

# Mobile Web Performance

## Getting and Staying Fast

@aaronpeters, Turbobytes

@andydavies, NCC Group

# Mobile – Everybody is Using It

“At the beginning of 2013 mobile (excluding tablet) accounted for 26% of our traffic, and we ended the year with it contributing 33%.”

Stuart McMillan, Schuh

# And Spending More

“Historically, mobile baskets have always been lower value than desktop but just before Christmas the difference was only about 6%”

Stuart McMillan, Schuh

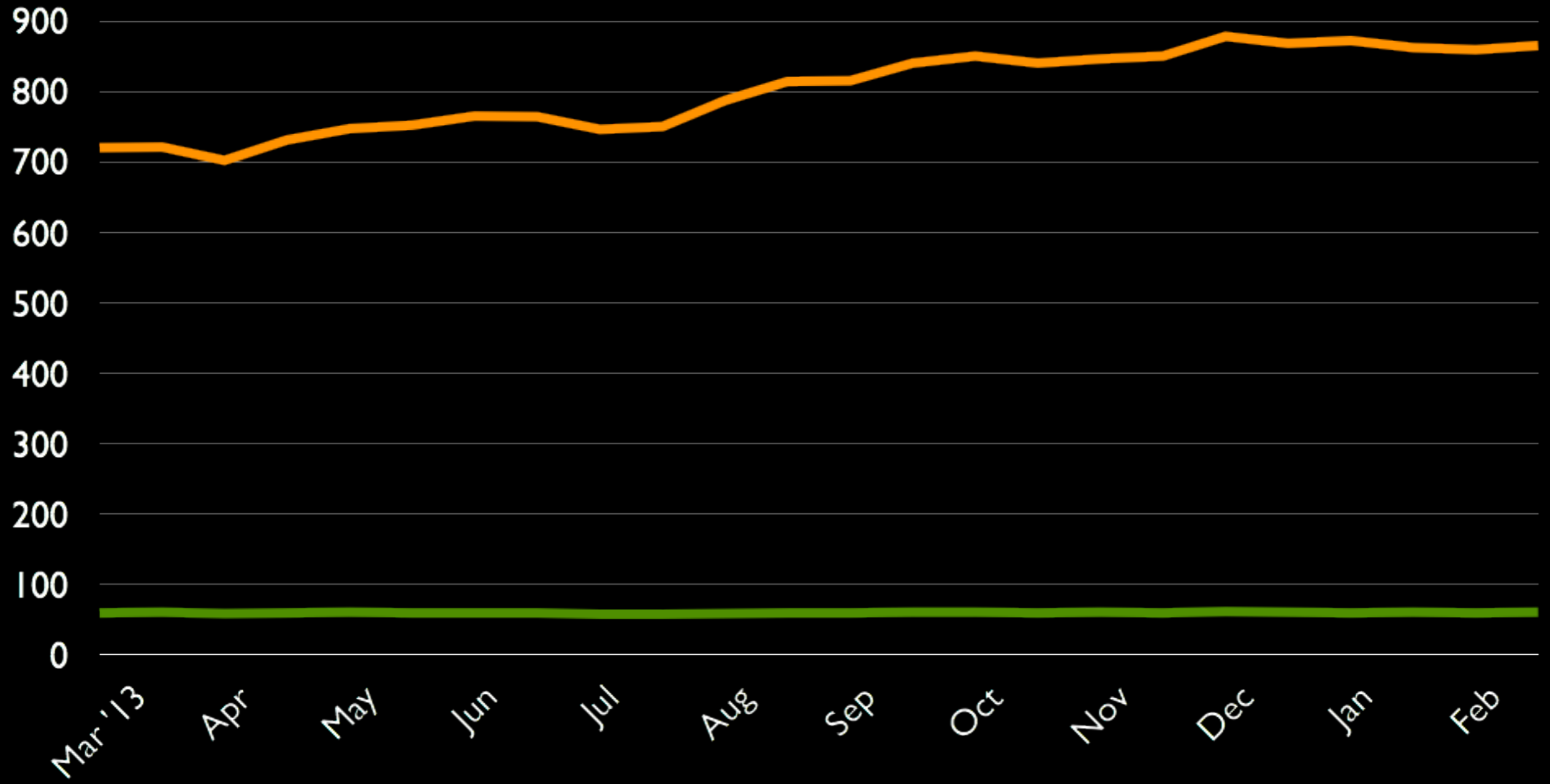
# User Expectations are High

“85% of mobile users expect sites to load at least as fast or faster than sites on their desktop”

Strangeloop Networks

# Mobile Pages are Growing

Requests  
Size (kB)





“We’ve remade the Internet in our image... obese.” Jason Grigsby

We're relying on ever faster  
phones and networks



# 4G isn't going to bail us out

**77.3M**

mobile  
connections

**2-3M 4G**

connections

Estimated 20% of connections will be LTE by end of  
2017





So many devices...  
lots of variation



# Meet the \$25 Smartphone



# Differing Network Environments

GPRS

EDGE

3G

4G

WiFi

Faster, Lower Latency???

