.com](https://dynatrace.com), [webperformance.com](https://webperformance.com), lots more)
4. Google PageSpeed Insights (API automation)
5. More that I am definitely leaving out

Great information on this topic online.

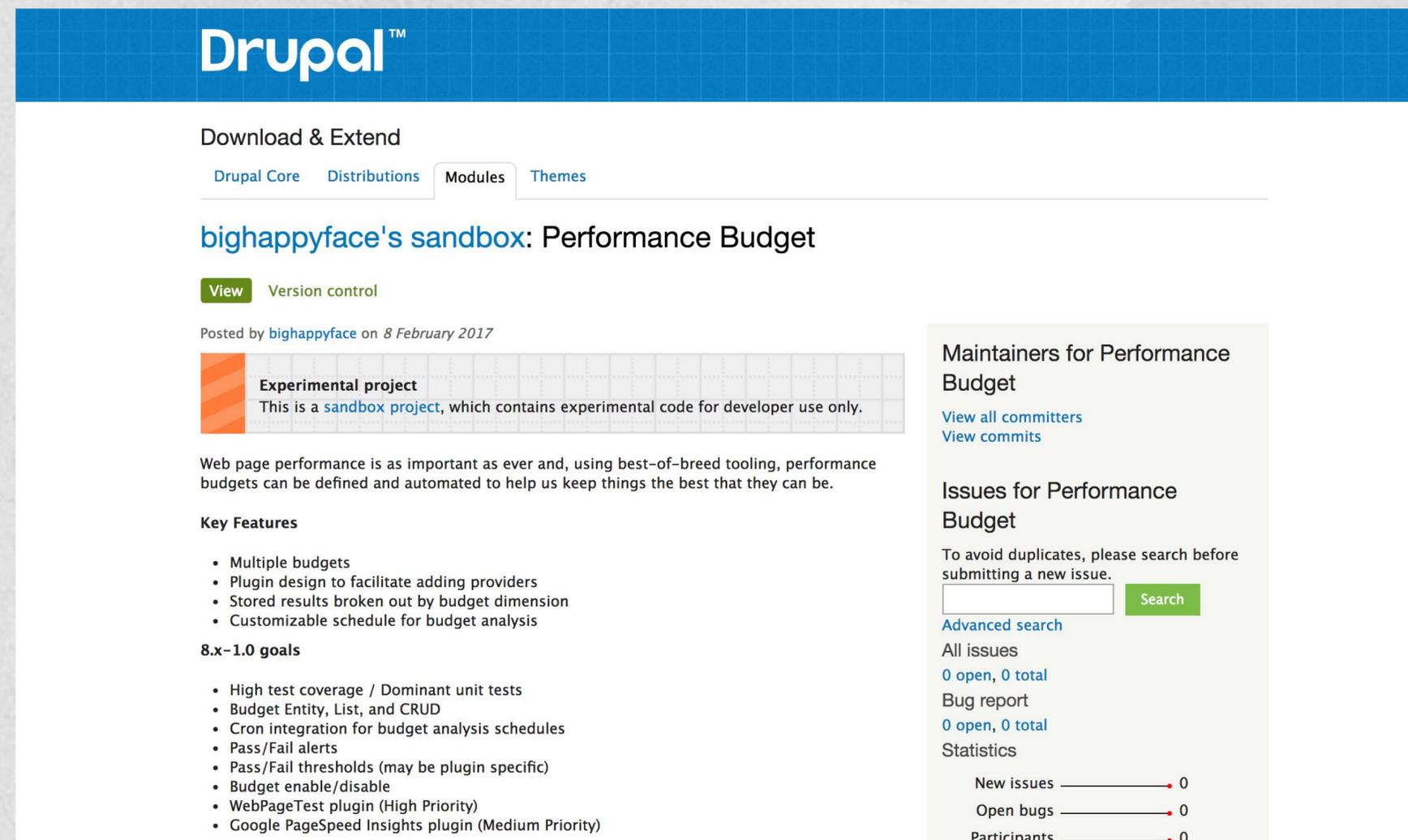


# Dev tools for measurement



## Chrome Audits Tab

# D8 highlights for measurement



The screenshot shows a Drupal 8 project page for 'Performance Budget' by user 'bighappyface'. The page includes a navigation bar with 'Download & Extend' and tabs for 'Drupal Core', 'Distributions', 'Modules', and 'Themes'. The project is marked as an 'Experimental project' and 'Version control'. It features a list of 'Key Features' and '8.x-1.0 goals'. On the right, there are sections for 'Maintainers for Performance Budget' and 'Issues for Performance Budget' with a search bar and statistics.

**Drupal™**

Download & Extend

[Drupal Core](#) [Distributions](#) [Modules](#) [Themes](#)

**bighappyface's sandbox: Performance Budget**

[View](#) Version control

Posted by [bighappyface](#) on 8 February 2017

**Experimental project**  
This is a [sandbox project](#), which contains experimental code for developer use only.

Web page performance is as important as ever and, using best-of-breed tooling, performance budgets can be defined and automated to help us keep things the best that they can be.

**Key Features**

- Multiple budgets
- Plugin design to facilitate adding providers
- Stored results broken out by budget dimension
- Customizable schedule for budget analysis

**8.x-1.0 goals**

- High test coverage / Dominant unit tests
- Budget Entity, List, and CRUD
- Cron integration for budget analysis schedules
- Pass/Fail alerts
- Pass/Fail thresholds (may be plugin specific)
- Budget enable/disable
- WebPageTest plugin (High Priority)
- Google PageSpeed Insights plugin (Medium Priority)

**Maintainers for Performance Budget**

[View all committers](#)  
[View commits](#)

**Issues for Performance Budget**

To avoid duplicates, please search before submitting a new issue.

