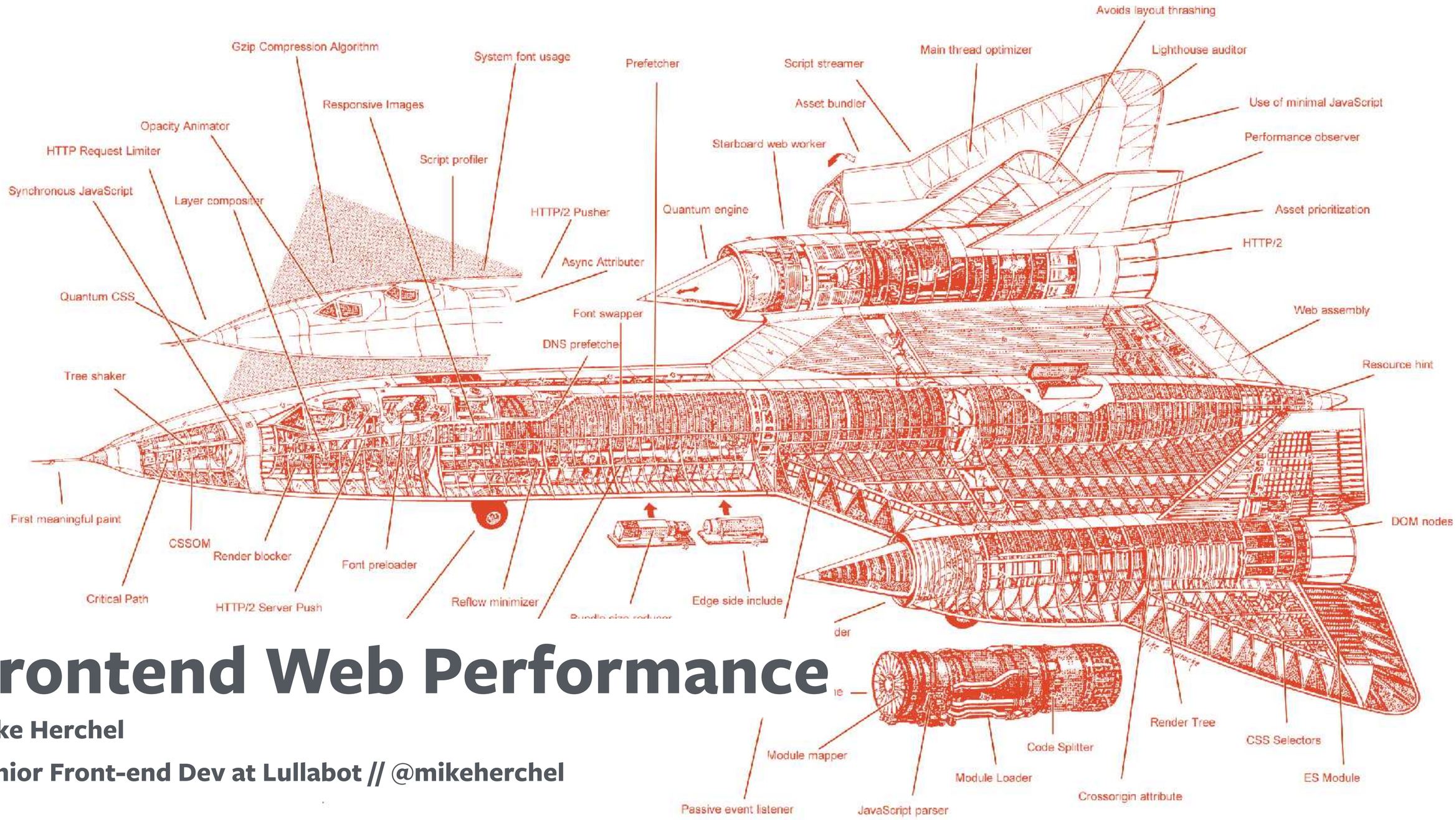
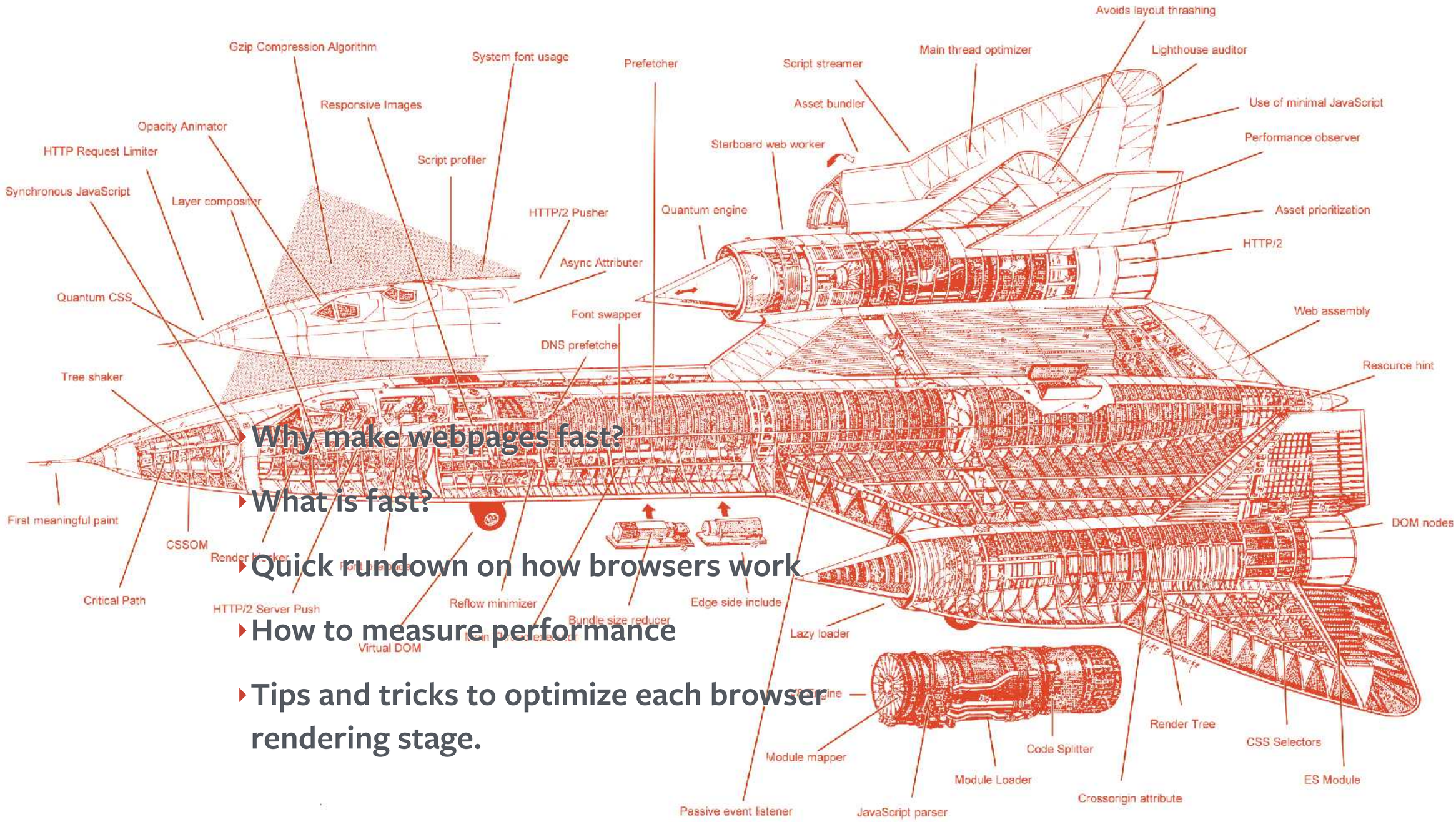


Frontend Web Performance

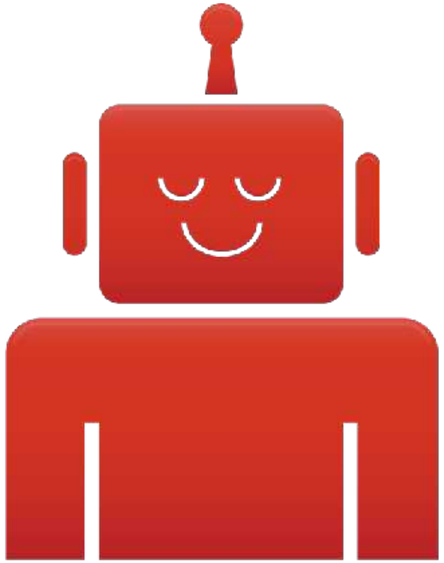
Mike Herchel

Senior Front-end Dev at Lullabot // @mikeherchel



- Why make webpages fast?
- What is fast?
- Quick rundown on how browsers work
- How to measure performance
- Tips and tricks to optimize each browser rendering stage.


Mike Herchel
Millie Herchel
Dexter
Herchel



Lullabot™

http://tiny.cc/dcon-perf

“80-90% of the end-user response time is spent on the frontend. Start there.

— Steve Souders

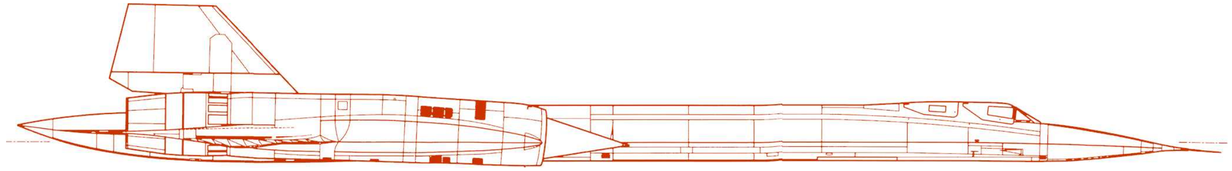
https://www.stevesouders.com/blog/2012/02/10/the-performance-golden-rule/

53% of mobile site visits are abandoned if pages take longer than 3 seconds to load.

– https://www.doubleclickbygoogle.com/articles/mobile-speed-matters/

Mobile sites load in 5 seconds earn up to 2x more mobile ad revenue.

– https://www.doubleclickbygoogle.com/articles/mobile-speed-matters/



WHAT IS FAST?

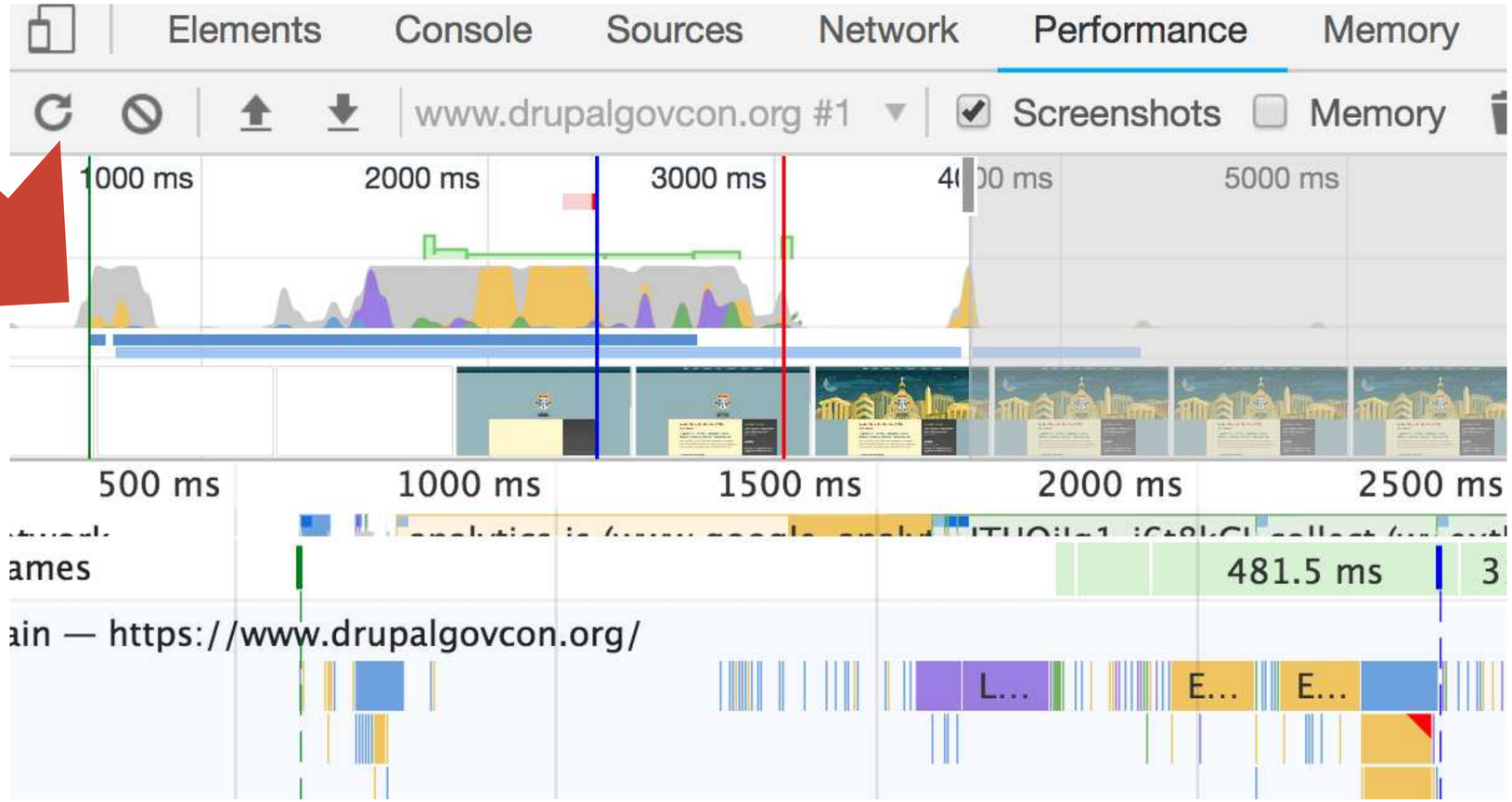
FRONTEND PERFORMANCE METRICS

- Time to First Byte
- Time to First Meaningful Paint
- Time to First Interactive
- Speed Index

TIME TO FIRST BYTE

- Time from when you begin navigation until the first byte of the html file hits your browser.
- Delays here can indicate backend performance issues.
- Effective caching really helps with this (Drupal FTW)
- CDNs can dramatically help. They position content closer to the user.

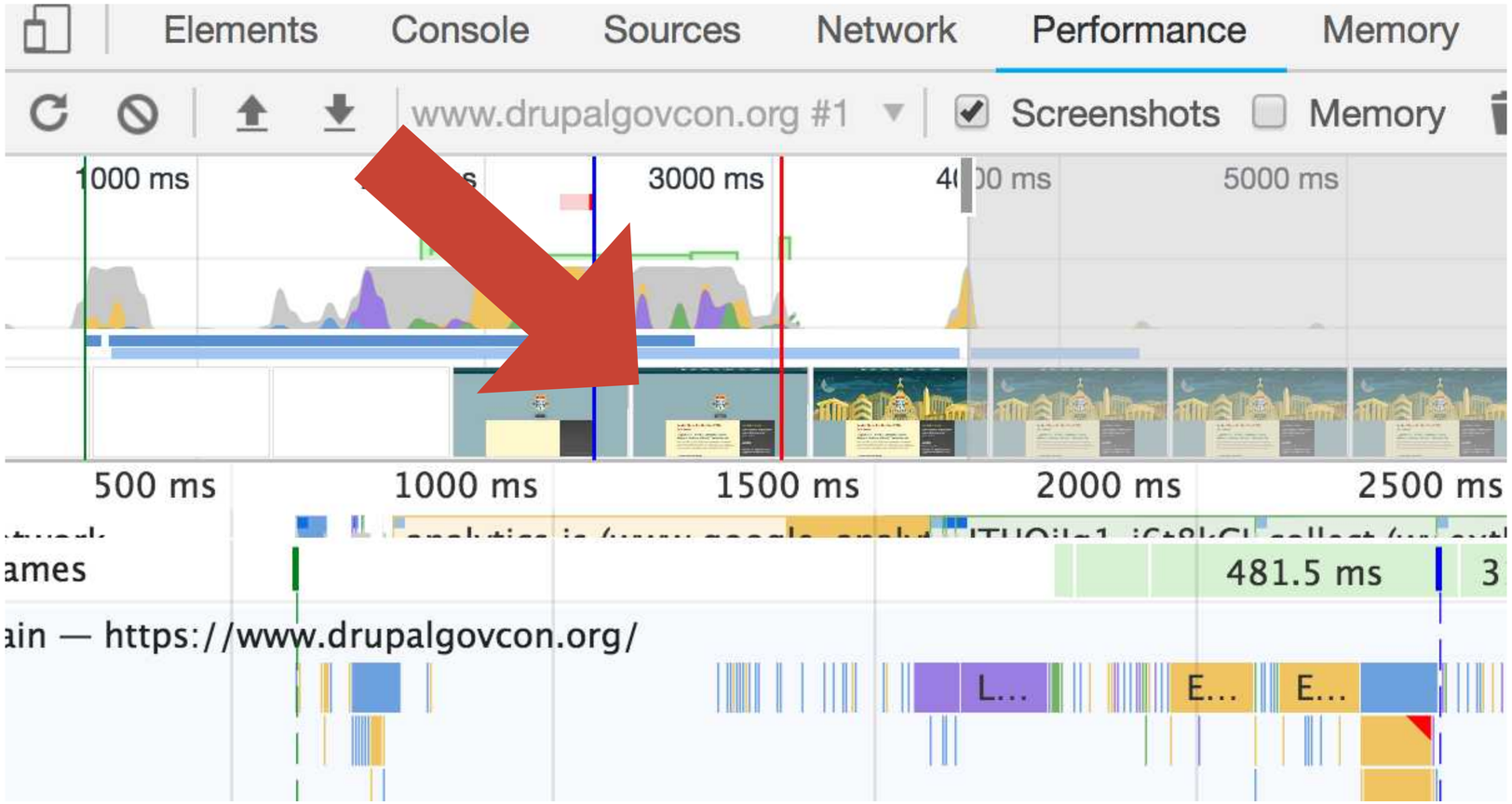
TIME TO FIRST BYTE



TIME TO FIRST MEANINGFUL PAINT

- Primary content is visible.
- Marks the paint event that follows the most significant change to layout.
- Can be ambiguous.