[Search](#)

[Advanced search](#)

All issues  
[0 open, 0 total](#)

Bug report  
[0 open, 0 total](#)

Statistics

|              |   |
|--------------|---|
| New issues   | 0 |
| Open bugs    | 0 |
| Participants | 0 |

## My sandbox module



**Q&A for measurement?**

# Networking (HTTP/Browsers)

# HTTP/2

What's new?

1. Binary instead of textual (easier to parse, more compact)
2. Fully multiplexed (parallel requests over a single origin connection)
3. Header compression to reduce overhead (HPACK, reduces round-trips)
4. Support for server pushes (proactive caching, good practices still TBD)

<https://http2.github.io/faq/>



# Headers

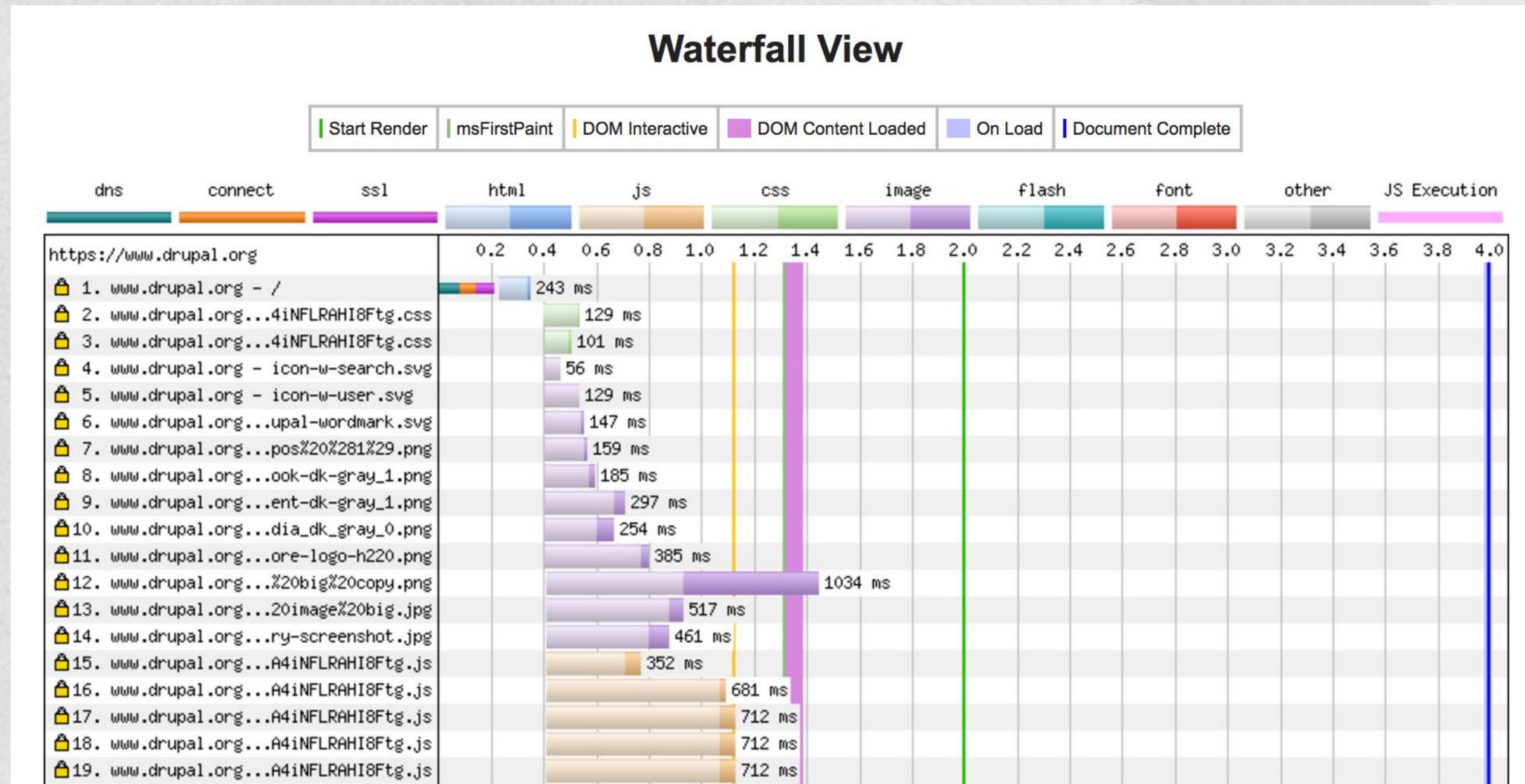
Headers describe documents and heavily influence the browser.

1. Cache-Control (the big one)
2. Vary (rules for varying caches - encoding, cookie, user agent)
3. ETag (cache validation)
4. Cookies (heavy, large influence on cache)
5. Link (canonical/alternative URLs, Resource Hints - preconnect/prefetch)

<https://developer.mozilla.org/en-US/docs/Web/HTTP/Caching>

[https://developer.mozilla.org/en-US/docs/Web/HTML/Link\\_types](https://developer.mozilla.org/en-US/docs/Web/HTML/Link_types)

# Waterfall optimization



know thy waterfall

# Waterfall optimization

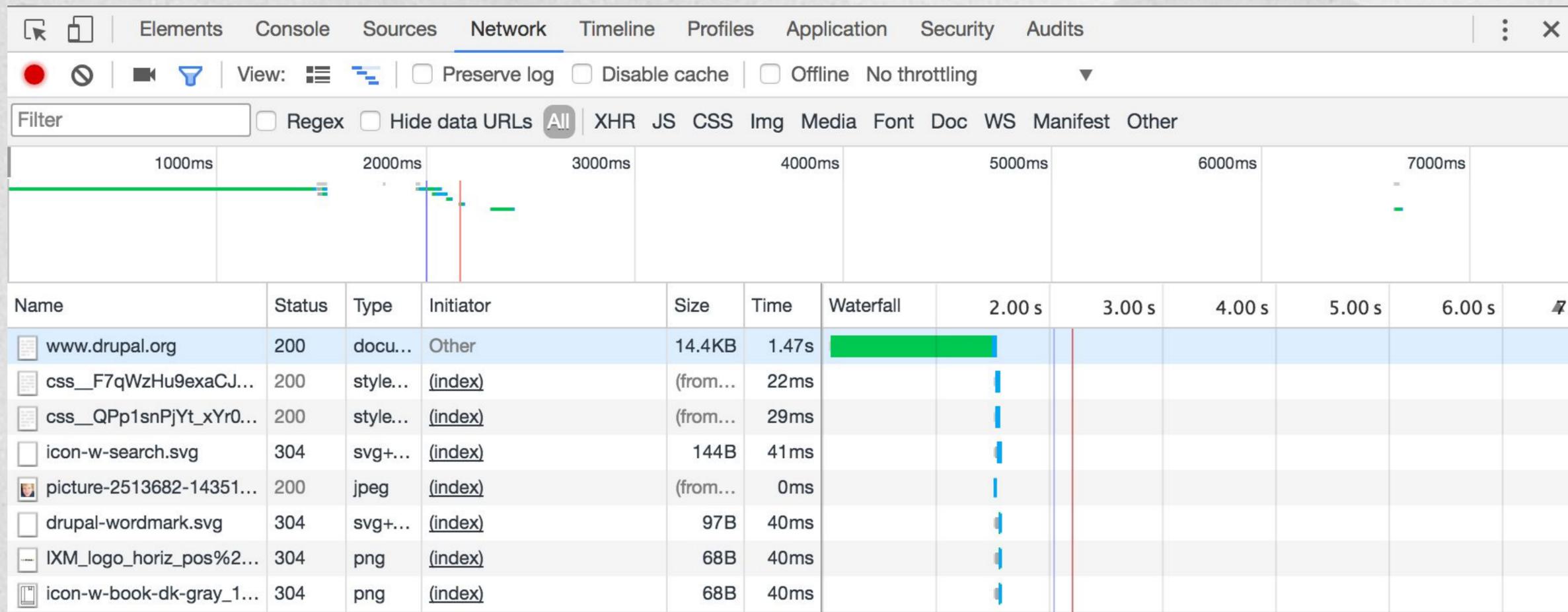
Some tips:

1. Get requests for your domain to the top
2. Understand the impacts of DNS, SSL Negotiation
3. Understand how HTTP/2 vs. HTTP/1.1 waterfalls differ
4. Observe impacts of resource hints
5. Observe nuances of third-party drag

Lots of guidance online.



# Dev tools for networking



## Chrome Network Tab

# D8 highlights for networking

## Resource Hints

[View](#) [Edit](#) [Version control](#) [View history](#) [Maintainers](#) [Automated testing](#)

Posted by [bighappyface](#) on *13 January 2017*

This module provides facilities for user agent resource hints.

Please see <https://www.w3.org/TR/resource-hints/> for more details.

Current Functionality:

- `dns-prefetch`, `preconnect`, and `prefetch`, `prerender` link elements
- `x-dns-prefetch-control` meta element
- HTTP header alternative to link elements by each type

Pending functionality:

- `crossorigin` and `as` link element attributes

Wishlist:

- Drupal API for module hooks to alter output
- JS API for dynamic link elements

### Project Information

Maintenance status: [Actively maintained](#)

Development status: [Under active development](#)

Module category: [Performance and Scalability](#)

[★ Star](#) [✉ All issues](#)

### Maintainers for Resource Hints

[bighappyface](#) - 15 commits  
last: 2 months ago, first: 3 months ago

[View all committers](#)  
[View commits](#)

### Issues for Resource Hints

To avoid duplicates, please search before submitting a new issue.

[Search](#)

[Advanced search](#)

All issues

6 open, 11 total

Bug report

0 open, 2 total

## Resource Hints module

The background is a dark blue, monochromatic photograph of a modern apartment complex. The building features multiple stories with balconies and large windows. In the center, there is a courtyard area with a body of water, possibly a swimming pool or a small lake, surrounded by a wooden deck and railings. The overall atmosphere is calm and modern.

# Q&A for networking?

# UI (HTML/CSS)

# Critical render path

What's a "critical render path?"

Set of steps browsers must take to convert resources into a useable site.

1. Understand your resources and how they affect rendering.
2. Understand the waterfall (blocking/waits, order of load, options to inline)
3. Minimize critical resources (minimum CSS, JS, images, fonts)
4. Minimize round-trips

<https://developers.google.com/web/fundamentals/performance/critical-rendering-path/analyzing-crp>

# Fonts

Web fonts are the bane of performance.