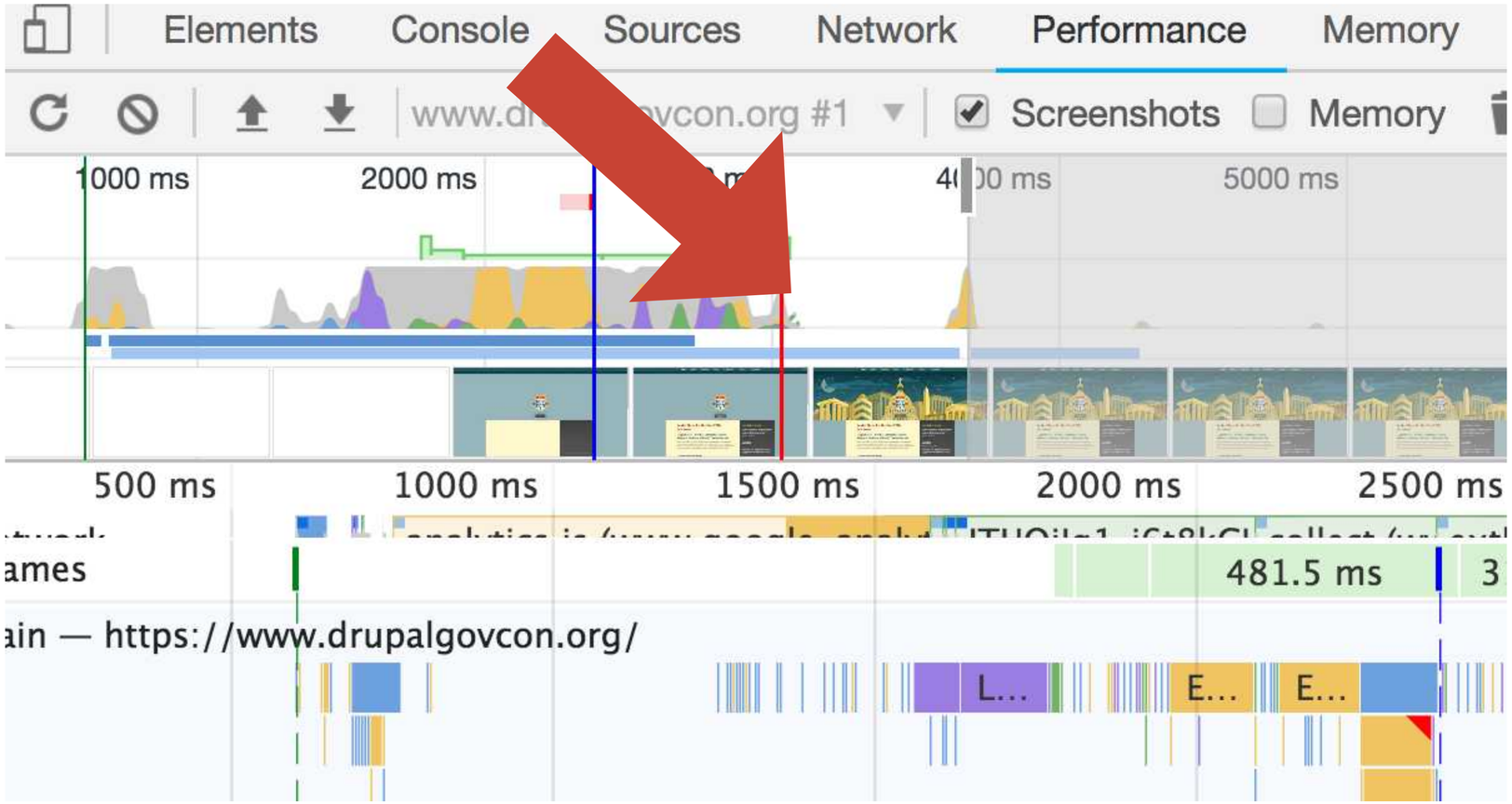
TIME TO FIRST MEANINGFUL PAINT



TIME TO INTERACTIVE

- Load is finished, and main thread work is done
- Consistently interactive

TIME TO INTERACTIVE

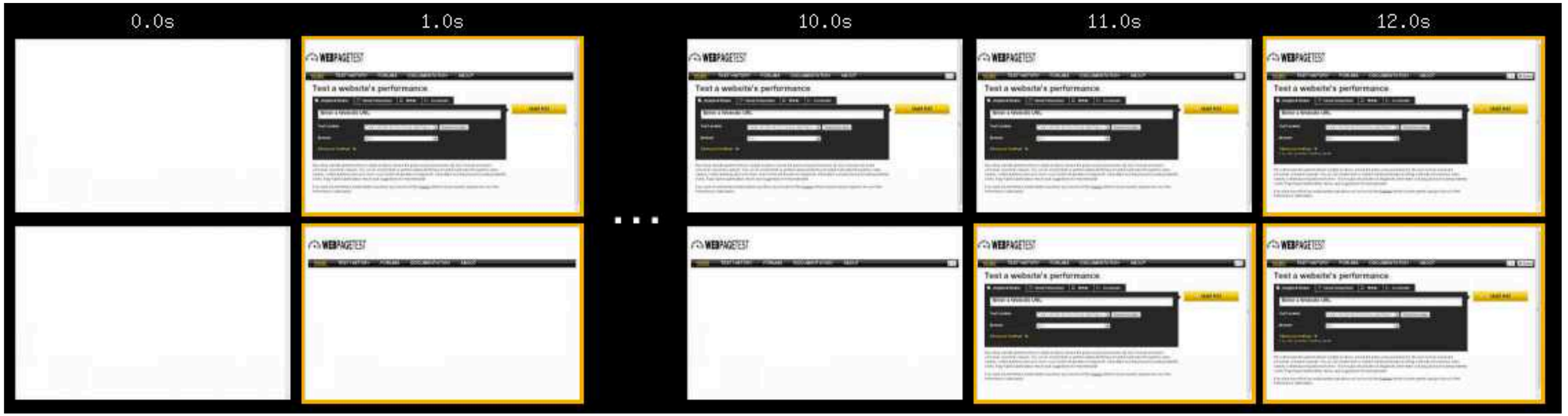


SPEED INDEX

- Calculated value
- Average time at which visible parts of the page are displayed
- How quickly does the page approach visually complete?
- Essentially the time it takes for average pixel to paint (milliseconds)

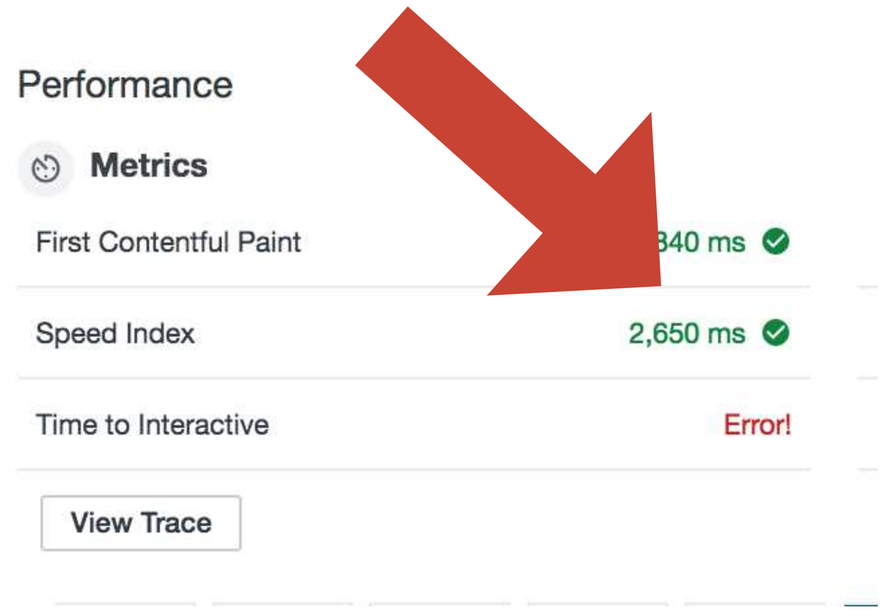
https://sites.google.com/a/webpagetest.org/docs/using-webpagetest/metrics/speed-index

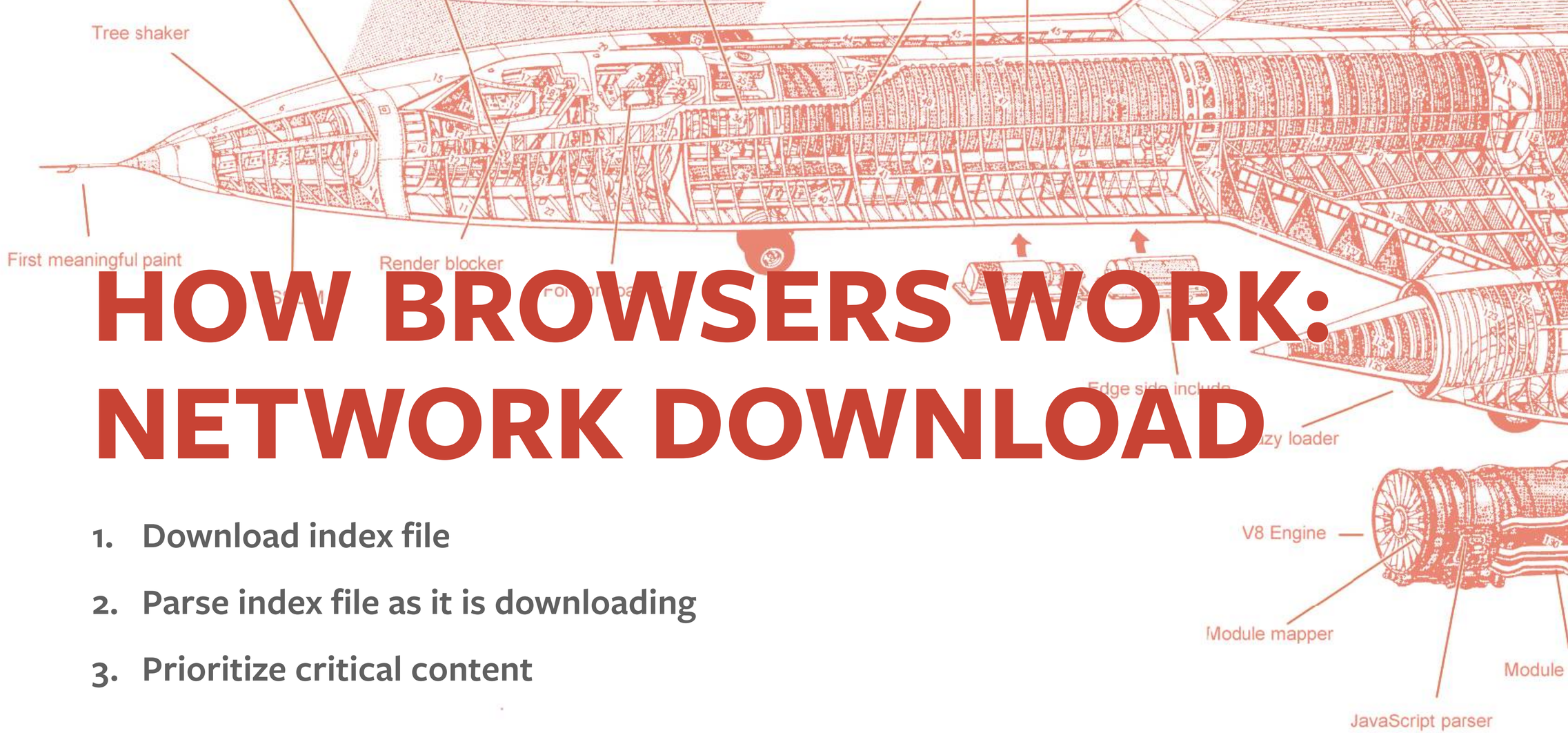
SPEED INDEX



https://sites.google.com/a/webpagetest.org/docs/using-webpagetest/metrics/speed-index

SPEED INDEX

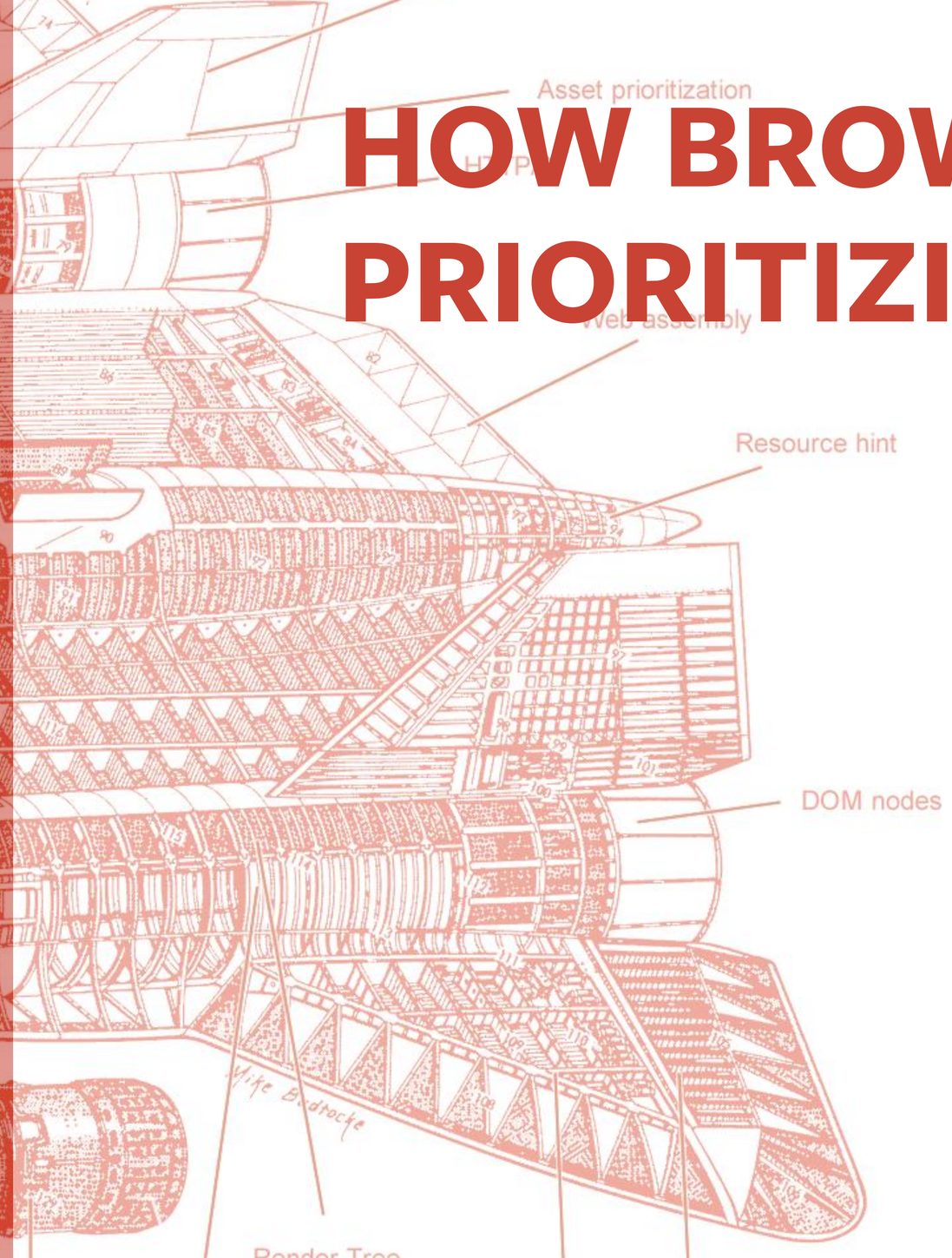

Performance
Metrics
First Contentful Paint
340 ms
Speed Index
2,650 ms
Time to Interactive
Error!
View Trace



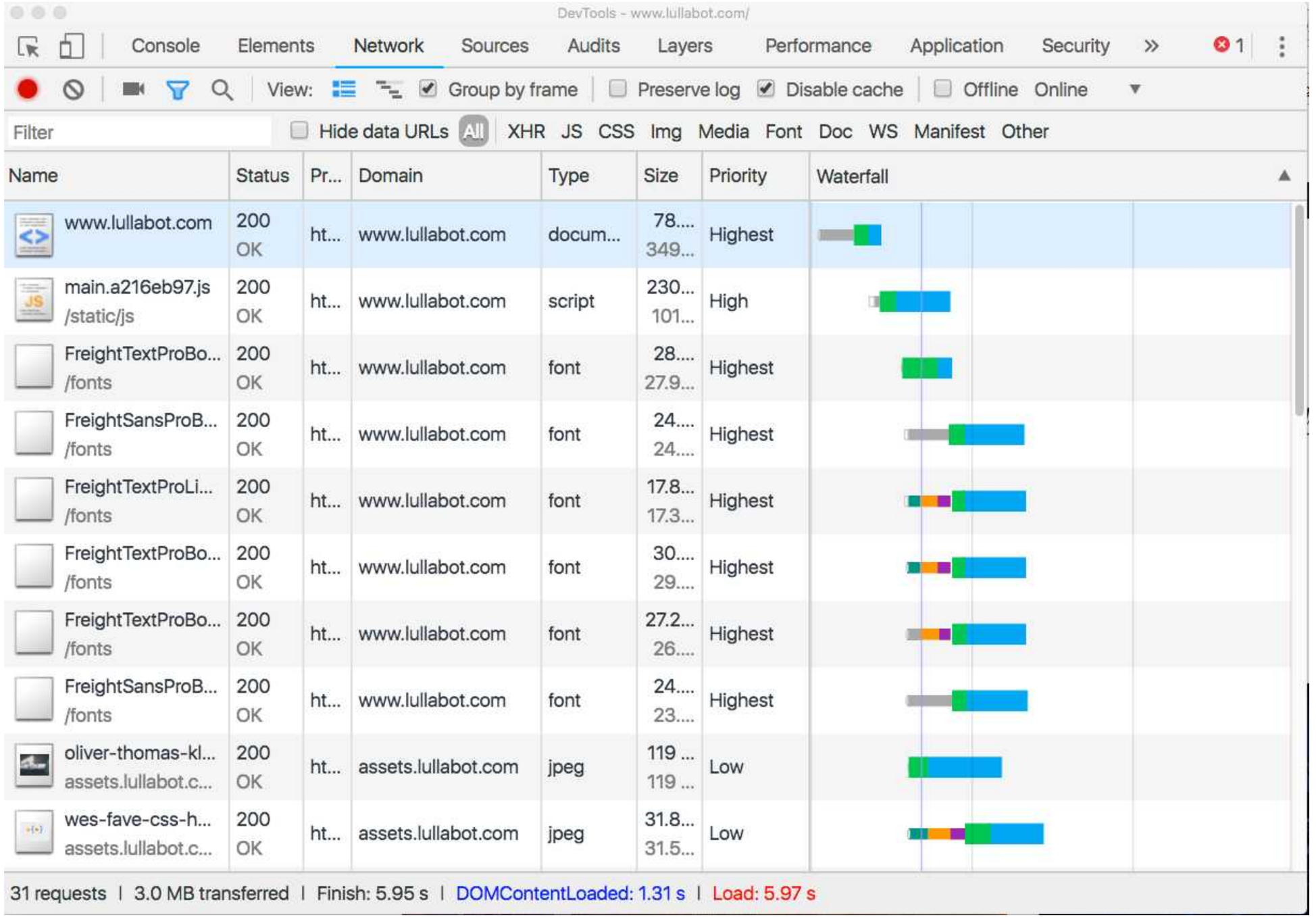
HOW BROWSERS WORK: NETWORK DOWNLOAD

1. Download index file
2. Parse index file as it is downloading
3. Prioritize critical content

HOW BROWSERS WORK: PRIORITIZING CONTENT

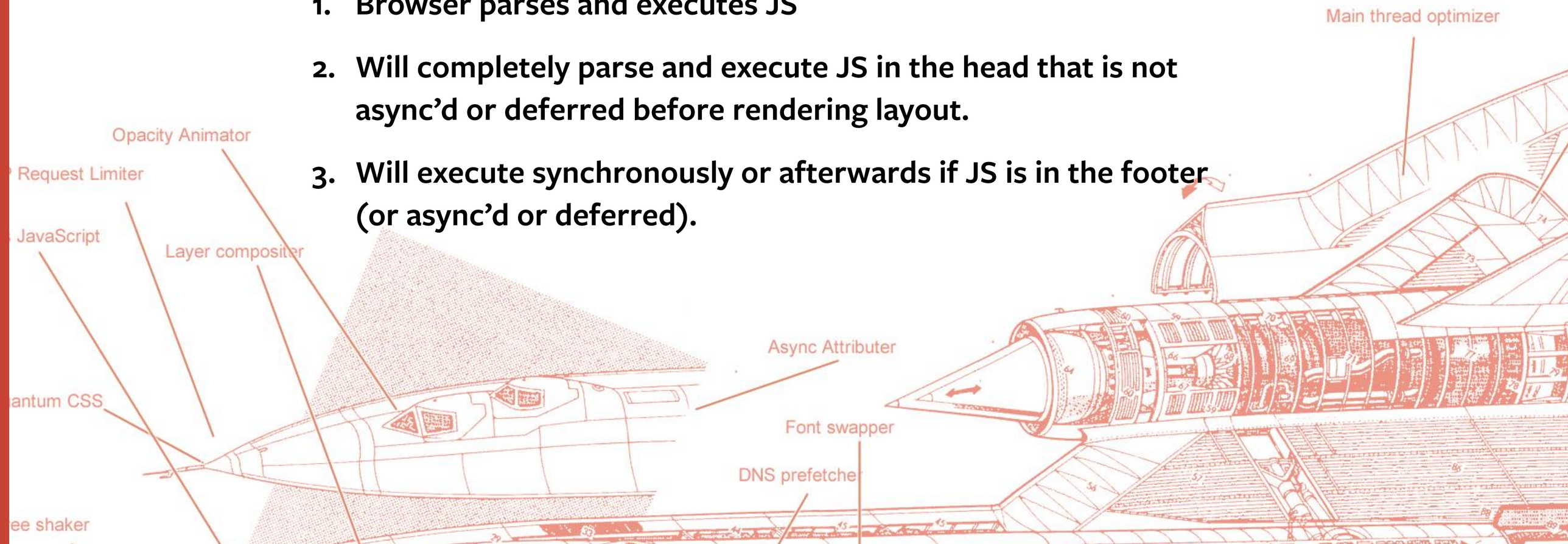


1. Highest
   - Initial document
   - CSS
2. High
   - Webfonts
   - Script tags in the <head>
   - XHR
3. Medium
   - Script tags outside of the <head>
4. Low