1. Overloaded with glyphs, diacritics, metadata, kerning...
2. Too many formats (browser support concerns, Google Fonts tries to help)
3. EOT and TTF formats are not compressed by default
4. Font redraws and FOUC (flash of unrendered content)
5. Always blocks

<https://developers.google.com/web/fundamentals/performance/optimizing-content-efficiency/webfont-optimization>



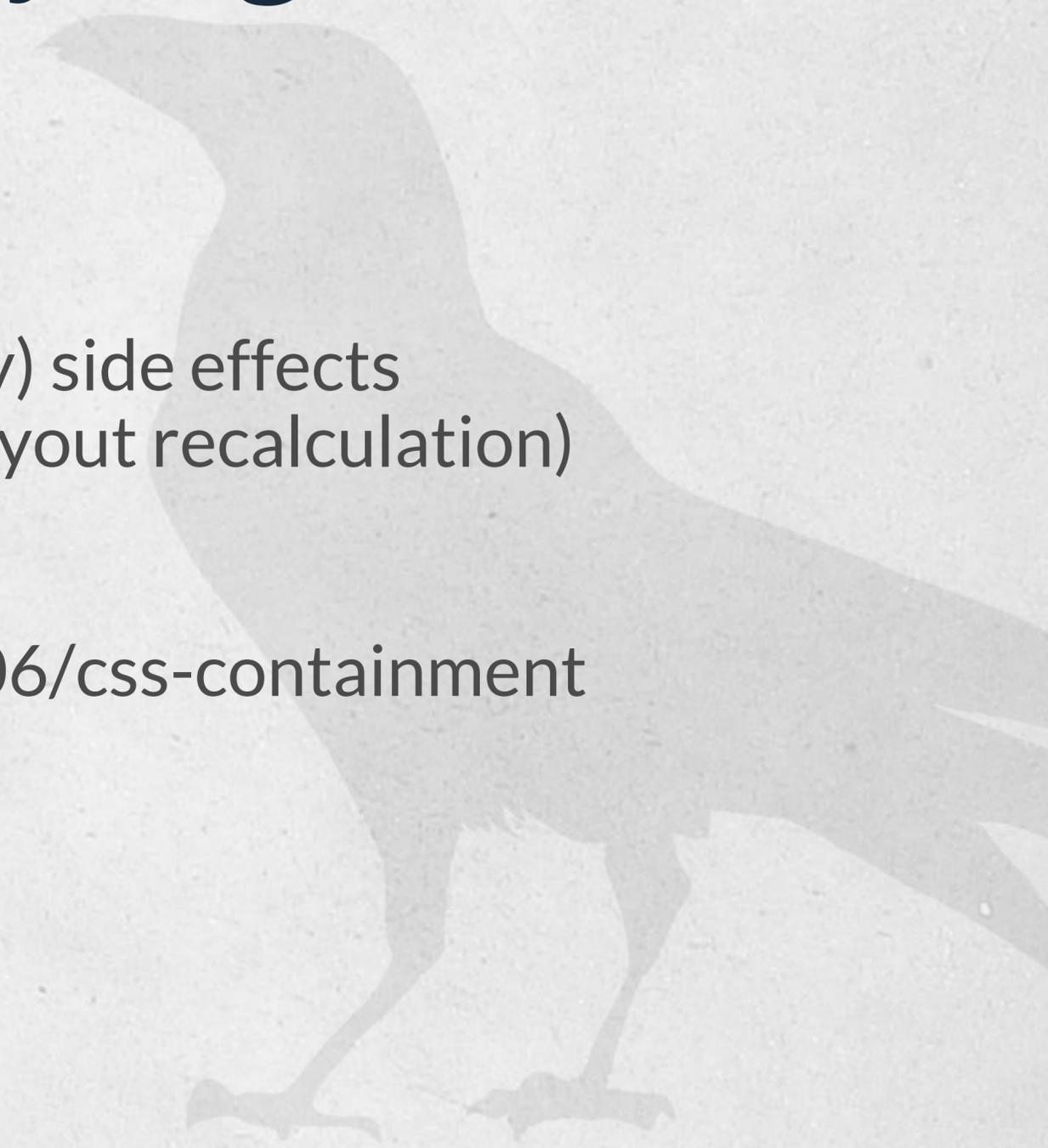
# Dynamic/transformative styling

The future of CSS/styling?

1. PostCSS (transforming styles with JS)  
Note: Beware super-selectors (selector specificity) side effects
2. CSS containment (element isolation to improve layout recalculation)

<http://postcss.org>

<https://developers.google.com/web/updates/2016/06/css-containment>



# Web Components

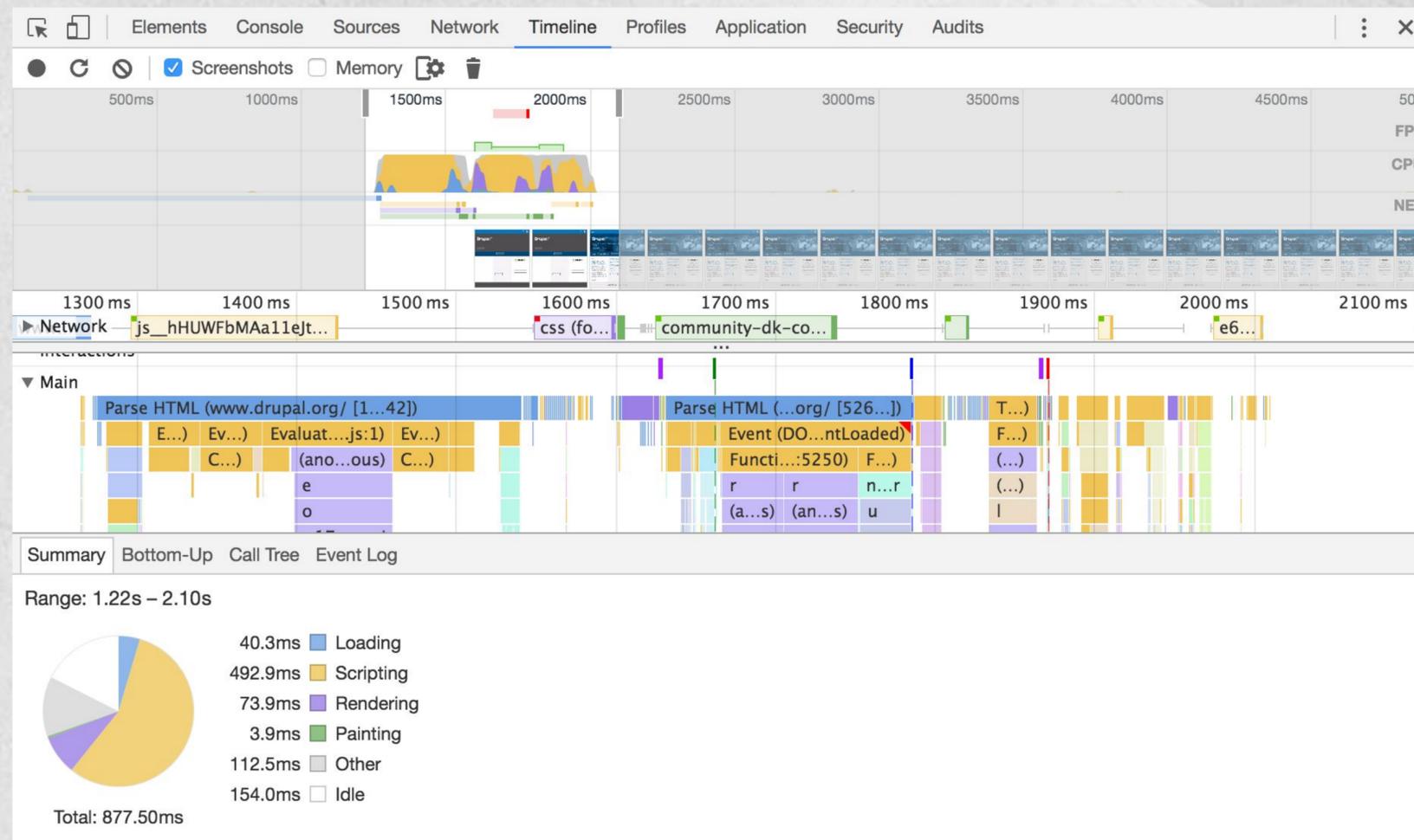
Self-contained building blocks for building all the things.

1. Tech: HTML Templates, Shadow DOM, Custom elements and HTML Imports
2. Benefits: CSS scoping, DOM encapsulation, composition, isolation

[https://developer.mozilla.org/en-US/docs/Web/Web\\_Components](https://developer.mozilla.org/en-US/docs/Web/Web_Components)

<https://developers.google.com/web/fundamentals/getting-started/primers/shadowdom>

# Dev tools for UI



## Chrome Timeline Tab

# D8 highlights for UI

## Web components

[View](#) [Version control](#) [View history](#) [Automated testing](#)

Posted by [btopro](#) on 5 February 2017



This project is not covered by Drupal's [security advisory policy](#).

[See Drupal @ PSU Blog post](#)  
[See the DrupalCon Baltimore 2017 talk \(2nd 1/2 of the session\)](#)



**Web components are the future.** Not layout systems, not template engines, not endless tpl files. [Webcomponents.org](#) is an emerging web industry standard to replace all of that. This module allows your front end people to develop exclusively in things like polymer and to have no knowledge of Drupal to do work for Drupal.

It has support for multiple component engines but we initially support Polymer which is incredibly powerful for creating simple reusable, well documented templates.

### Modules included in this package

#### Web components

API that helps with managing the integration of web components. This establishes webcomponent as an entity for storage and tracking. This sets up for a workflow where you can

★ Star 5  No mail

### Maintainers for Web components

[btopro](#) – 28 commits  
last: 18 hours ago, first: 2 months ago

[View all committers](#)  
[View commits](#)

### Issues for Web components

To avoid duplicates, please search before submitting a new issue.

[Advanced search](#)

All issues

8 open, 16 total

## Web Components module



# Q&A for UI?

# Code (JS)

# JS Asynchronous/lazy loading

Some key metrics that are important to you.