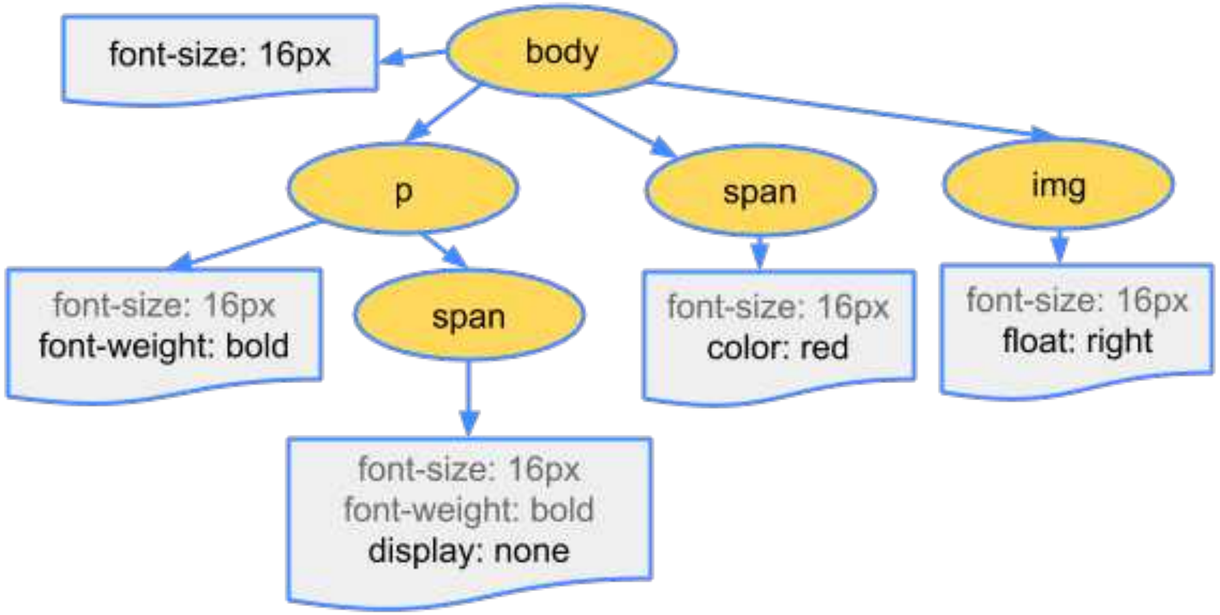

DevTools - www.lullabot.com/
Console
Elements
Network
Sources
Audits
Layers
Performance
Application
Security
1
View:
Group by frame
Preserve log
Disable cache
Offline
Online
Filter
Hide data URLs
All
XHR
JS
CSS
Img
Media
Font
Doc
WS
Manifest
Other
Name
Status
Pr...
Domain
Type
Size
Priority
Waterfall
www.lullabot.com
200 OK
ht...
www.lullabot.com
docum...
78.... 349...
Highest
main.a216eb97.js
/static/js
200 OK
ht...
www.lullabot.com
script
230... 101...
High
FreightTextProBo...
/fonts
200 OK
ht...
www.lullabot.com
font
28.... 27.9...
Highest
FreightSansProB...
/fonts
200 OK
ht...
www.lullabot.com
font
24.... 24....
Highest
FreightTextProLi...
/fonts
200 OK
ht...
www.lullabot.com
font
17.8... 17.3...
Highest
FreightTextProBo...
/fonts
200 OK
ht...
www.lullabot.com
font
30.... 29....
Highest
FreightTextProBo...
/fonts
200 OK
ht...
www.lullabot.com
font
27.2... 26....
Highest
FreightSansProB...
/fonts
200 OK
ht...
www.lullabot.com
font
24.... 23....
Highest
oliver-thomas-kl...
assets.lullabot.c...
200 OK
ht...
assets.lullabot.com
jpeg
119 ... 119 ...
Low
wes-fave-css-h...
assets.lullabot.c...
200 OK
ht...
assets.lullabot.com
jpeg
31.8... 31.5...
Low
31 requests | 3.0 MB transferred | Finish: 5.95 s | DOMContentLoaded: 1.31 s | Load: 5.97 s

HOW BROWSERS WORK: PARSE / EXECUTE CSS & JS

1. **Browser parses and executes JS**
2. **Will completely parse and execute JS in the head that is not async'd or deferred before rendering layout.**
3. **Will execute synchronously or afterwards if JS is in the footer (or async'd or deferred).**

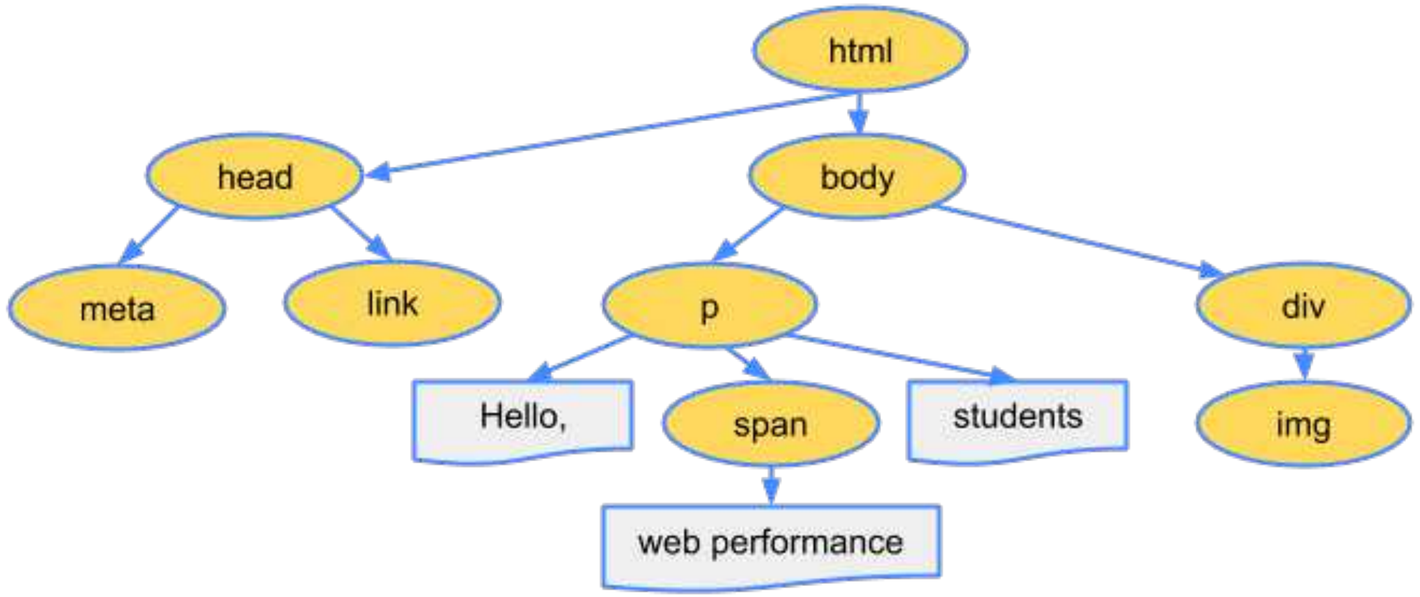


HOW BROWSERS WORK: CREATING THE CSSOM



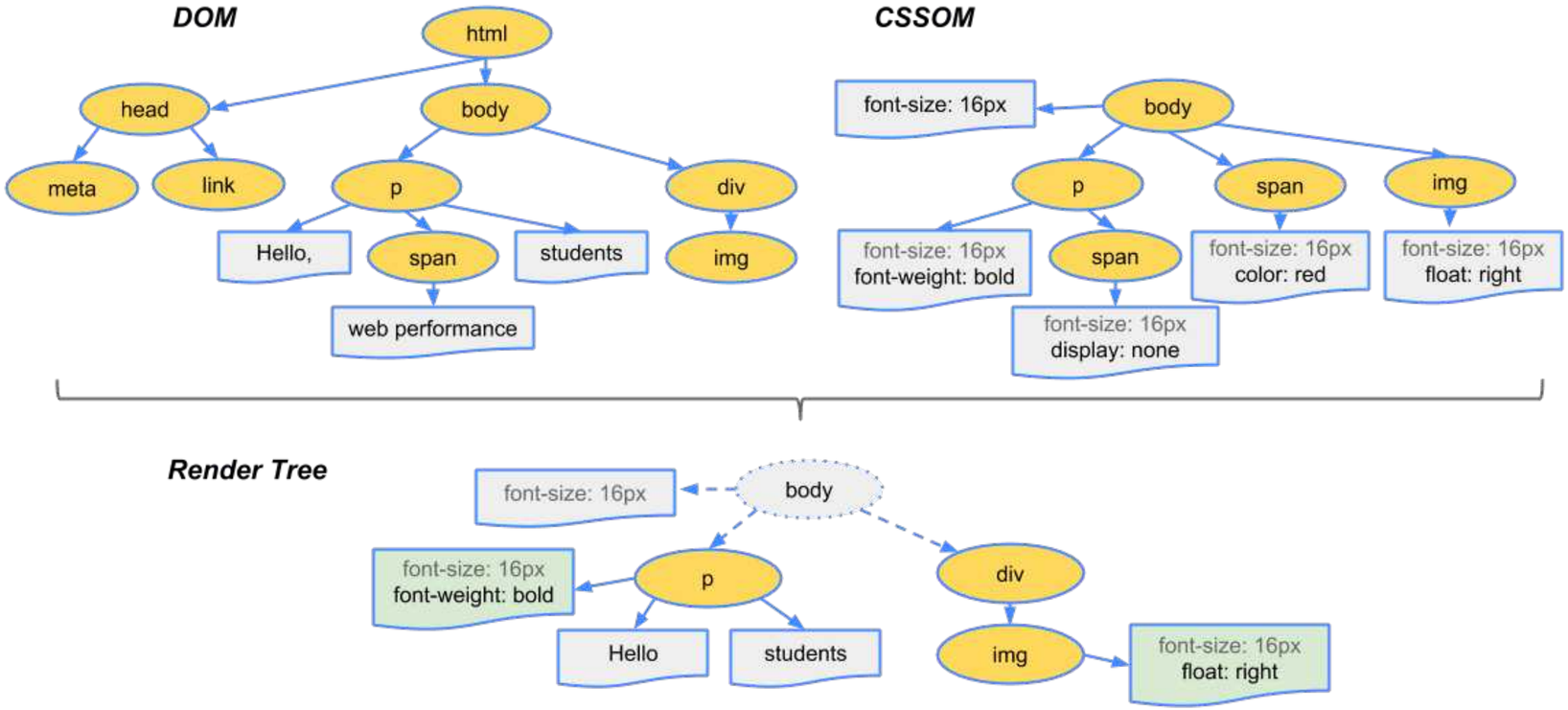
https://developers.google.com/web/fundamentals/performance/critical-rendering-path/constructing-the-object-model

HOW BROWSERS WORK: CREATING THE DOM



https://developers.google.com/web/fundamentals/performance/critical-rendering-path/constructing-the-object-model

HOW BROWSERS WORK: CREATING THE RENDER TREE



https://developers.google.com/web/fundamentals/performance/critical-rendering-path/render-tree-construction

LAYOUT
(AKA REFLOW)

- Browser calculates how much space it takes to put elements on screen.
- Calculates where to place the elements on the screen in relation to other elements and the viewport.
- Expensive.

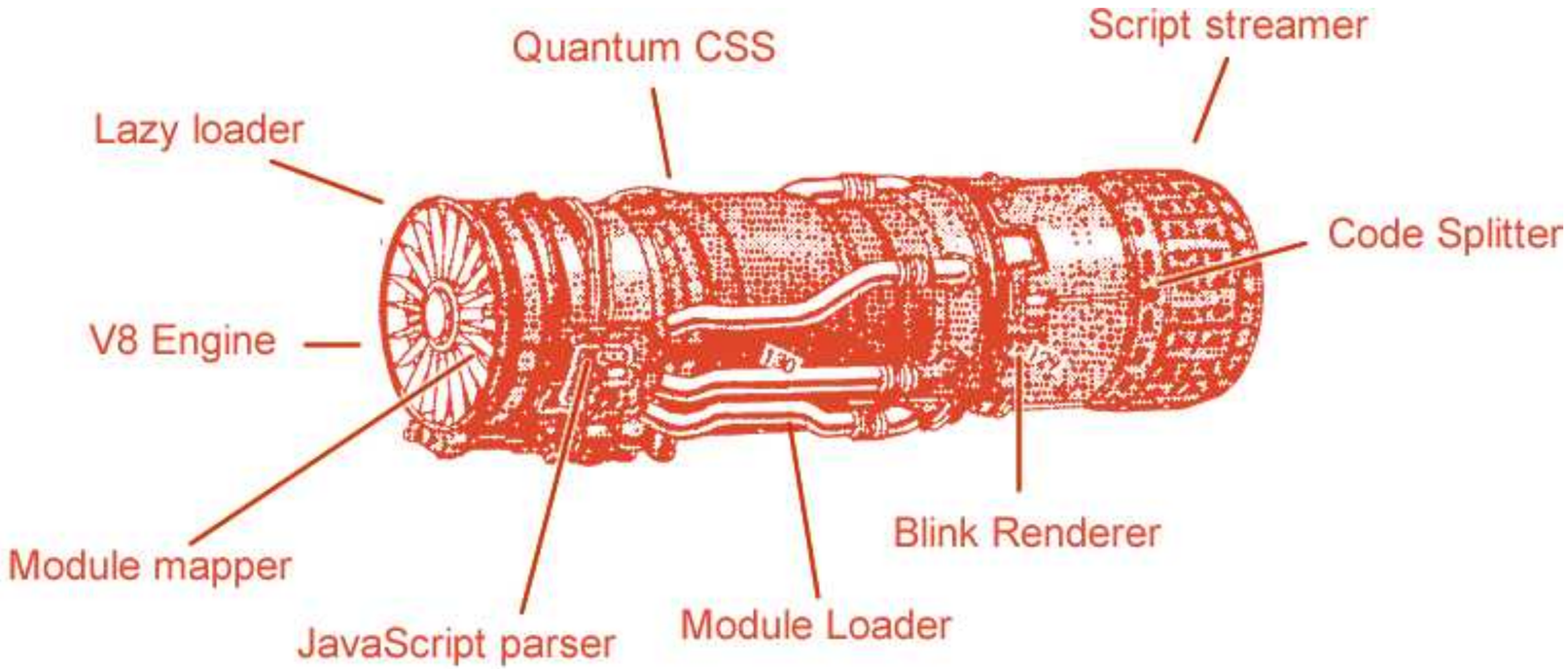
PAINT

- The process of filling in pixels.
- Text, colors, images, borders, etc
- Expensive.

COMPOSITING

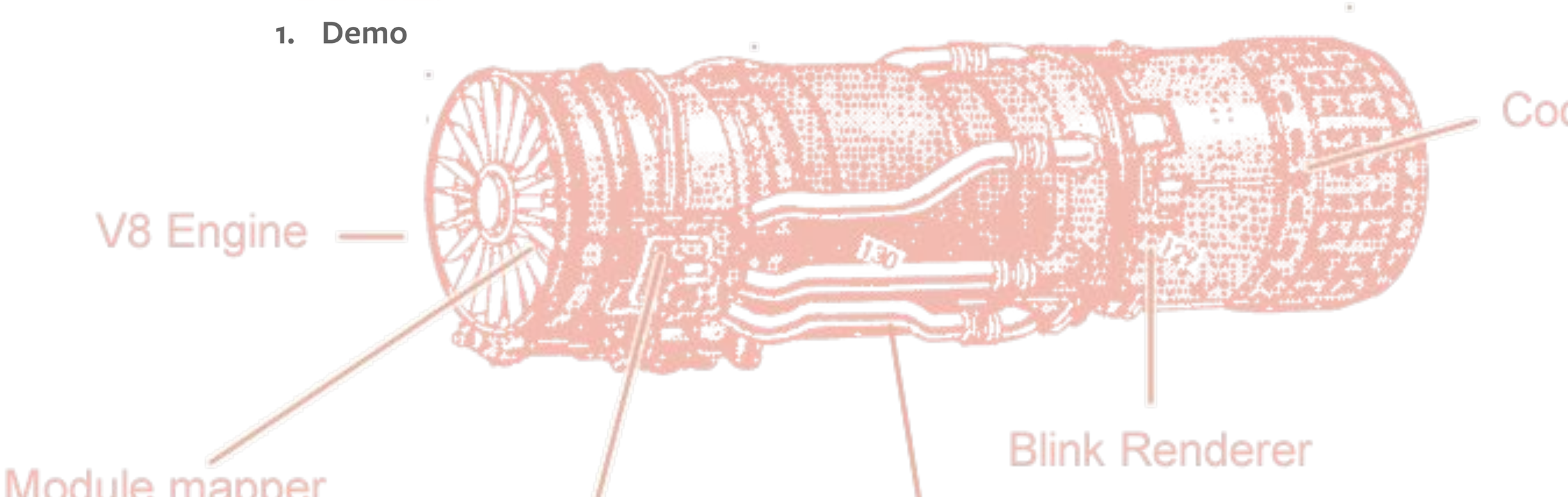
- Multiple layers within browser get placed on the screen.
- Think of these as Photoshop layers - they can easily be moved around
- Cheap!