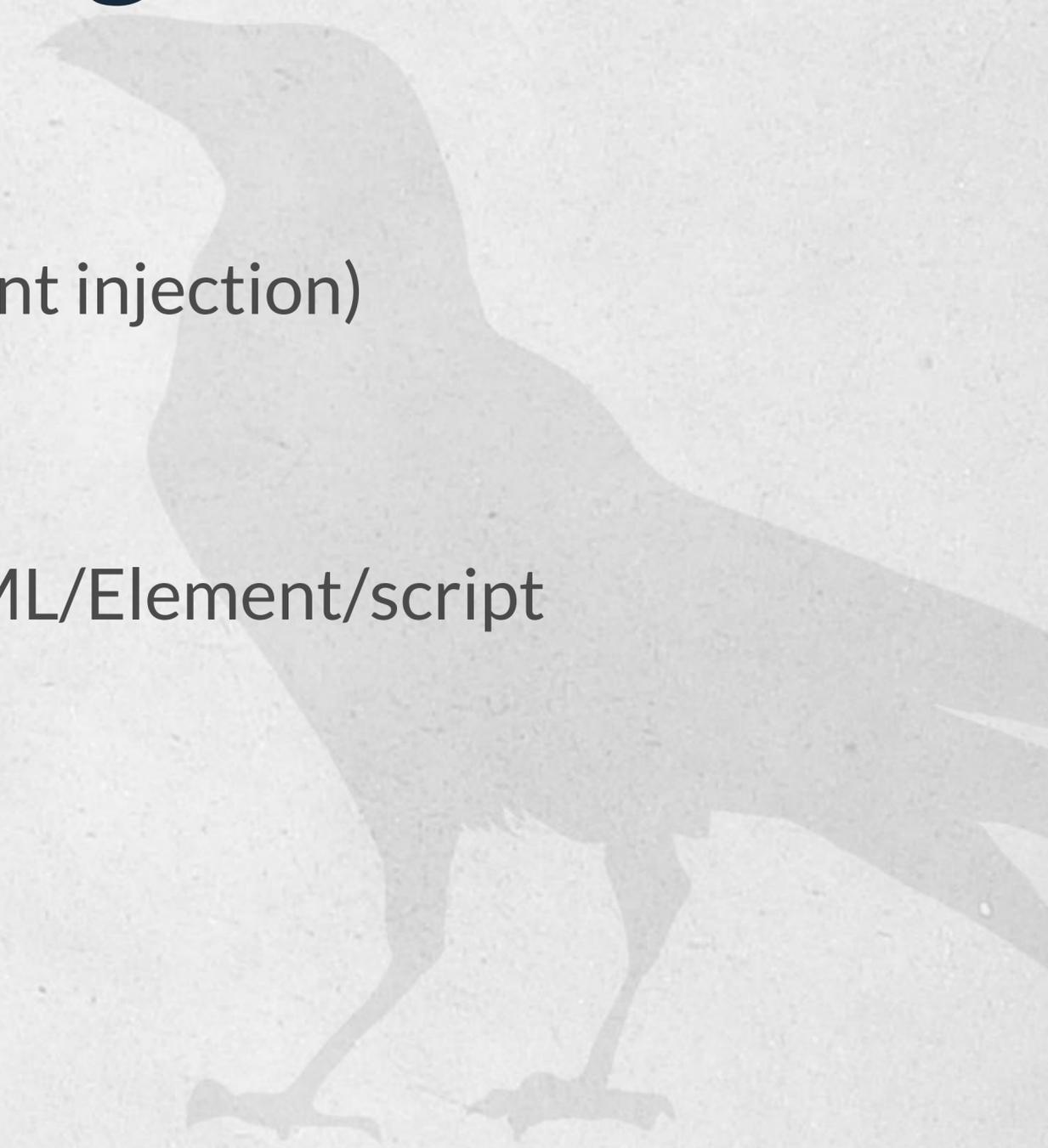
1. async script attribute (same as DOM script element injection)
2. Code splitting (webpack all day)
3. JS module loader (require.js, WhatWG proposals)

<https://developer.mozilla.org/en-US/docs/Web/HTML/Element/script>

<https://webpack.github.io/docs/code-splitting.html>

<http://requirejs.org/>

<https://whatwg.github.io/loader/>



# JS Transpiling and ES6+ browser support

Modern JS and all of its goodness.

1. Babel, babel, babel
2. babel-preset-env (automatically determine the Babel plugins and polyfills you need - smaller artifacts)

<https://babeljs.io>

<https://github.com/babel/babel-preset-env>



# General code performance

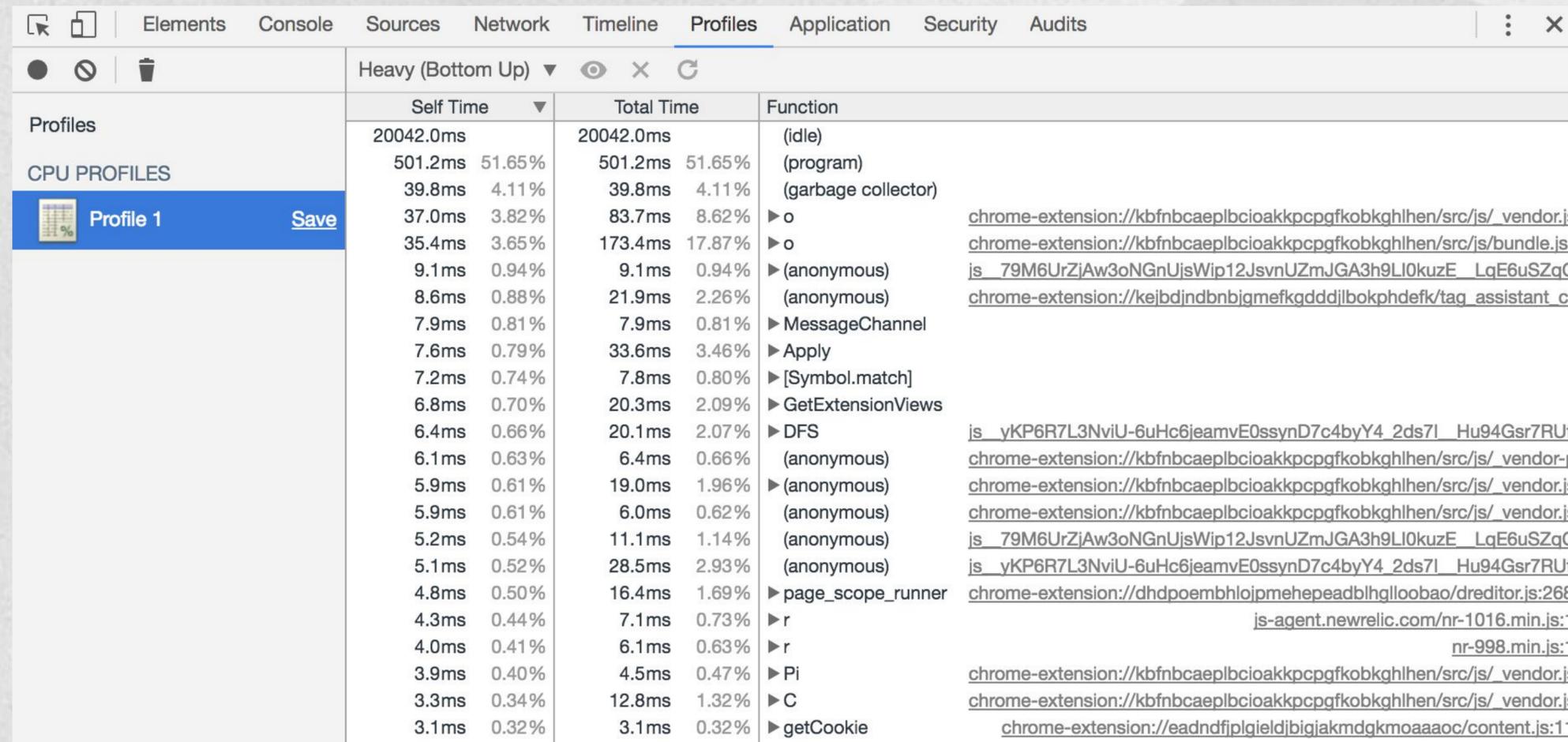
1. ASM.js (optimizable, low-level subset of JavaScript)
2. Slow code is slow code (measure complexity)