MEASURING PERFORMANCE



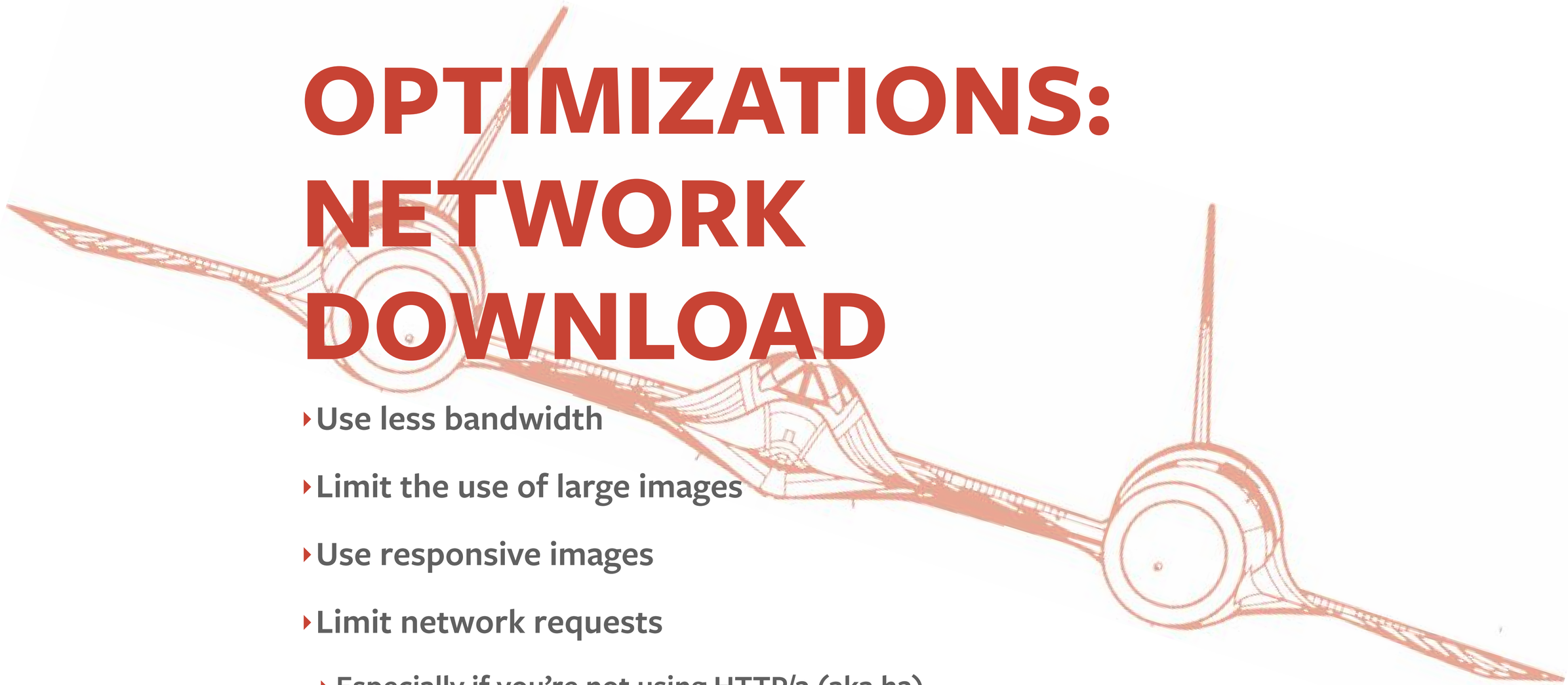
MEASURING PERF: DEVTOOLS AUDITS TAB

1. Demo

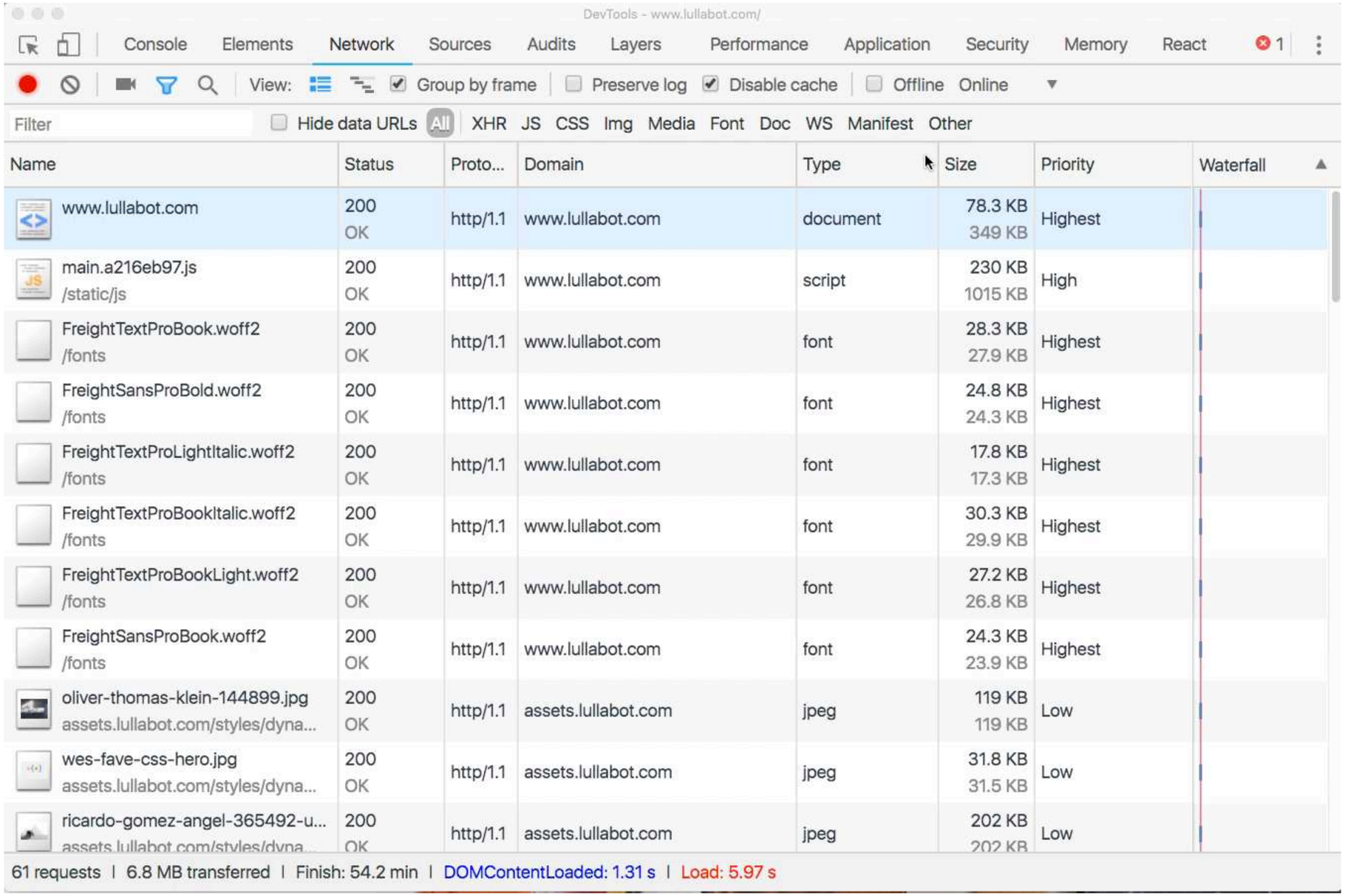


OPTIMIZATIONS

OPTIMIZATIONS: NETWORK DOWNLOAD



- Use less bandwidth
- Limit the use of large images
- Use responsive images
- Limit network requests
  - Especially if you’re not using HTTP/2 (aka h2)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Memory
React
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Group by frame
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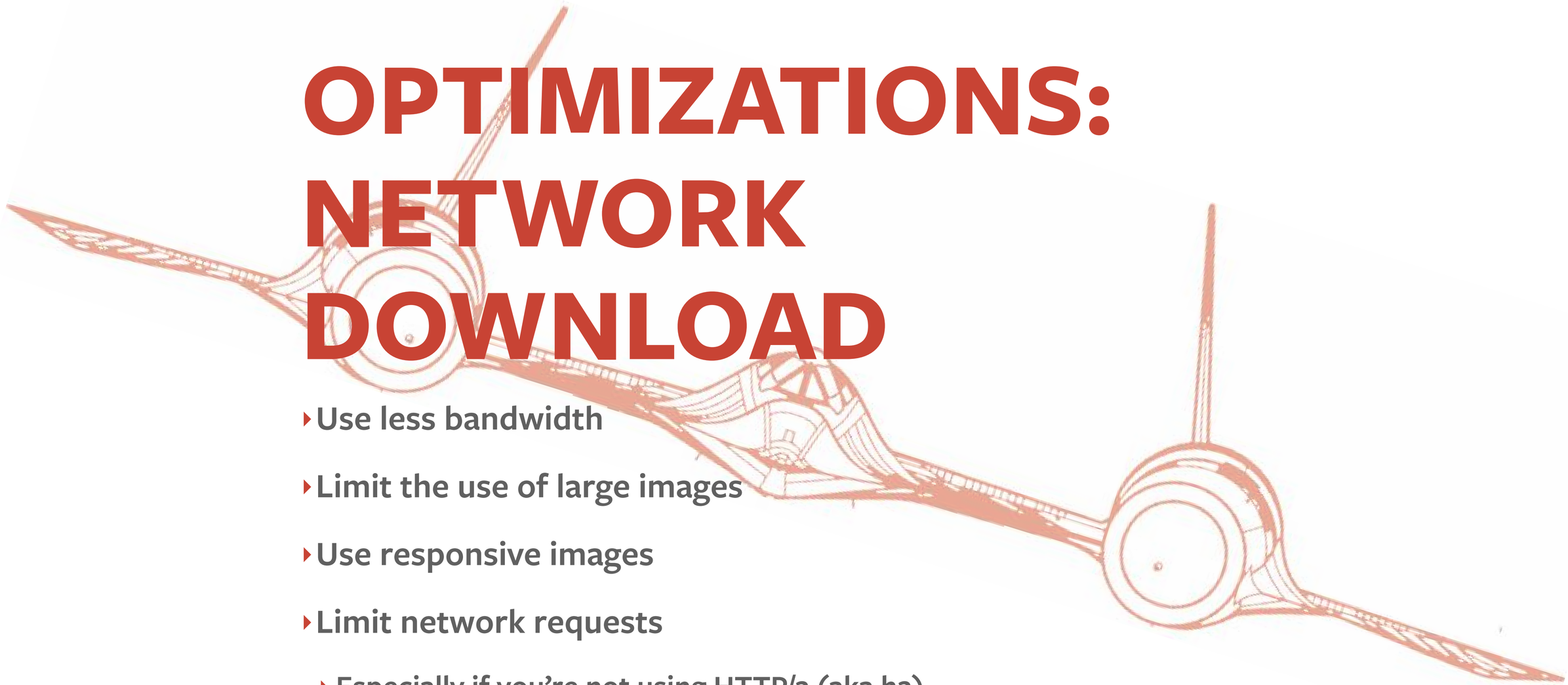
Disable cache
Offline
Online
Filter
Hide data URLs
All
XHR
JS
CSS
Img
Media
Font
Doc
WS
Manifest
Other
Name
Status
Proto...
Domain
Type
Size
Priority
Waterfall
www.lullabot.com
200 OK
http/1.1
www.lullabot.com
document
78.3 KB
349 KB
Highest
main.a216eb97.js
/static/js
200 OK
http/1.1
www.lullabot.com
script
230 KB
1015 KB
High
FreightTextProBook.woff2
/fonts
200 OK
http/1.1
www.lullabot.com
font
28.3 KB
27.9 KB
Highest
FreightSansProBold.woff2
/fonts
200 OK
http/1.1
www.lullabot.com
font
24.8 KB
24.3 KB
Highest
FreightTextProLightItalic.woff2
/fonts
200 OK
http/1.1
www.lullabot.com
font
17.8 KB
17.3 KB
Highest
FreightTextProBookItalic.woff2
/fonts
200 OK
http/1.1
www.lullabot.com
font
30.3 KB
29.9 KB
Highest
FreightTextProBookLight.woff2
/fonts
200 OK
http/1.1
www.lullabot.com
font
27.2 KB
26.8 KB
Highest
FreightSansProBook.woff2
/fonts
200 OK
http/1.1
www.lullabot.com
font
24.3 KB
23.9 KB
Highest
oliver-thomas-klein-144899.jpg
assets.lullabot.com/styles/dyna...
200 OK
http/1.1
assets.lullabot.com
jpeg
119 KB
119 KB
Low
wes-fave-css-hero.jpg
assets.lullabot.com/styles/dyna...
200 OK
http/1.1
assets.lullabot.com
jpeg
31.8 KB
31.5 KB
Low
ricardo-gomez-angel-365492-u...
200 OK
http/1.1
assets.lullabot.com
jpeg
202 KB
202 KB
Low
61 requests | 6.8 MB transferred | Finish: 54.2 min | DOMContentLoaded: 1.31 s | Load: 5.97 s

PRPL PATTERN

- Push critical resources for the initial URL route.
- Render initial route.
- Pre-cache remaining routes.
- Lazy-load and create remaining routes on demand.

https://developers.google.com/web/fundamentals/performance/prpl-pattern/

OPTIMIZATIONS: NETWORK DOWNLOAD



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- Limit the use of large images
- Use responsive images
- Limit network requests
  - Especially if you’re not using HTTP/2 (aka h2)

DevTools - www.usatoday.com/

Elements | Console | Sources | Network | Performance | Memory | Application | Security | Audits

2 31

View: | Group by frame | Preserve log | Disable cache | Offline | Online

Filter | Hide data URLs | All | XHR | JS | CSS | Img | Media | Font | Doc | WS | Manifest | Other

5000 ms | 10000 ms | 15000 ms | 20000 ms | 25000 ms | 30000 ms | 35000 ms | 40000 ms | 45000 m

Name	Status	Protocol	Domain	Type	Initiator	Size	Time	Priority	Connection ID	Waterfall
mon?anId=922805&campId=728x90&pubId=1…	200	http/1.1	pixel.adsafeprotect…	gif	main.…	309 B	38 ms	Low	2330644	
dt?advEntityId=241810&asId=ada9e807-24a0-…	200	http/1.1	dt.adsafeprotected.…	gif	adj?p…	301 B	68 ms	Low	2332134	
dt?advEntityId=241810&asId=ada9e807-24a0-…	200	http/1.1	dt.adsafeprotected.…	gif	adj?p…	301 B	67 ms	Low	2332134	
dt?anId=922805&asId=6cc90a78-6f10-8376-fe…	200	http/1.1	dt.adsafeprotected.…	gif	main.…	301 B	68 ms	Low	2332134	
acbTG8-PEs2SkBLPDZBSnRNcmZbODo6Rkx…	200	http/1.1	sp.usatoday.com	script	(inde…	1.6 KB	347 ms	Low	2336723	
bcn?fe=1554681889365&y=2.0.1100&elg=411…	200	h2	www.summerhams…	gif	7q1z…	181 B	76 ms	Low	2329752	
dt?anId=922805&asId=6cc90a78-6f10-8376-fe…	200	http/1.1	dt.adsafeprotected.…	gif	main.…	301 B	70 ms	Low	2332134	
favicon.png	200	h2	www.gannett-cdn.c…	webp	Other	685 B	7 ms	High	2326976	
event.png?impid=d643c9cdd23348208ab6b35…	200	http/1.1	tps11004.doubleve…	png	dv-m…	465 B	139 ms	Lowest	2336742	
event.png?impid=b1aba9cffafa458c9ccf92402f…	200	http/1.1	tps11008.doubleve…	png	dv-m…	465 B	126 ms	Lowest	2336751	
vent.png?impid=d643c9cdd23348208ab6b35…	200	http/1.1	tps11004.doubleve…	png	dv-m…	465 B	218 ms	Lowest	2336781	
nt.png?impid=b1aba9cffafa458c9ccf92402f…	200	http/1.1	tps11008.doubleve…	png	dv-m…	465 B	214 ms	Lowest	2336789	
ush-worker.js	200	h2	www.usatoday.com	javascript	push-…	0 B	12 ms	High	2326976	
.gif?e=25&q=2&hp=1&kq=2&lo=0&ua=null…	200	http/1.1	px.moatads.com	gif	VM57…	409 B	119 ms	Low	2336806	
aid=comcast01&pid=comcast01&cid=%E…	200	h2	choices.trustarc.com	gif	ca?pi…	362 B	128 ms	Low	2333527	
nt.png?impid=d643c9cdd23348208ab6b35…	200	http/1.1	tps11004.doubleve…	png	dv-m…	465 B	125 ms	Lowest	2336825	
ent.png?impid=b1aba9cffafa458c9ccf92402f…	200	http/1.1	tps11008.doubleve…	png	dv-m…	465 B	190 ms	Lowest	2336838	
b7ac0e2ada?a=36908477&sa=1&v=1071.385e…	200	http/1.1	bam.nr-data.net	xhr	(inde…	183 B	50 ms	High	2336664	
e=ChMIqryippm_4QIVQmJ-Ch0bgAmFEA…	200	http/2+quic…	ade.googlesyndicat…	gif	expre…	87 B	169 ms	Low	0	
dt?anId=922805&asId=4ffd1062-4de9-b31c-e2…	200	http/1.1	dt.adsafeprotected.…	gif	main.…	301 B	69 ms	Low	2332134	
dt?anId=922805&asId=4ffd1062-4de9-b31c-e2…	200	http/1.1	dt.adsafeprotected.…	gif	main.…	308 B	63 ms	Low	2336093	
ping?h=usatoday.com&p=%2F&u=CTbJD8ubS…	200	h2	ping.chartbeat.net	gif	chart…	168 B	74 ms	Low	2328129	
dt?advEntityId=241810&asId=ada9e807-24a0-…	200	http/1.1	dt.adsafeprotected.…	gif	adj?p…	301 B	67 ms	Low	2332134	

1154 requests | 6.7 MB transferred | 18.1 MB resources | Finish: 38.20 s | DOMContentLoaded: 2.94 s | Load: 22.61 s

RESOURCE HINTS

- Link tags inserted in <HEAD> that tell the browser to reach out and download or connect to resources

  - `<link rel='preload' ...`

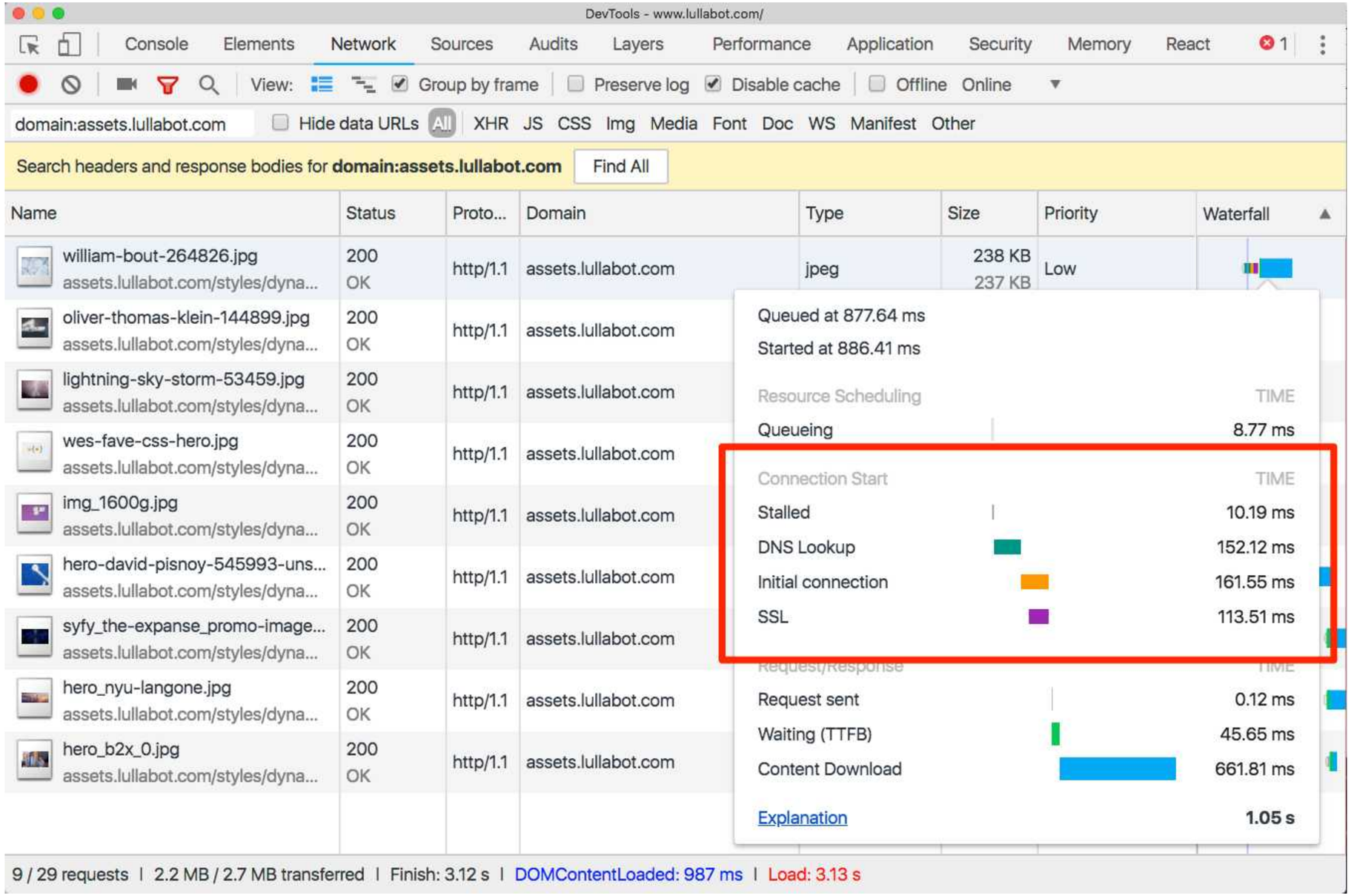
  - `<link rel='preconnect' ...`

PRELOAD IN ACTION

```
<!DOCTYPE html>
<html lang="en">

<head>
  <meta charset="utf-8">
  <meta name="viewport" content="width=device-width,initial-scale=1,shrink-to-fit=no">
  <meta name="theme-color" content="#000000">
  <link rel="manifest" href="/manifest.json">
  <link rel="icon" type="image/png" href="/favicon.png" />
  <title>Lullabot</title>
  <link href="https://api.lullabot.com" rel="preconnect" crossorigin>
  <link href="https://assets.lullabot.com" rel="preconnect" crossorigin>
  <link rel="preload" href="/static/js/main.a216eb97.js" as="script" />
  <style type="text/css">
    @font-face {
      font-family: 'FreightTextPro';
      font-weight: 300;
      font-style: normal;
      src: url('/fonts/FreightTextProBookLight.woff2') format('woff2'), url('/fonts/FreightTextProBookLight.woff') format('woff')
    }

    @font-face {
```

PRECONNECT IN ACTION

```
<!DOCTYPE html>
<html lang="en">

<head>
  <meta charset="utf-8">
  <meta name="viewport" content="width=device-width,initial-scale=1,shrink-to-fit=no">
  <meta name="theme-color" content="#000000">
  <link rel="manifest" href="/manifest.json">
  <link rel="icon" type="image/png" href="/favicon.png" />
  <title>Lullabot</title>
  <link href="https://api.lullabot.com" rel="preconnect" crossorigin>
  <link href="https://assets.lullabot.com" rel="preconnect" crossorigin>
  <style type="text/css">
    @font-face {
      font-family: 'FreightTextPro';
      font-weight: 300;
      font-style: normal;
      src: url('/fonts/FreightTextProBookLight.woff2') format('woff2'), url('/fonts/FreightTextProBookLight.woff') format('woff')
    }

    @font-face {
      font-family: 'FreightTextPro';
      font-weight: 300;
      font-style: italic;
      src: url('/fonts/FreightTextProLightItalic.woff2') format('woff2'), url('/fonts/FreightTextProLightItalic.woff') format('wo
```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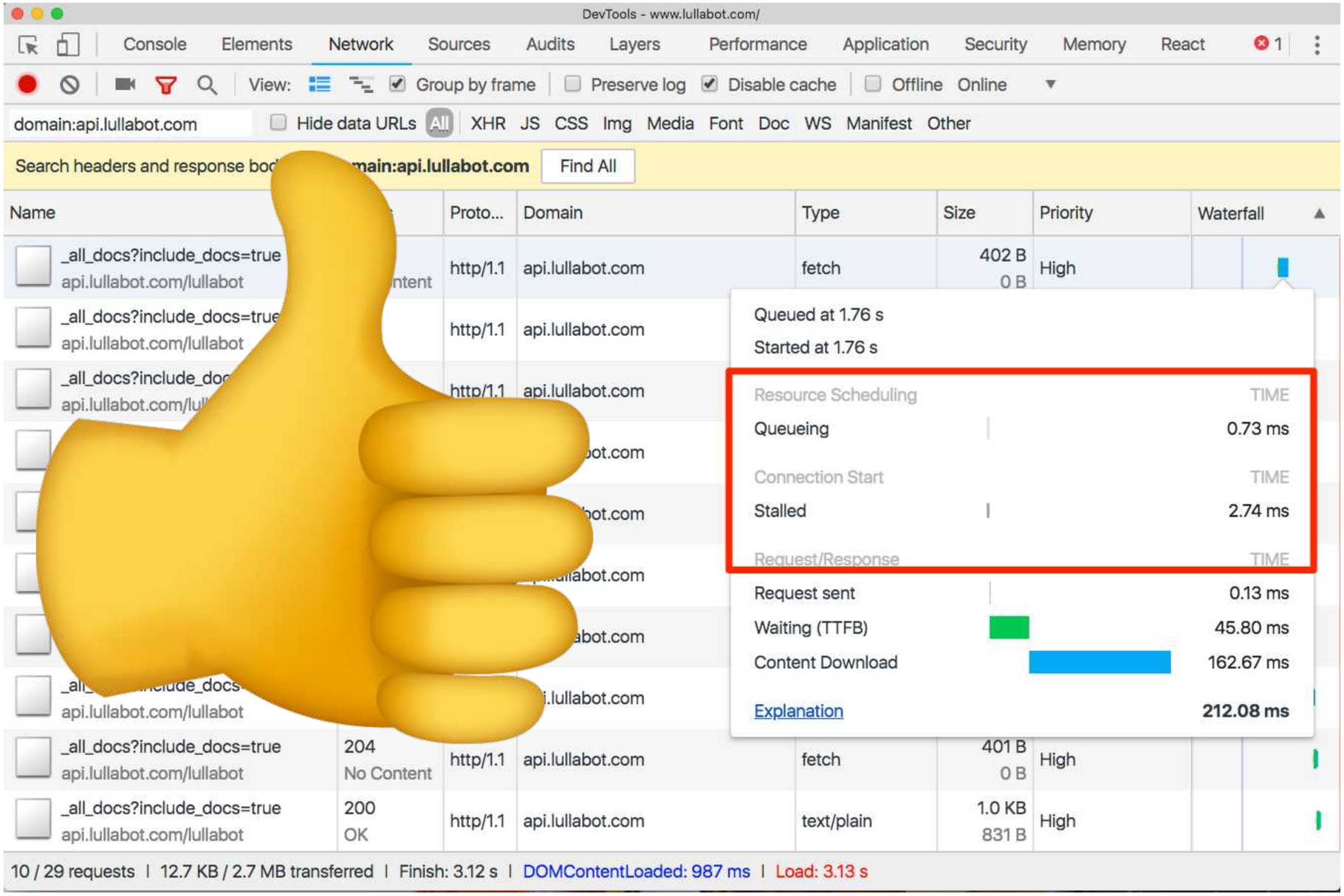
Audits
Layers
Performance
Application
Security
Memory
React
1
View:
Group by frame
Preserve log
Disable cache
Offline
Online
domain:assets.lullabot.com
Hide data URLs
All
XHR
JS
CSS
Img
Media
Font
Doc
WS
Manifest
Other
Search headers and response bodies for domain:assets.lullabot.com
Find All
Name
Status
Proto...
Domain
Type
Size
Priority
Waterfall
william-bout-264826.jpg
assets.lullabot.com/styles/dyna...
200
OK
http/1.1
assets.lullabot.com
jpeg
238 KB
237 KB
Low
oliver-thomas-klein-144899.jpg
assets.lullabot.com/styles/dyna...
200
OK
http/1.1
assets.lullabot.com
lightning-sky-storm-53459.jpg
assets.lullabot.com/styles/dyna...
200
OK
http/1.1
assets.lullabot.com
wes-fave-css-hero.jpg
assets.lullabot.com/styles/dyna...
200
OK
http/1.1
assets.lullabot.com
img_1600g.jpg
assets.lullabot.com/styles/dyna...
200
OK
http/1.1
assets.lullabot.com
hero-david-pisnoy-545993-uns...
assets.lullabot.com/styles/dyna...
200
OK
http/1.1
assets.lullabot.com
syfy_the-expanse_promo-image...
assets.lullabot.com/styles/dyna...
200
OK
http/1.1
assets.lullabot.com
hero_nyu-langone.jpg
assets.lullabot.com/styles/dyna...
200
OK
http/1.1
assets.lullabot.com
hero_b2x_0.jpg
assets.lullabot.com/styles/dyna...
200
OK
http/1.1
assets.lullabot.com
Queued at 877.64 ms
Started at 886.41 ms
Resource Scheduling
TIME
Queueing
8.77 ms
Connection Start
TIME
Stalled
10.19 ms
DNS Lookup
152.12 ms
Initial connection
161.55 ms
SSL
113.51 ms
Request/Response
TIME
Request sent
0.12 ms
Waiting (TTFB)
45.65 ms
Content Download
661.81 ms
Explanation
1.05 s
9 / 29 requests | 2.2 MB / 2.7 MB transferred | Finish: 3.12 s | DOMContentLoaded: 987 ms | Load: 3.13 s


DevTools - www.lullabot.com/
Console
Elements
Network
Sources
Audits
Layers
Performance
Application
Security
Memory
React
View:
Group by frame
Preserve log
Disable cache
Offline
Online
domain:api.lullabot.com
Hide data URLs
All
XHR
JS
CSS
Img
Media
Font
Doc
WS
Manifest
Other
Find All
Name
Proto...
Domain
Type
Size
Priority
Waterfall
_all_docs?include_docs=true
api.lullabot.com/lullabot
http/1.1
api.lullabot.com
fetch
402 B
0 B
High
Queued at 1.76 s
Started at 1.76 s
Resource Scheduling
TIME
Queueing
0.73 ms
Connection Start
TIME
Stalled
2.74 ms
Request/Response
TIME
Request sent
0.13 ms
Waiting (TTFB)
45.80 ms
Content Download
162.67 ms
Explanation
212.08 ms
204
No Content
401 B
200
OK
1.0 KB
831 B
text/plain
10 / 29 requests
12.7 KB / 2.7 MB transferred
Finish: 3.12 s
DOMContentLoaded: 987 ms
Load: 3.13 s

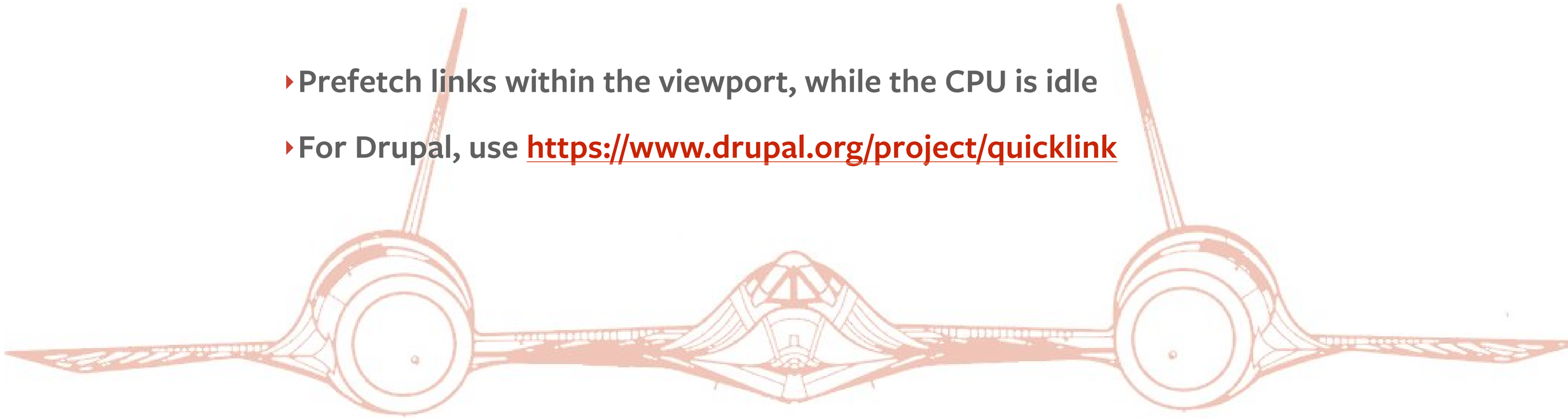
ALL TOGETHER NOW…

```
<!DOCTYPE html>
<html lang="en" dir="ltr">

<head>
  <meta name="viewport" content="initial-scale=1.0,width=device-width">
  <meta name="theme-color" content="#eecf1e">
  <link rel="preload" href="/sites/all/themes/zeus/fonts/tablet_gothic/360074_3_0.woff2" as="font" type="font/woff2" crossorigin>
  <link rel="preload" href="/sites/all/themes/zeus/fonts/tablet_gothic/360074_2_0.woff2" as="font" type="font/woff2" crossorigin>
  <link rel="preload" href="/sites/all/themes/zeus/fonts/tablet_gothic/360074_4_0.woff2" as="font" type="font/woff2" crossorigin>
  <link rel="preload" href="/sites/all/themes/zeus/fonts/tablet_gothic/360074_1_0.woff2" as="font" type="font/woff2" crossorigin>
  <link rel="preload" href="/sites/all/themes/zeus/fonts/tablet_gothic_condensed/360074_5_0.woff2" as="font" type="font/woff2" crossorigin>
  <link rel="preload" href="/sites/all/themes/zeus/fonts/adelle/360074_0_0.woff2" as="font" type="font/woff2" crossorigin>
  <link rel="preload" href="/sites/all/themes/zeus/images/new-design/homepage/hero-image-primary--small.jpg" as="image" media="(max-width: 640px)">
  <link rel="preload" href="/sites/all/themes/zeus/images/new-design/homepage/hero-image-primary--med.jpg" as="image" media="(min-width: 640px) and (max-width: 980px)">
  <link rel="preload" href="/sites/all/themes/zeus/images/new-design/homepage/hero-image-primary--med-large.jpg" as="image" media="(min-width: 980px) and (max-width: 1200px)">
  <link rel="preload" href="/sites/all/themes/zeus/images/new-design/homepage/hero-image-primary.jpg" as="image" media="(min-width: 1200px)">
  <link rel="preconnect" href="https://fonts.googleapis.com">
  <link rel="preconnect" href="https://app-ab05.marketo.com">
  <link rel="preconnect" href="https://cdnjs.cloudflare.com">
  <link rel="preconnect" href="https://cdn.optimizely.com">
  <link rel="preconnect" href="https://logx.optimizely.com">
  <link rel="preconnect" href="https://static.olark.com">
  <meta http-equiv="Content-Type" content="text/html; charset=utf-8" />
  <script type="text/javascript">
    window.NREUM || (NREUM = {}), __nr_require = function (e, t, n) {
      function r(n) {
        if (!t[n]) {
          var o = t[n] = {
            exports: {}
          };
          e[n][0].call(o.exports, function (t) {
            var o = e[n][1][t];
```

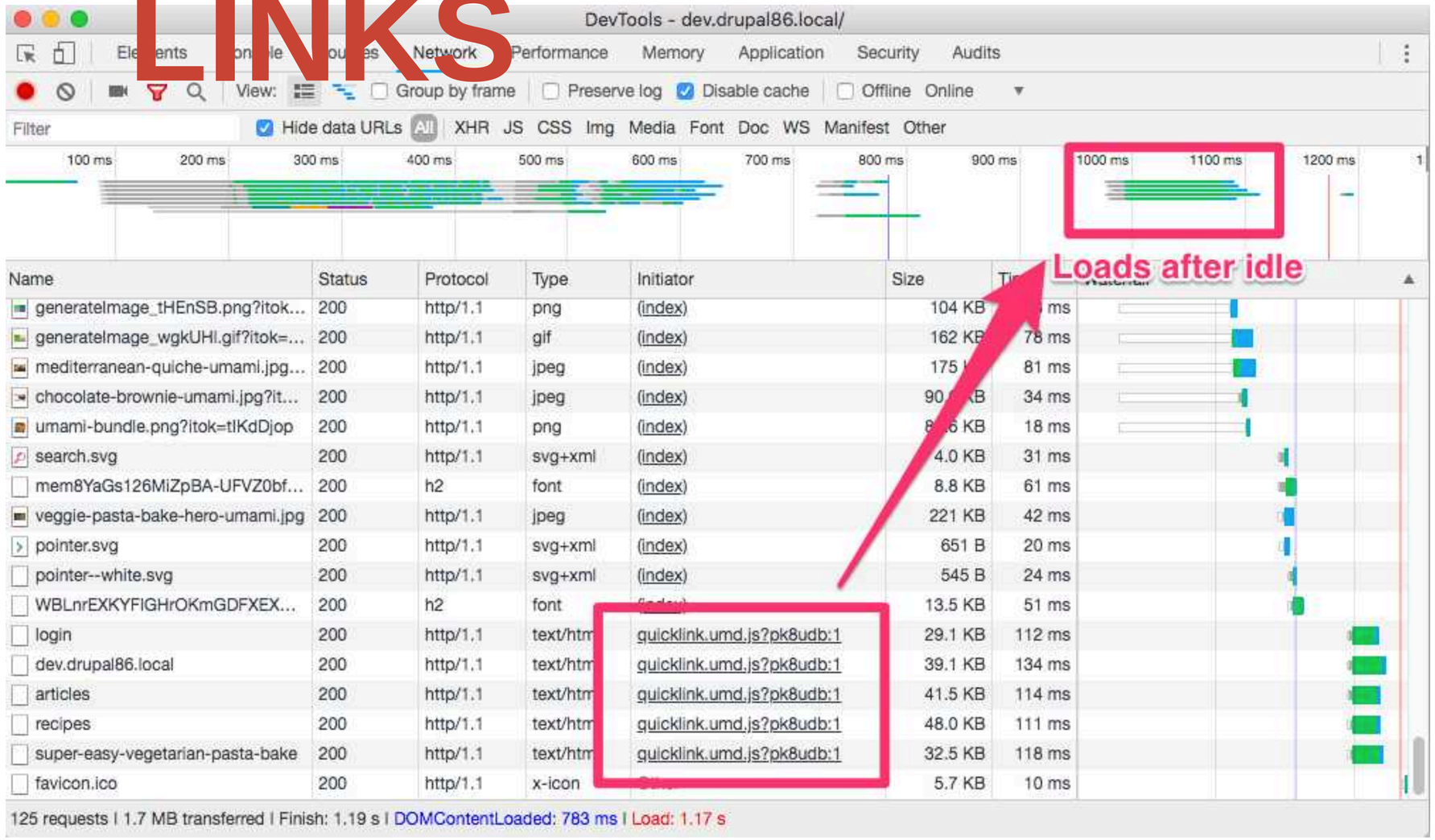
START USING TODAY!

PREFETCH

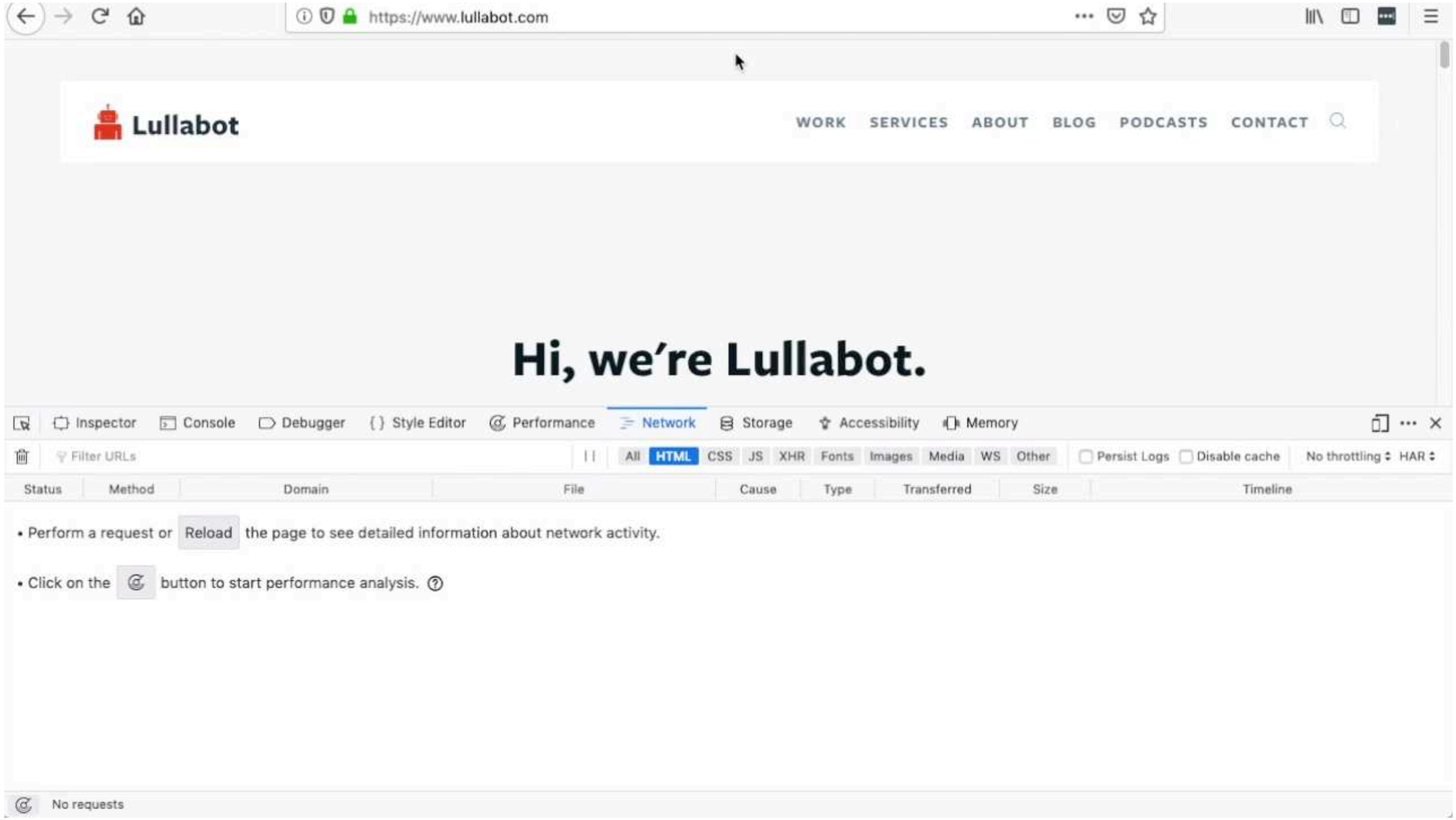


- Prefetch links within the viewport, while the CPU is idle
- For Drupal, use https://www.drupal.org/project/quicklink