<http://asmjs.org/>

<http://bigocheatsheet.com/>



# Dev tools for code



| Self Time |        | Total Time |        | Function            |
|-----------|--------|------------|--------|---------------------|
| 20042.0ms |        | 20042.0ms  |        | (idle)              |
| 501.2ms   | 51.65% | 501.2ms    | 51.65% | (program)           |
| 39.8ms    | 4.11%  | 39.8ms     | 4.11%  | (garbage collector) |
| 37.0ms    | 3.82%  | 83.7ms     | 8.62%  | ▶ o                 |
| 35.4ms    | 3.65%  | 173.4ms    | 17.87% | ▶ o                 |
| 9.1ms     | 0.94%  | 9.1ms      | 0.94%  | ▶ (anonymous)       |
| 8.6ms     | 0.88%  | 21.9ms     | 2.26%  | (anonymous)         |
| 7.9ms     | 0.81%  | 7.9ms      | 0.81%  | ▶ MessageChannel    |
| 7.6ms     | 0.79%  | 33.6ms     | 3.46%  | ▶ Apply             |
| 7.2ms     | 0.74%  | 7.8ms      | 0.80%  | ▶ [Symbol.match]    |
| 6.8ms     | 0.70%  | 20.3ms     | 2.09%  | ▶ GetExtensionViews |
| 6.4ms     | 0.66%  | 20.1ms     | 2.07%  | ▶ DFS               |
| 6.1ms     | 0.63%  | 6.4ms      | 0.66%  | (anonymous)         |
| 5.9ms     | 0.61%  | 19.0ms     | 1.96%  | ▶ (anonymous)       |
| 5.9ms     | 0.61%  | 6.0ms      | 0.62%  | (anonymous)         |
| 5.2ms     | 0.54%  | 11.1ms     | 1.14%  | (anonymous)         |
| 5.1ms     | 0.52%  | 28.5ms     | 2.93%  | (anonymous)         |
| 4.8ms     | 0.50%  | 16.4ms     | 1.69%  | ▶ page_scope_runner |
| 4.3ms     | 0.44%  | 7.1ms      | 0.73%  | ▶ r                 |
| 4.0ms     | 0.41%  | 6.1ms      | 0.63%  | ▶ r                 |
| 3.9ms     | 0.40%  | 4.5ms      | 0.47%  | ▶ Pi                |
| 3.3ms     | 0.34%  | 12.8ms     | 1.32%  | ▶ C                 |
| 3.1ms     | 0.32%  | 3.1ms      | 0.32%  | ▶ getCookie         |

## Chrome Profiles Tab

# D8 highlights for code

[Drupal Core](#) [Distributions](#) [Modules](#) [Themes](#)

[View](#) [Version control](#) [View history](#) [Automated testing](#)

Posted by [Drupal](#) on *28 September 2003*

Get started by downloading the official Drupal core files. These official releases come bundled with a variety of modules and themes to give you a good starting point to help build your site. Drupal core includes basic community features like blogging, forums, and contact forms, and can be easily extended by downloading other contributed modules and themes.

**Before installing Drupal, please review the [system requirements](#) and the [Installation Guide](#).**

[Information on version numbers](#) can be found in the [online documentation](#).

### Following Drupal core development

For announcements of major initiatives and opportunities to contribute, please follow the [Core announcements group](#) (RSS feed, [@drupalcore](#) on twitter.).