PREFETCHING LINKS

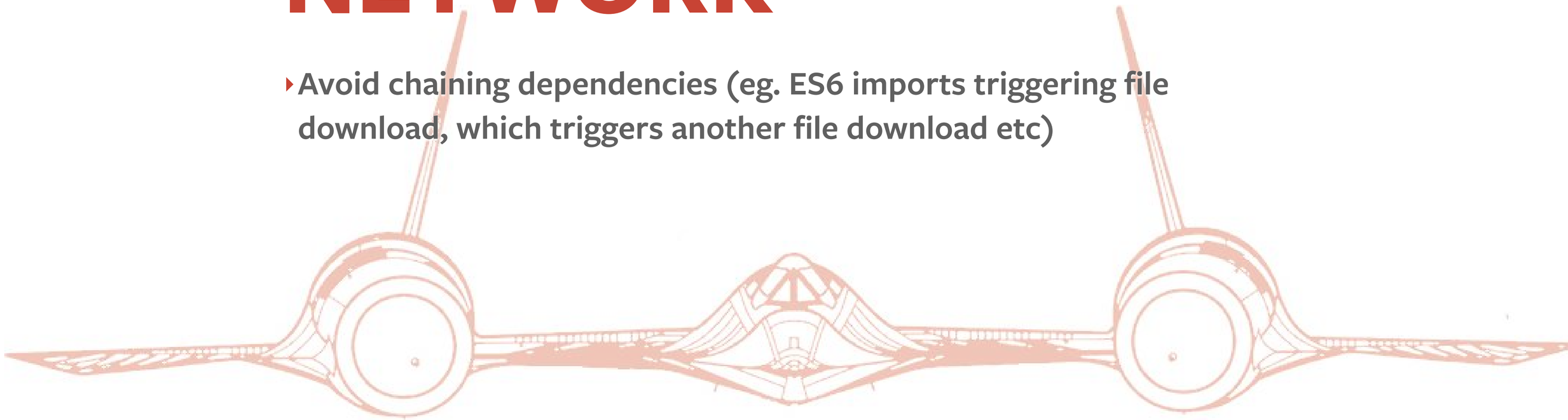


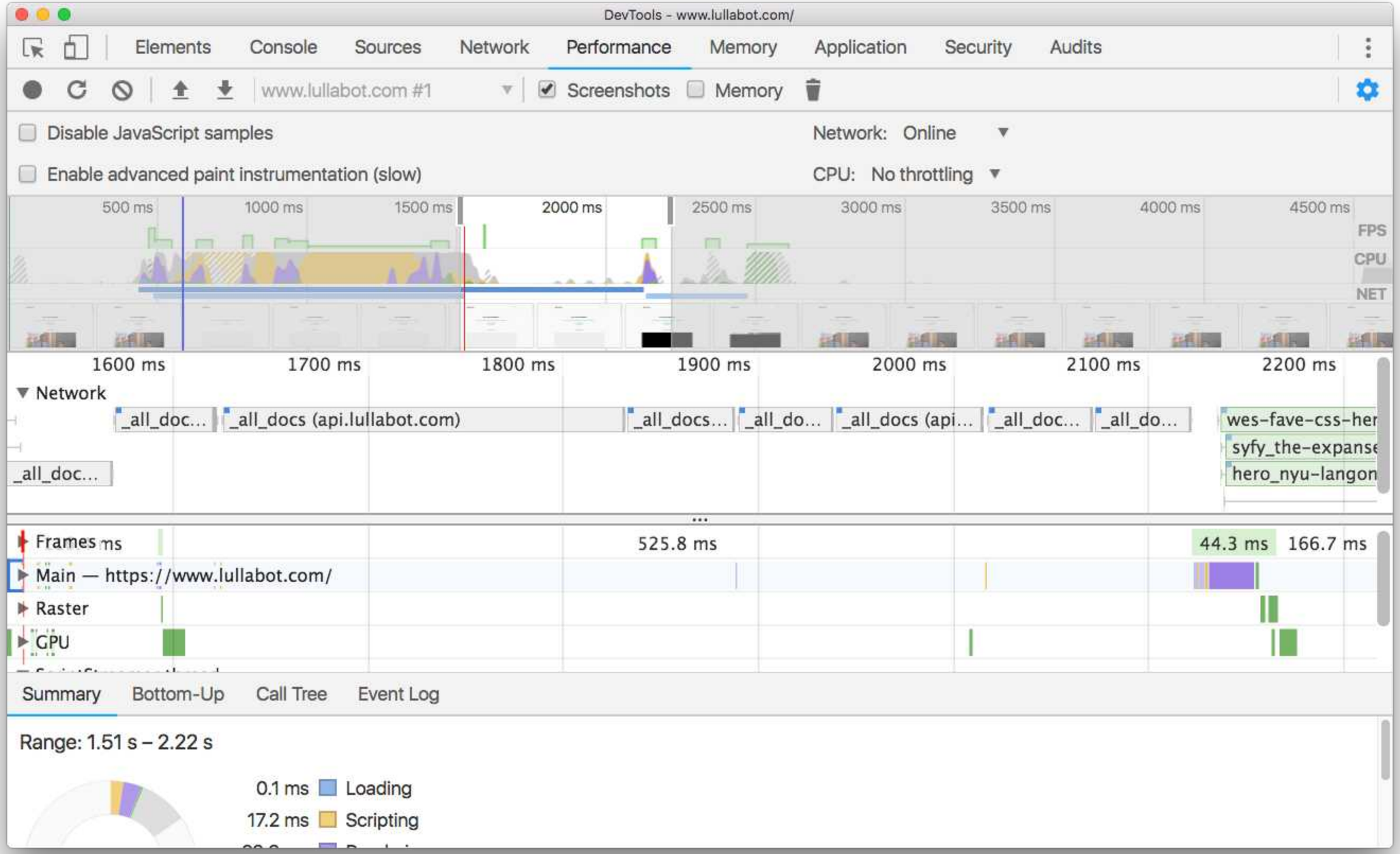
LINKS ENTERING VIEWPORT



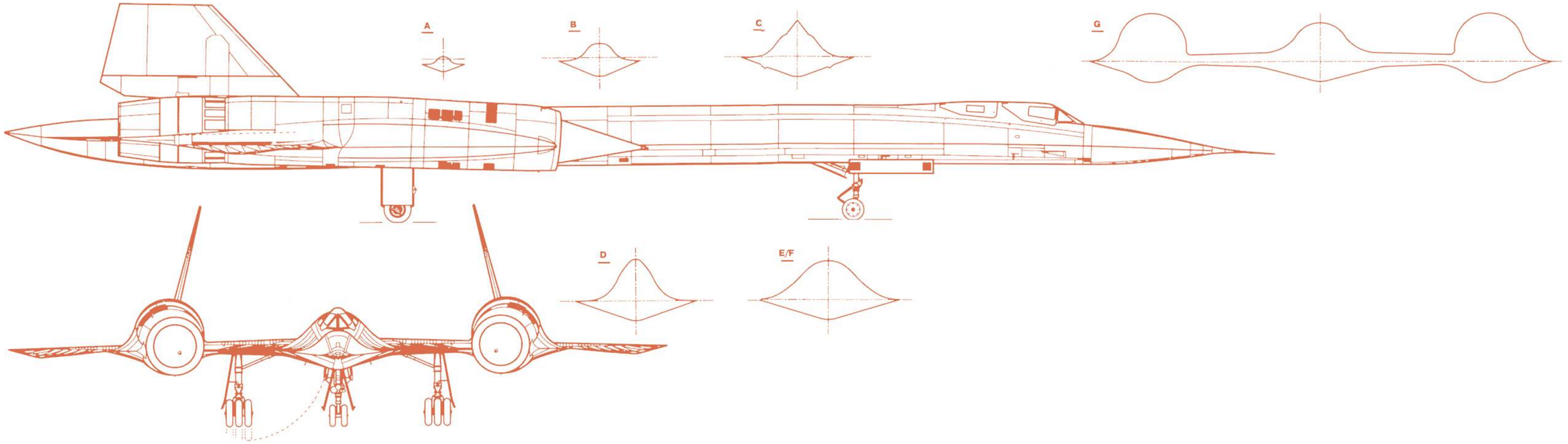
OPTIMIZATIONS: NETWORK

- Avoid chaining dependencies (eg. ES6 imports triggering file download, which triggers another file download etc)

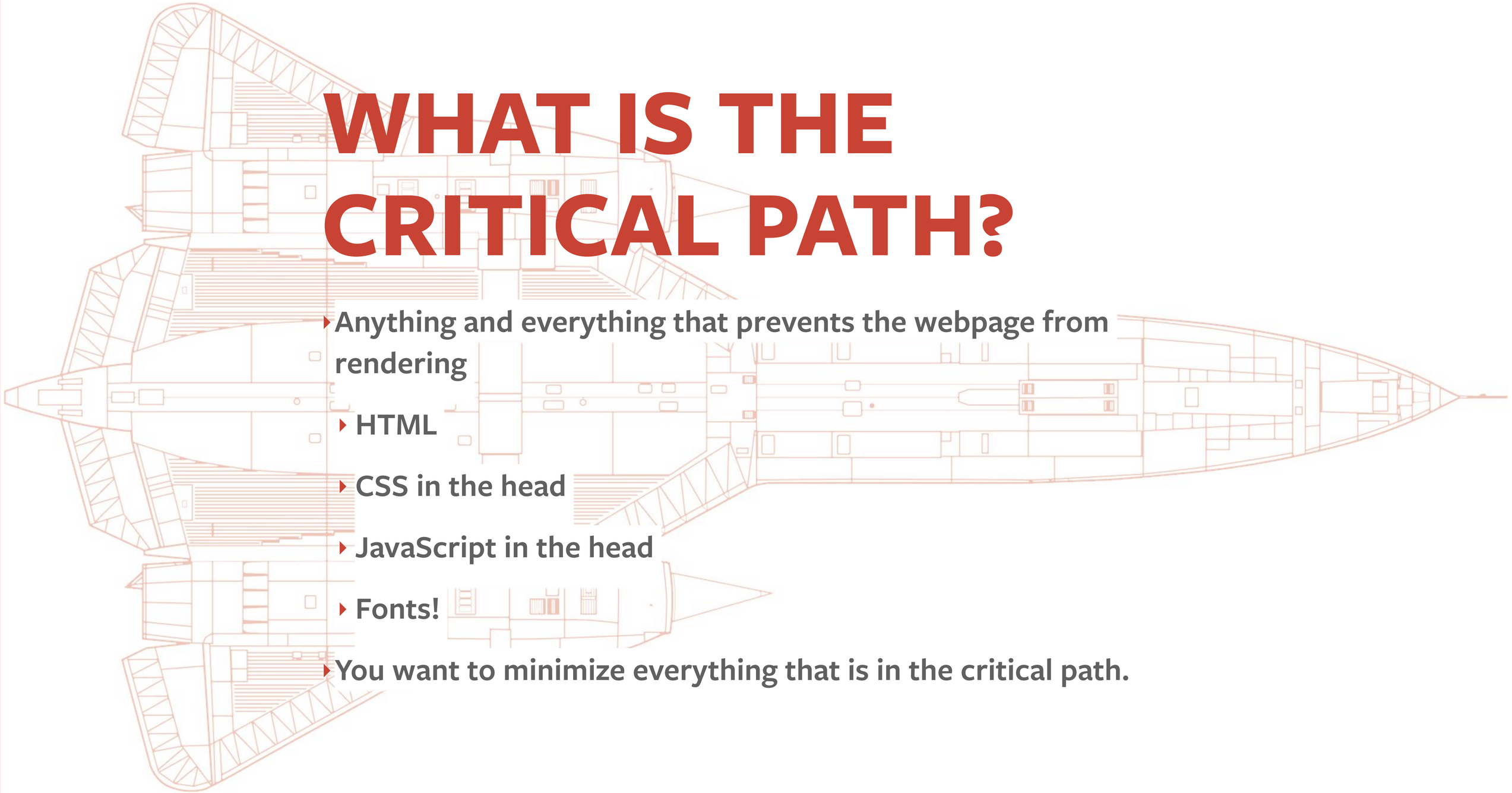



DevTools - www.lullabot.com/
Elements
Console
Sources
Network
Performance
Memory
Application
Security
Audits
www.lullabot.com #1
Screenshots
Memory
Disable JavaScript samples
Network: Online
Enable advanced paint instrumentation (slow)
CPU: No throttling
500 ms
1000 ms
1500 ms
2000 ms
2500 ms
3000 ms
3500 ms
4000 ms
4500 ms
FPS
CPU
NET
1600 ms
1700 ms
1800 ms
1900 ms
2000 ms
2100 ms
2200 ms
Network
_all_doc...
_all_docs (api.lullabot.com)
_all_docs...
_all_do...
_all_docs (api...
_all_doc...
_all_do...
wes-fave-css-her
syfy_the-expanse
hero_nyu-langon
_all_doc...
Frames
525.8 ms
44.3 ms
166.7 ms
Main — https://www.lullabot.com/
Raster
GPU
Summary
Bottom-Up
Call Tree
Event Log
Range: 1.51 s – 2.22 s
0.1 ms Loading
17.2 ms Scripting

OPTIMIZATIONS: RENDERING

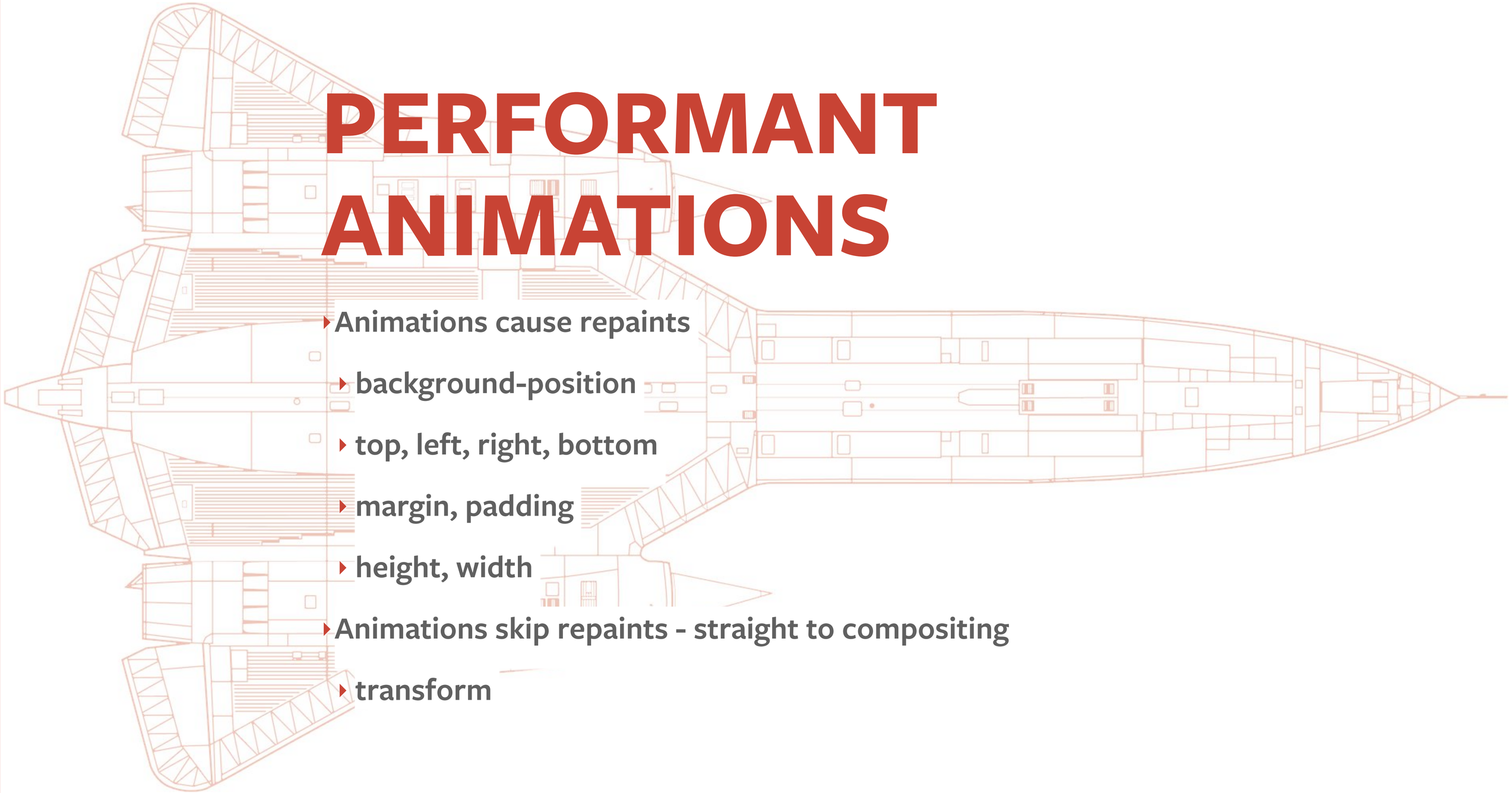


https://developers.google.com/web/fundamentals/performance/critical-rendering-path/constructing-the-object-model



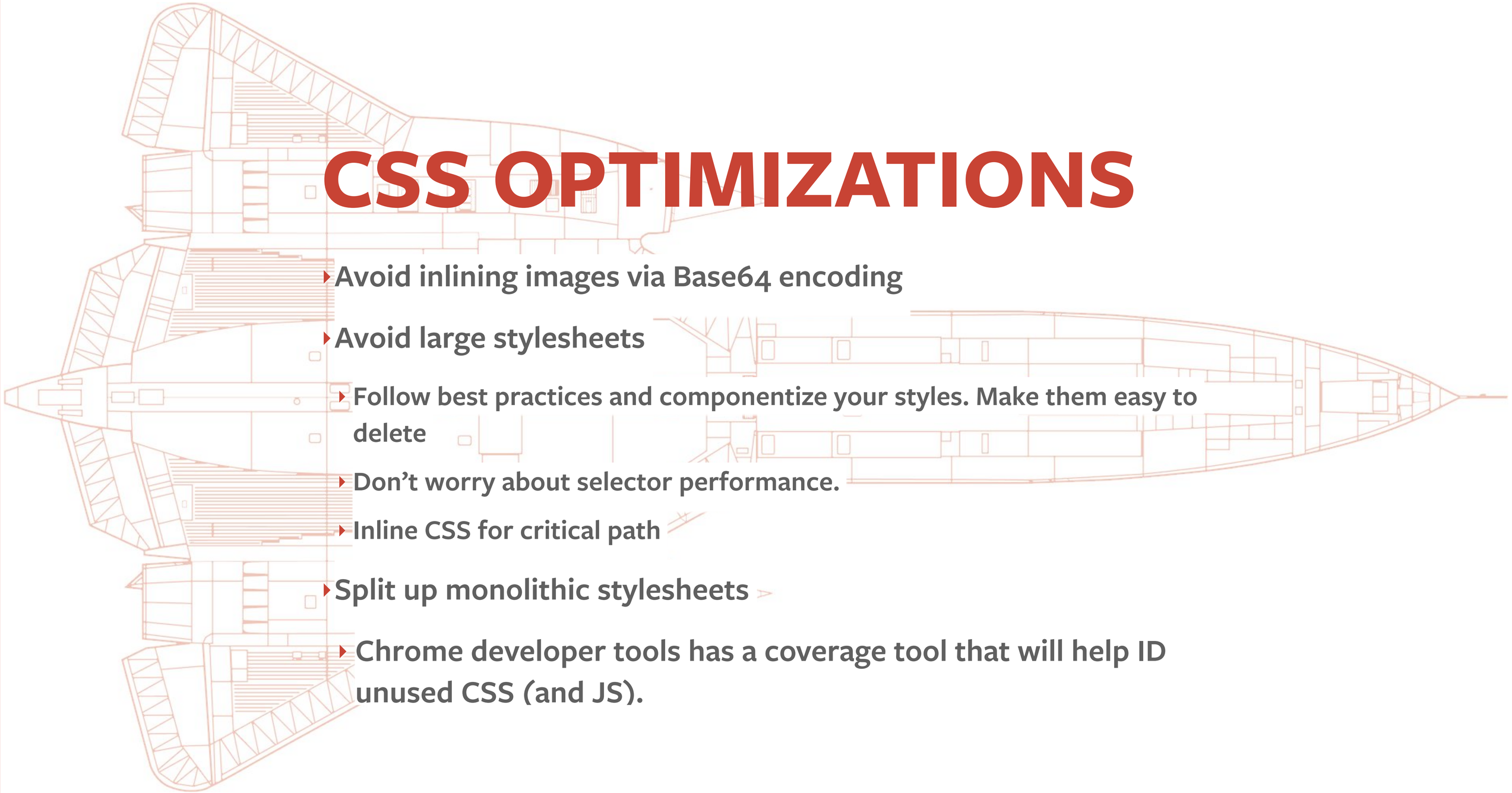
WHAT IS THE CRITICAL PATH?