[Change records for Drupal core](#)

[★ Star](#) 71 [✉ Followed](#)

### Maintainers for Drupal core

- [Gábor Hojtsy](#) – 1698 commits  
last: 53 min ago, first: 10 years ago
- [cilefen](#) – 41 commits  
last: 18 hours ago, first: 4 months ago
- [catch](#) – 4579 commits  
last: 1 day ago, first: 5 years ago
- [lauriii](#) – 21 commits  
last: 1 day ago, first: 1 month ago
- [alexpott](#) – 7416 commits  
last: 1 day ago, first: 4 years ago

Drupal 8 is better for JS



**Q&A for code?**



# Some thoughts



**low performance**



**high performance**

# **Performance challenges**

**(get out of your comfort zone)**



**Performance frustrates**  
(progress comes slow)



# **Performance rewards**

**(validation all around)**



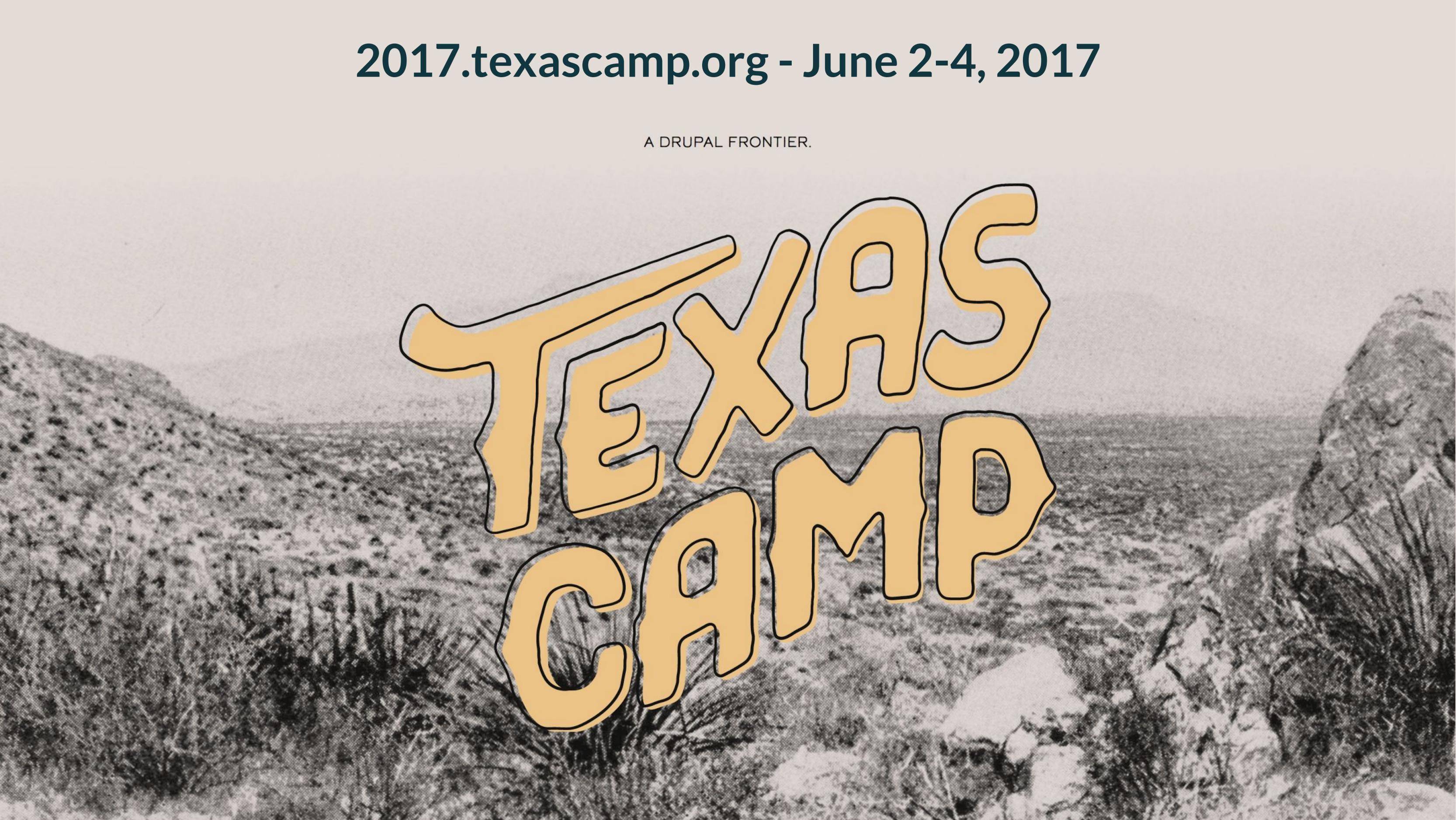


**One more thing**

[2017.texascamp.org](http://2017.texascamp.org) - June 2-4, 2017

A DRUPAL FRONTIER.

TEXAS  
CAMP



# SUBMISSION DEADLINE FAST APPROACHING

Visit this page to keep up with Texas Camp-related announcements.



**PONY  
EXPRESS**

- THE TEXAS CAMP -  
**NEWSLETTER**

YOU'LL HEAR IT HERE FIRST

STRAIGHT FROM THE HORSES MOUTH

Name

Email address

**SIGN UP**

**[2017.texascamp.org/submit-session](https://2017.texascamp.org/submit-session) (closes 4/28)**

# Join Us for Contribution Sprints

**Friday, April 28, 2017**

**First-Time Sprinter  
Workshop**  
9:00am-12:00pm  
Room: 307-308

**Mentored Core Sprint**  
9:00am-12:00pm  
Room:301-303

**General Sprints**  
9:00am-6:00pm  
Room:309-310

**#drupalsprints**



**BALTIMORE**

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**WHAT DID  
YOU THINK?**

Locate this session at the  
DrupalCon Baltimore website:  
<http://baltimore2017.drupal.org/schedule>

Take the survey!  
<https://www.surveymonkey.com/r/drupalconbaltimore>

**THANK YOU!**



**BALTIMORE**

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**Web Performance in 2017**

with @bighappyface