- Anything and everything that prevents the webpage from rendering
  - HTML
  - CSS in the head
  - JavaScript in the head
  - Fonts!
- You want to minimize everything that is in the critical path.



PERFORMANT ANIMATIONS

- Animations cause repaints
  - background-position
  - top, left, right, bottom
  - margin, padding
  - height, width
- Animations skip repaints - straight to compositing
  - transform



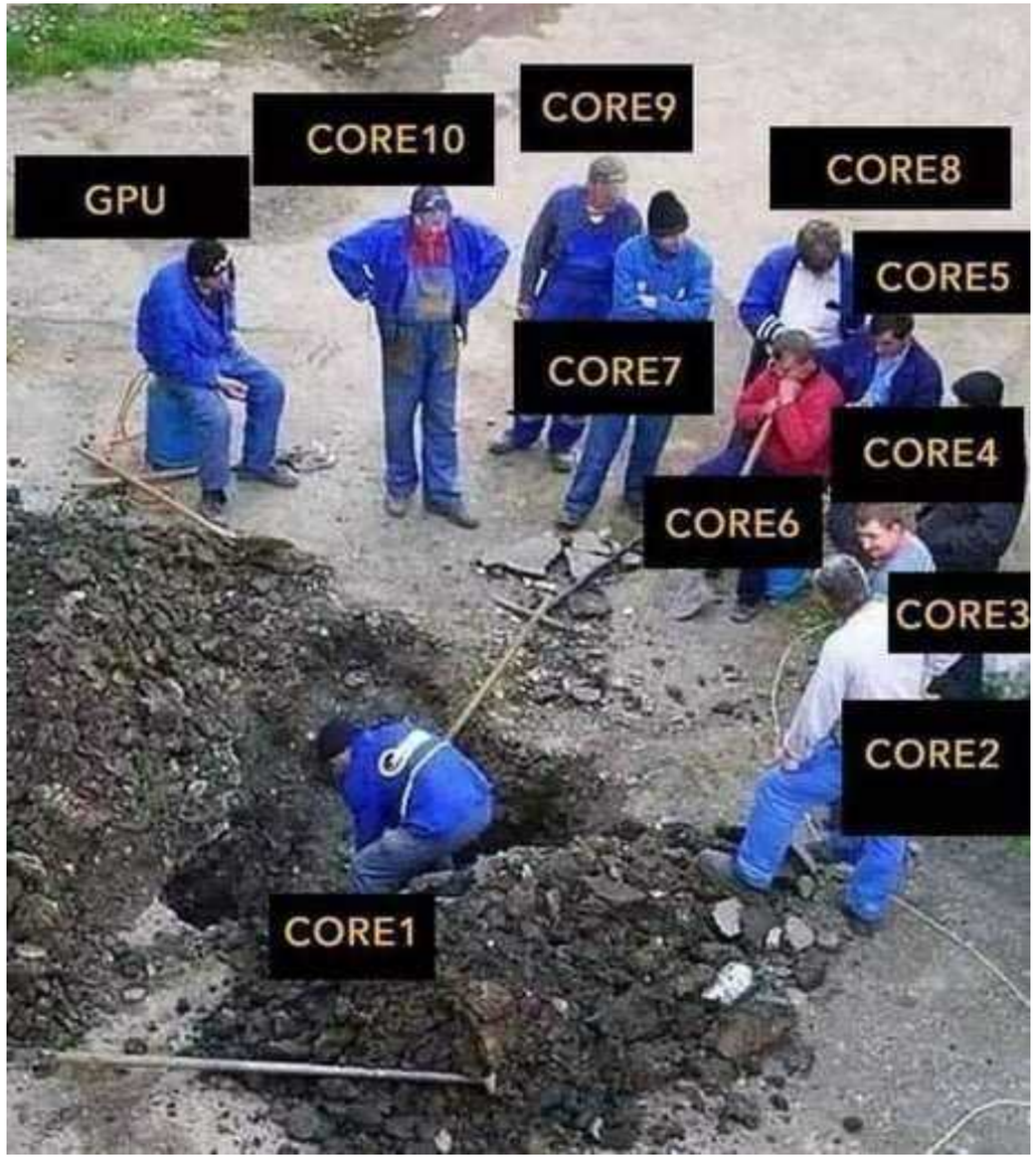
CSS OPTIMIZATIONS

- Avoid inlining images via Base64 encoding
- Avoid large stylesheets
  - Follow best practices and componentize your styles. Make them easy to delete
  - Don’t worry about selector performance.
  - Inline CSS for critical path
- Split up monolithic stylesheets
  - Chrome developer tools has a coverage tool that will help ID unused CSS (and JS).

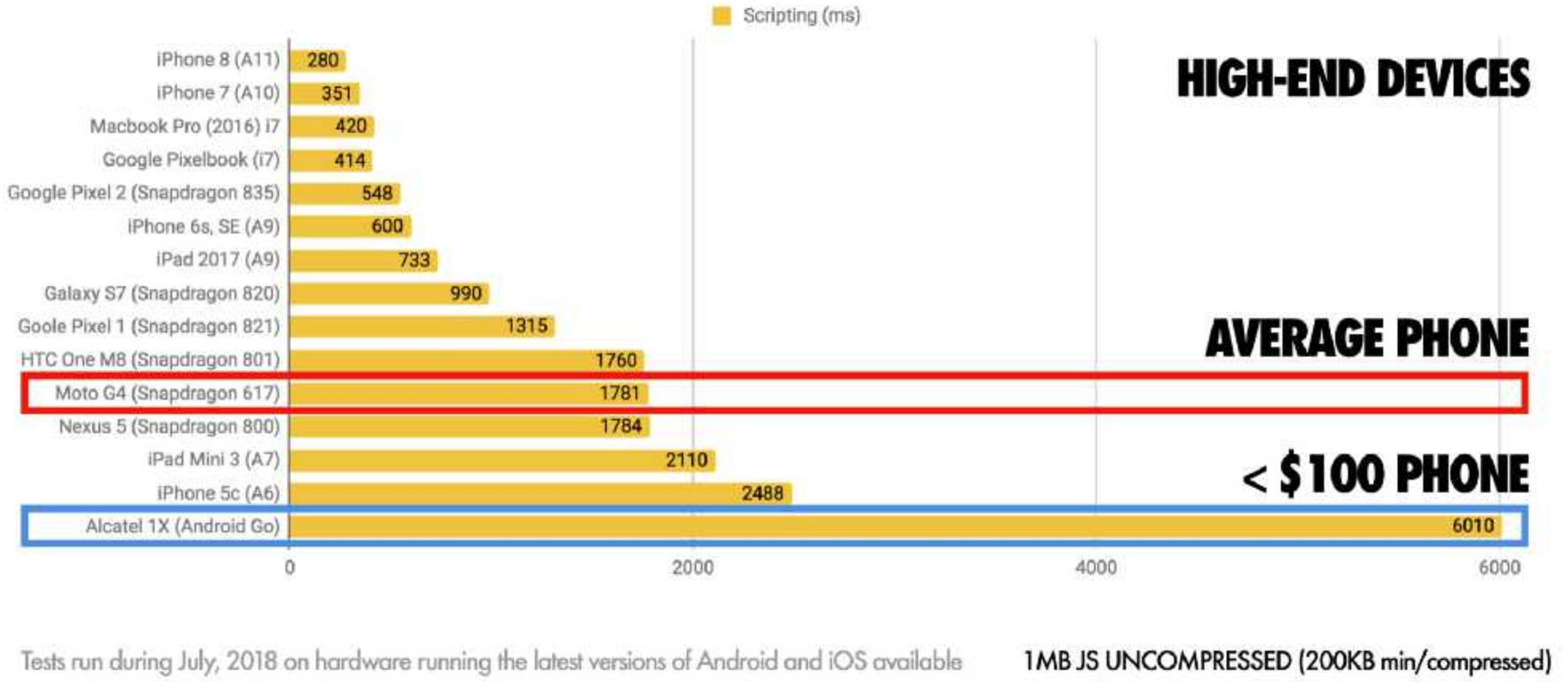
OPTIMIZE YOUR JAVASCRIPT

- Less JavaScript the better!

JAVASCRIPT MAIN THREAD EXECUTION



2018 JAVASCRIPT PROCESSING TIMES



Tests run during July, 2018 on hardware running the latest versions of Android and iOS available

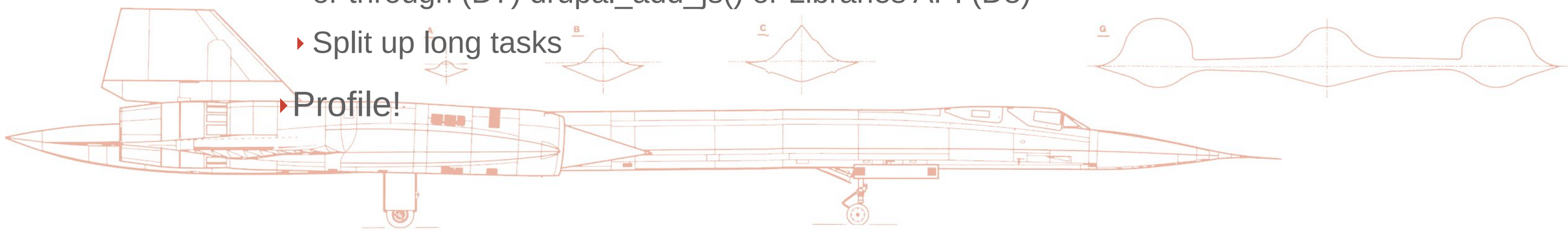
1MB JS UNCOMPRESSED (200KB min/compressed)

Processing (parse/compile) times for 1MB of uncompressed JavaScript (<200KB minified and gzipped) manually profiled on real devices. (src)

https://medium.com/@addyosmani/the-cost-of-javascript-in-2018-7d8950fbb5d4

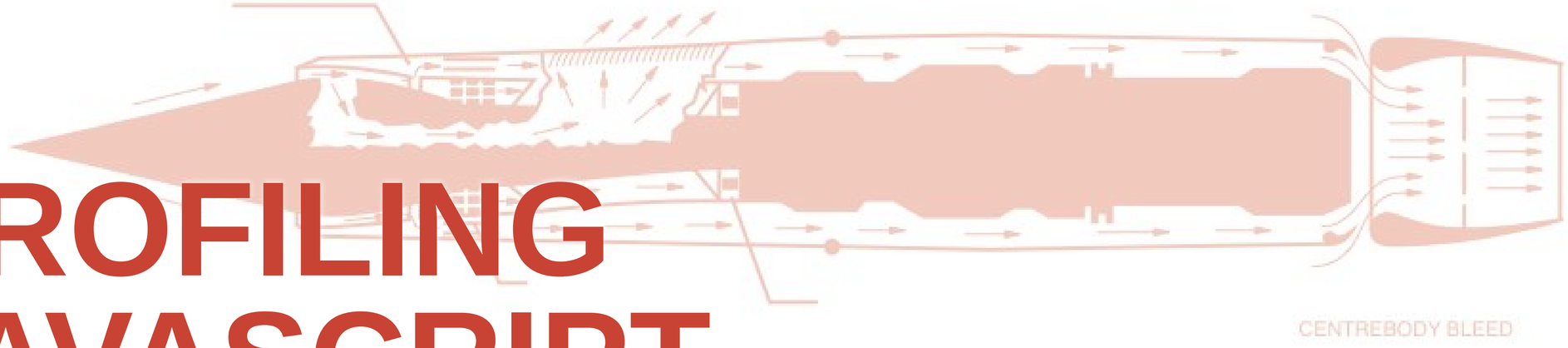
OPTIMIZE YOUR JAVASCRIPT

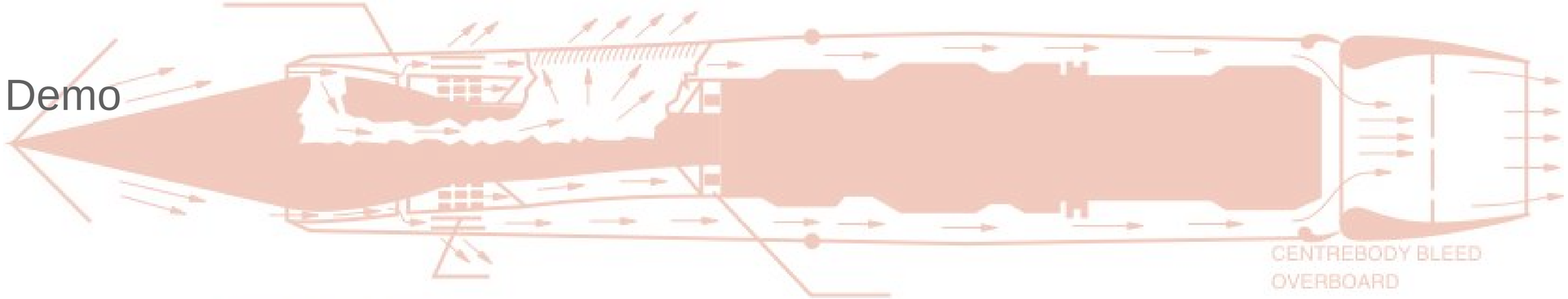
- Less JavaScript the better!
- Identify unused code through Chrome DevTools coverage tool.
- Identify 💩💩💩 third party scripts.
- Code split
  - Either automatically through build tool (webpack)
  - or through (D7) drupal_add_js() or Libraries API (D8)
  - Split up long tasks
- Profile!

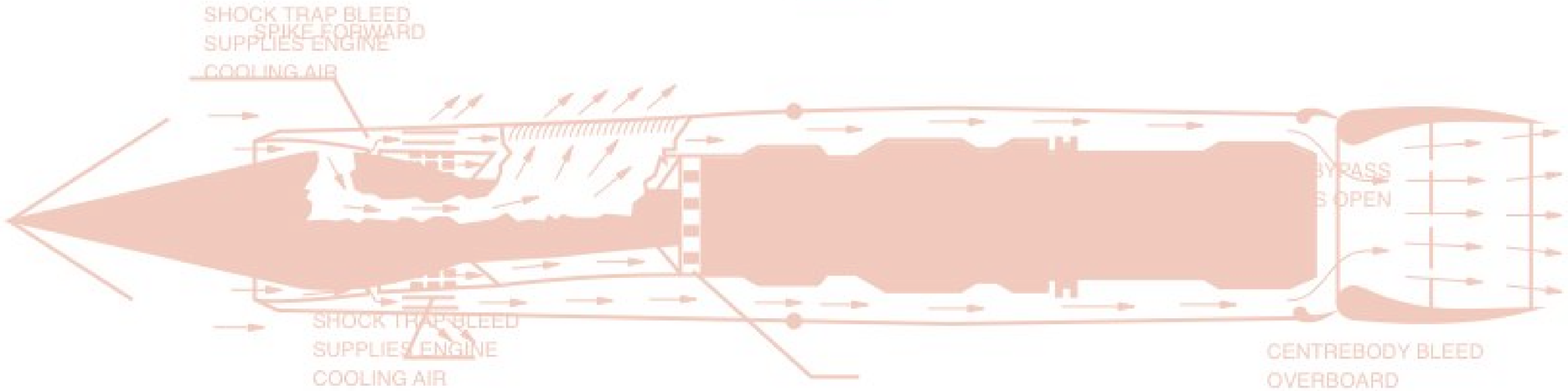


PROFILING JAVASCRIPT

1. Demo

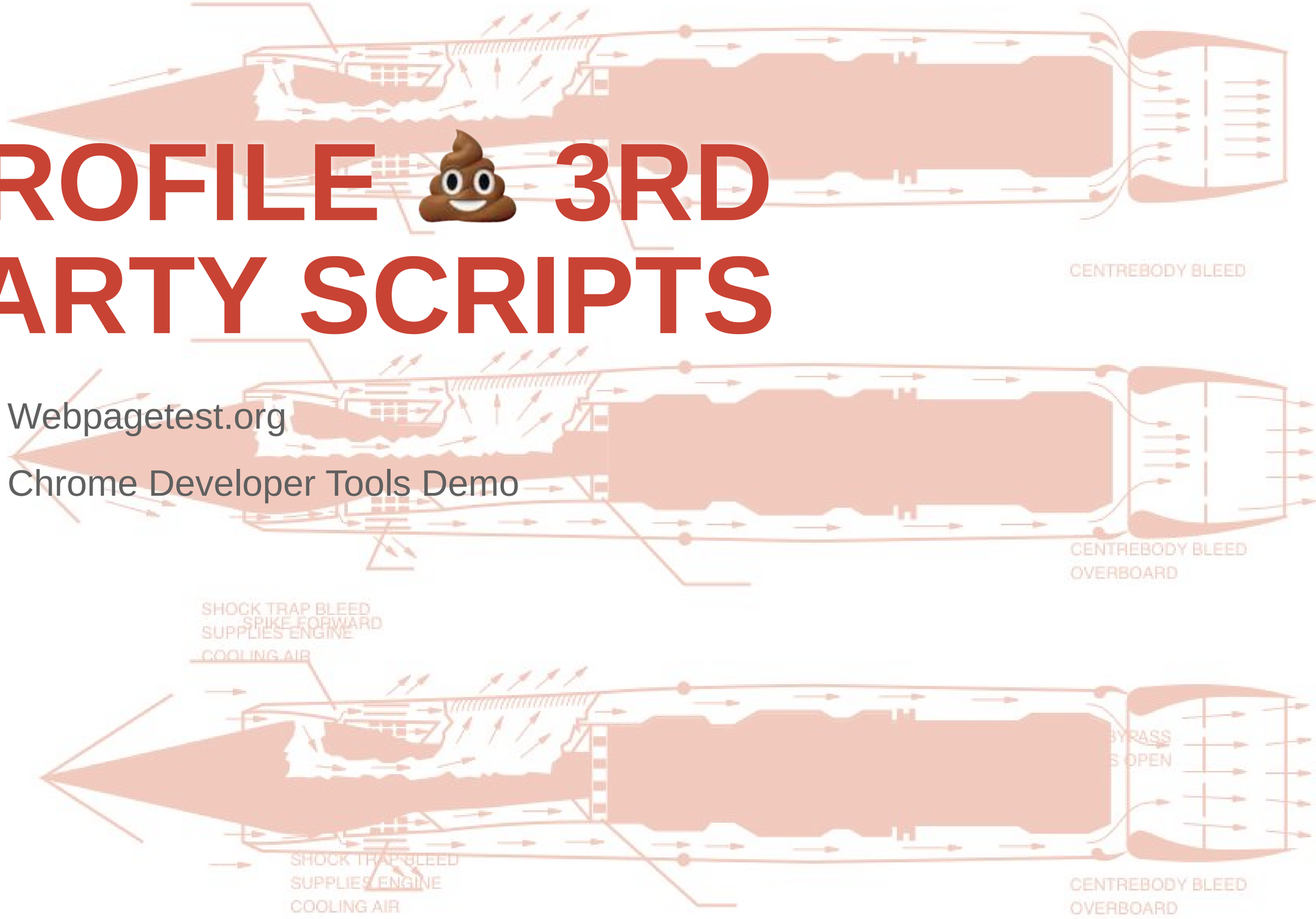






PROFILE 💩 3RD PARTY SCRIPTS

1. Webpagetest.org
2. Chrome Developer Tools Demo



WEBPAGETEST

Test a website's performance

Advanced Testing | Simple Testing | Visual Comparison | Traceroute

Enter a Website URL

START TEST

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

Browser: Chrome

Advanced Settings ▶

3 runs, First View only, Cable connection

Run a free website speed test from multiple locations around the globe using real browsers (IE and Chrome) and at real consumer connection speeds. You can run simple tests or perform advanced testing including multi-step transactions, video capture, content blocking and much more. Your results will provide rich diagnostic information including resource loading waterfall charts, Page Speed optimization checks and suggestions for improvements.

If you have any performance/optimization questions you should visit the Forums where industry experts regularly discuss Web Performance Optimization.

Recent Industry Blog Posts

- A Node to Workers Story
- Diving into Technical SEO using Cloudflare Workers
- Stopping Drupal's SA-CORE-2019-003 Vulnerability
- Chart sizes and TV Mode
- Insightful Takeaways from The Streaming Forum 2019
- more...

Recent Discussions

- Image in front page and single page
- Pass throttling to lighthouse
- Website Testing?
- woff font file request returned 404 before refetched properly
- Scripting result "no successful results"|
- more...

WebPagetest Partners

WEBPAGETEST

Web Page Performance Test for

www.gainesville.com

From: Dulles, VA - **Chrome - Cable**
3/10/2019, 4:54:05 PM

Need help improving?

First Byte Time	Keep-alive Enabled	Compress Transfer	Compress Images	Cache static content	Effective use of CDN
A	A	A	A	F	✓

Tester: VM01-07-192.168.10.65
First View only
Test runs: **9**
Re-run the test

Raw page data - Raw object data
Export HTTP Archive (.har)
View Test Log

Performance Results (Median Run)

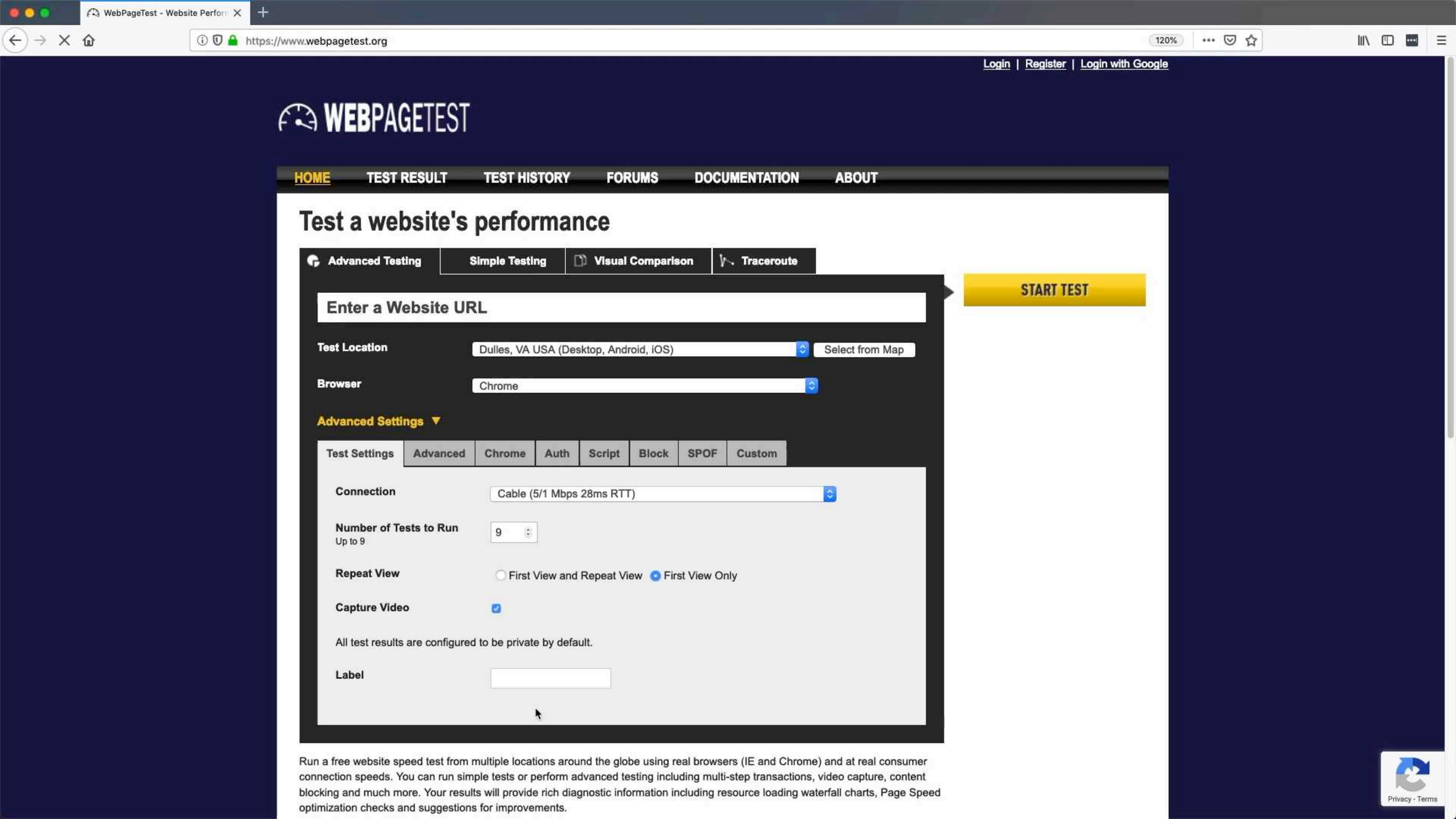
	Load Time	First Byte	Start Render	User Time	Speed Index	First Interactive (beta)	Document Complete Time	Document Complete Requests	Document Complete Bytes In	Fully Loaded Time	Fully Loaded Requests	Fully Loaded Bytes In	Fully Loaded Cost
First View (Run 3)	10.475s	0.307s	1.500s	4.648s	3.488s	> 1.477s	10.475s	179	3,644 KB	18.681s	252	3,847 KB	$$$$$

Plot Full Results

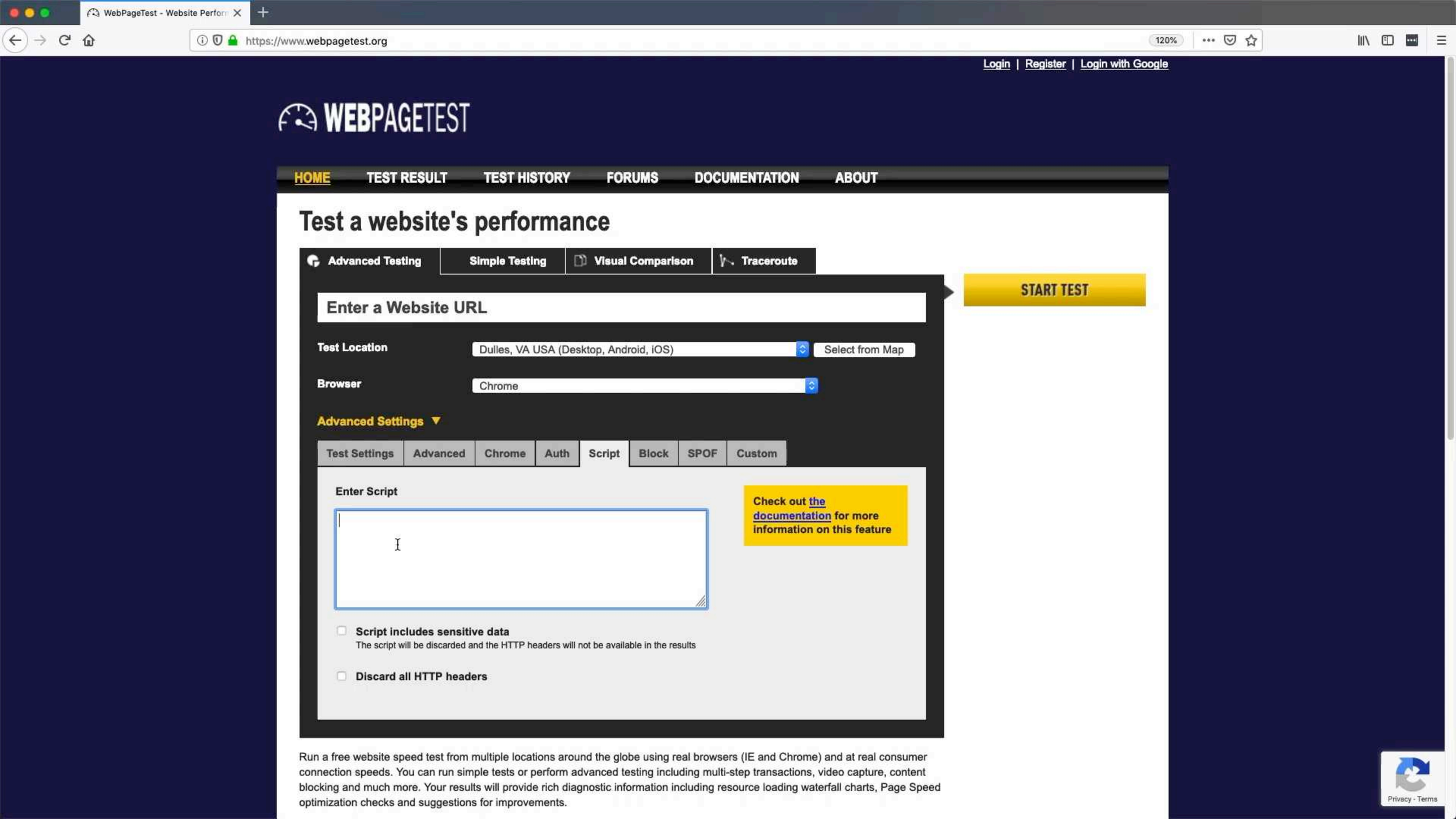
Test Results

Run 1:

Waterfall	Screenshot	Video
		


WebPageTest - Website Perfor
https://www.webpagetest.org
120%
Login | Register | Login with Google
WEBPAGETEST
HOME
TEST RESULT
TEST HISTORY
FORUMS
DOCUMENTATION
ABOUT
Test a website's performance
Advanced Testing
Simple Testing
Visual Comparison
Traceroute
START TEST
Enter a Website URL
Test Location
Dulles, VA USA (Desktop, Android, iOS)
Select from Map
Browser
Chrome
Advanced Settings
Test Settings
Advanced
Chrome
Auth
Script
Block
SPOF
Custom
Connection
Cable (5/1 Mbps 28ms RTT)
Number of Tests to Run
Up to 9
9
Repeat View
First View and Repeat View
First View Only
Capture Video
All test results are configured to be private by default.
Label
Run a free website speed test from multiple locations around the globe using real browsers (IE and Chrome) and at real consumer connection speeds. You can run simple tests or perform advanced testing including multi-step transactions, video capture, content blocking and much more. Your results will provide rich diagnostic information including resource loading waterfall charts, Page Speed optimization checks and suggestions for improvements.
Privacy - Terms

```
blockDomainsExcept www.gainesville.com cdn.gatehousemedia.com cdnjs.cloudflare.com
navigate  https://www.gainesville.com
```


WebPageTest - Website Perfor
https://www.webpagetest.org
120%
Login | Register | Login with Google
WEBPAGETEST
HOME
TEST RESULT
TEST HISTORY
FORUMS
DOCUMENTATION
ABOUT
Test a website's performance
Advanced Testing
Simple Testing
Visual Comparison
Traceroute
START TEST
Enter a Website URL
Test Location
Dulles, VA USA (Desktop, Android, iOS)
Select from Map
Browser
Chrome
Advanced Settings
Test Settings
Advanced
Chrome
Auth
Script
Block
SPOF
Custom
Enter Script
Check out the documentation for more information on this feature
Script includes sensitive data
The script will be discarded and the HTTP headers will not be available in the results
Discard all HTTP headers
Run a free website speed test from multiple locations around the globe using real browsers (IE and Chrome) and at real consumer connection speeds. You can run simple tests or perform advanced testing including multi-step transactions, video capture, content blocking and much more. Your results will provide rich diagnostic information including resource loading waterfall charts, Page Speed optimization checks and suggestions for improvements.
Privacy - Terms

Web Page Performance Test for

https://www.gainesville.com

From: Dulles, VA - **Chrome - Cable**
3/10/2019, 4:56:33 PM
Scripted test

Need help improving?

A	A	A	A	F	✓
First Byte Time	Keep-alive Enabled	Compress Transfer	Compress Images	Cache static content	Effective use of CDN

Tester: VM02-07-192.168.10.75
First View only
Test runs: **9**
Script

Raw page data - Raw object data
Export HTTP Archive (.har)
View Test Log

Re-run the test

Performance Results (Median Run)

							Document Complete			Fully Loaded			
	Load Time	First Byte	Start Render	User Time	Speed Index	First Interactive (beta)	Time	Requests	Bytes In	Time	Requests	Bytes In	Cost
First View (Run 5)	11.236s	0.235s	1.300s	4.238s	3.263s	> 15.496s	11.236s	255	3,890 KB	18.998s	320	4,092 KB	$$$$$

Plot Full Results

Test Results

Run 1:

	Waterfall	Screenshot	Video
			

View 1 Day test log for URLs containing Update List

Only list tests which include video Show repeat view Do not limit the number of results (warning: WILL be slow)

Clicking on an URL will bring you to that test's results

Compare	Date/Time	From	Label	URL
	03/10/19 16:55:45	Dulles, VA - **Chrome - Cable** (video)	Without third party scripts	https://www.gainesville.com
	03/10/19 16:53:16	Dulles, VA - **Chrome - Cable** (video)	Default	http://www.gainesville.com

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Diving into Technical SEO using Cloudflare Workers
Stopping Drupal's SA-CORE-2019-003 Vulnerability
Chart sizes and TV Mode
Insightful Takeaways from The Streaming Forum 2019
more...

Recent Discussions

Image in front page and single page
Pass throttling to lighthouse
Website Testing?
woff font file request returned 404 before refetched properly
Scripting result "no successful results"|
more...

WebPagetest Partners

Tested From: Dulles, VA - **Chrome - Cable**

Export filmstrip as an image...

Slow Motion

Create Video

Advanced customization options...

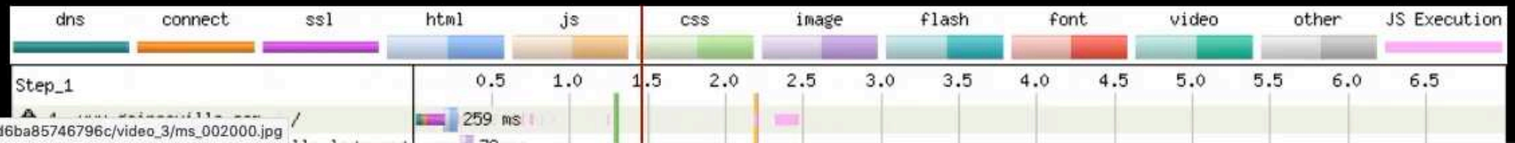
Thumbnail Size: Small / Medium / Large

Thumbnail Interval: 60 FPS / 0.1 sec / 0.5 sec / 1 sec / 5 sec

Comparison Endpoint: Visually Complete / Last Change / Document Complete / Fully Loaded

Waterfall Opacity (adjust sliders to adjust the transparency of the given waterfall):

Without third party scripts — Default



Your video will be available shortly. Please wait...

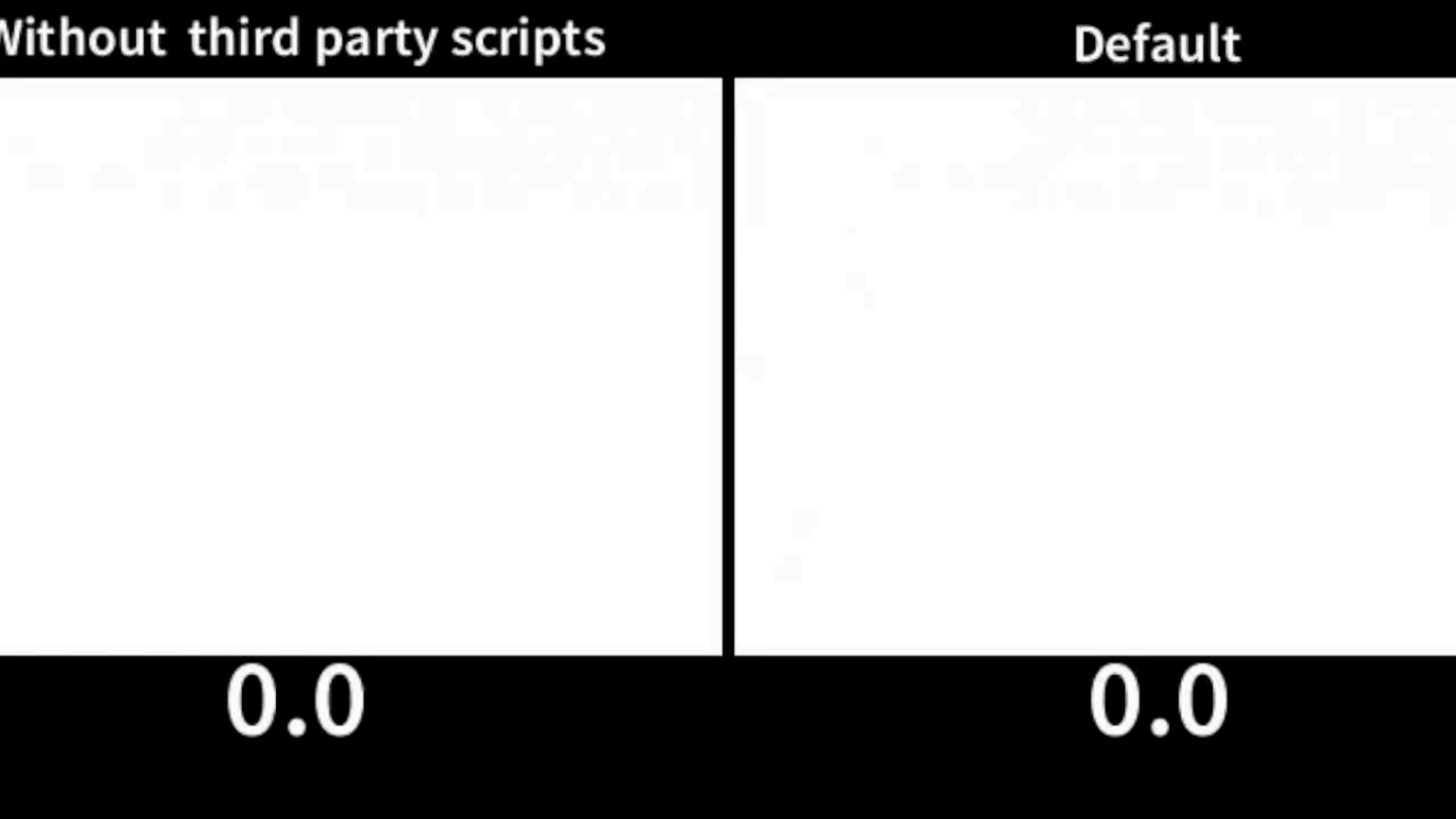
Recent Industry Blog Posts

- A Node to Workers Story
- Diving into Technical SEO using Cloudflare Workers
- Stopping Drupal's SA-CORE-2019-003 Vulnerability
- Chart sizes and TV Mode
- Insightful Takeaways from The Streaming Forum 2019
- more...

Recent Discussions

- Image in front page and single page
- Pass throttling to lighthouse
- Website Testing?
- woff font file request returned 404 before refetched properly
- Scripting result "no successful results"|
- more...

WebPagetest Partners


Without third party scripts
Default
0.0
0.0

PROFILE THIRD PARTY SCRIPTS IN CHROME DEVTOOLS

- Demo!

KEY TAKEAWAYS

(START DOING THIS TODAY!)

- Learn how to identify performance issues
  - Learn the metrics
  - Practice measuring these
  - Find the bottlenecks on your site!
- Less JavaScript
- Start using resource hints today!
  - Preload your fonts!
  - Async and then preload your scripts

— me (right now), quoting Josh Koenig, quoting Kyle Matthews

MAKE THE WEB A BETTER PLACE!

Don’t let proprietary solutions win!

THANK YOU!

Mike Herchel
Senior Frontend Developer at Lullabot
@mikeherchel