Special networks...

Conference, Hotel, Coffee shop WiFi

# Latency is a huge issue

“In 2012, the average worldwide RTT to Google is still ~100ms, and ~50-60ms within the US.”

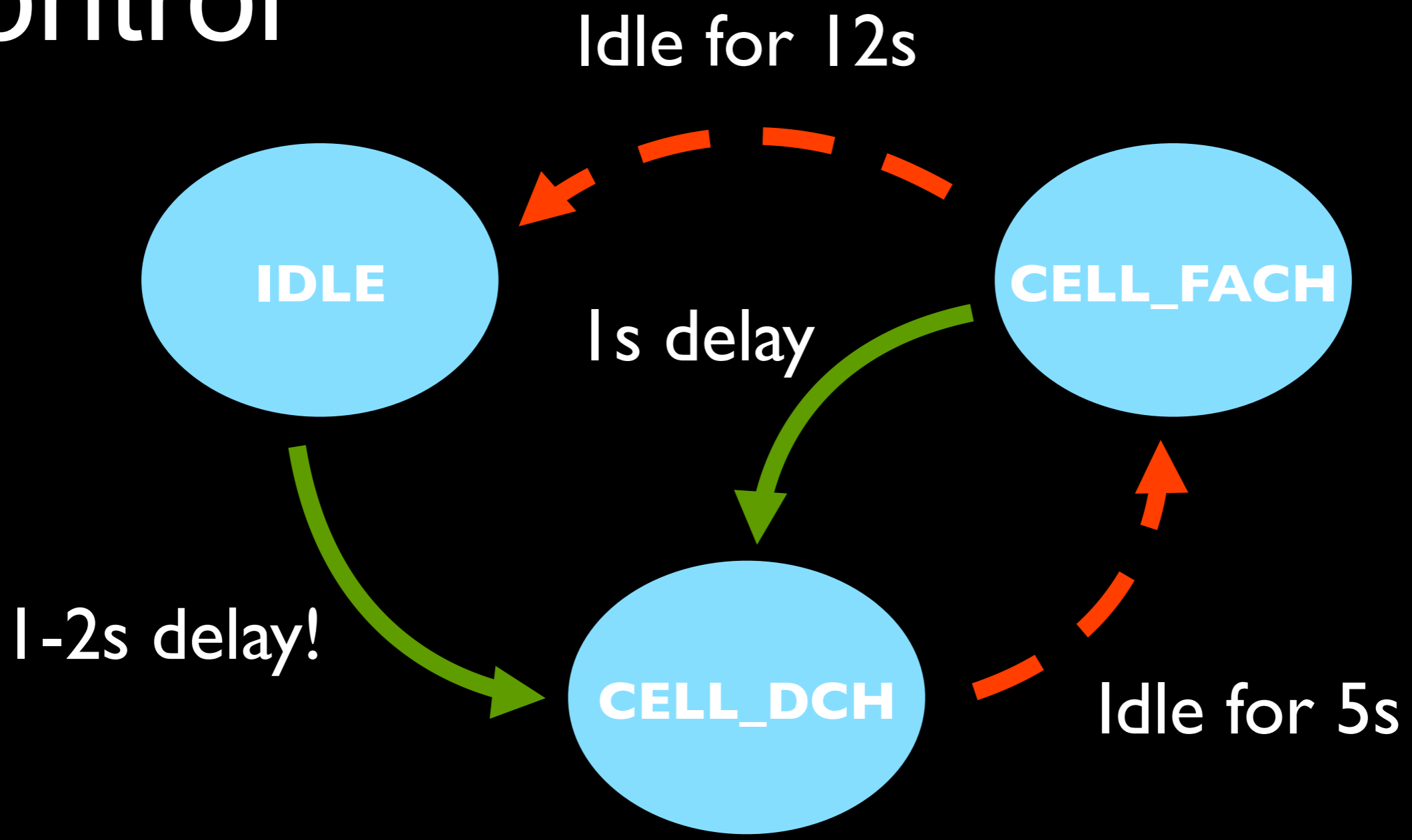
“we are looking at 100-1000ms RTT range on mobile”

Ilya Grigorik

An iPhone is shown from a top-down perspective, lying on a light-colored wooden surface. The phone's screen is dark and displays a low battery icon, which is a red-outlined battery with a small red segment on the left side. Below the battery icon is a white lightning bolt symbol, indicating that the phone is charging. A white charging cable is plugged into the bottom of the phone. The background is a plain wooden surface with a visible grain.

It's not just  
about speed

# 3G Radio Resource Control



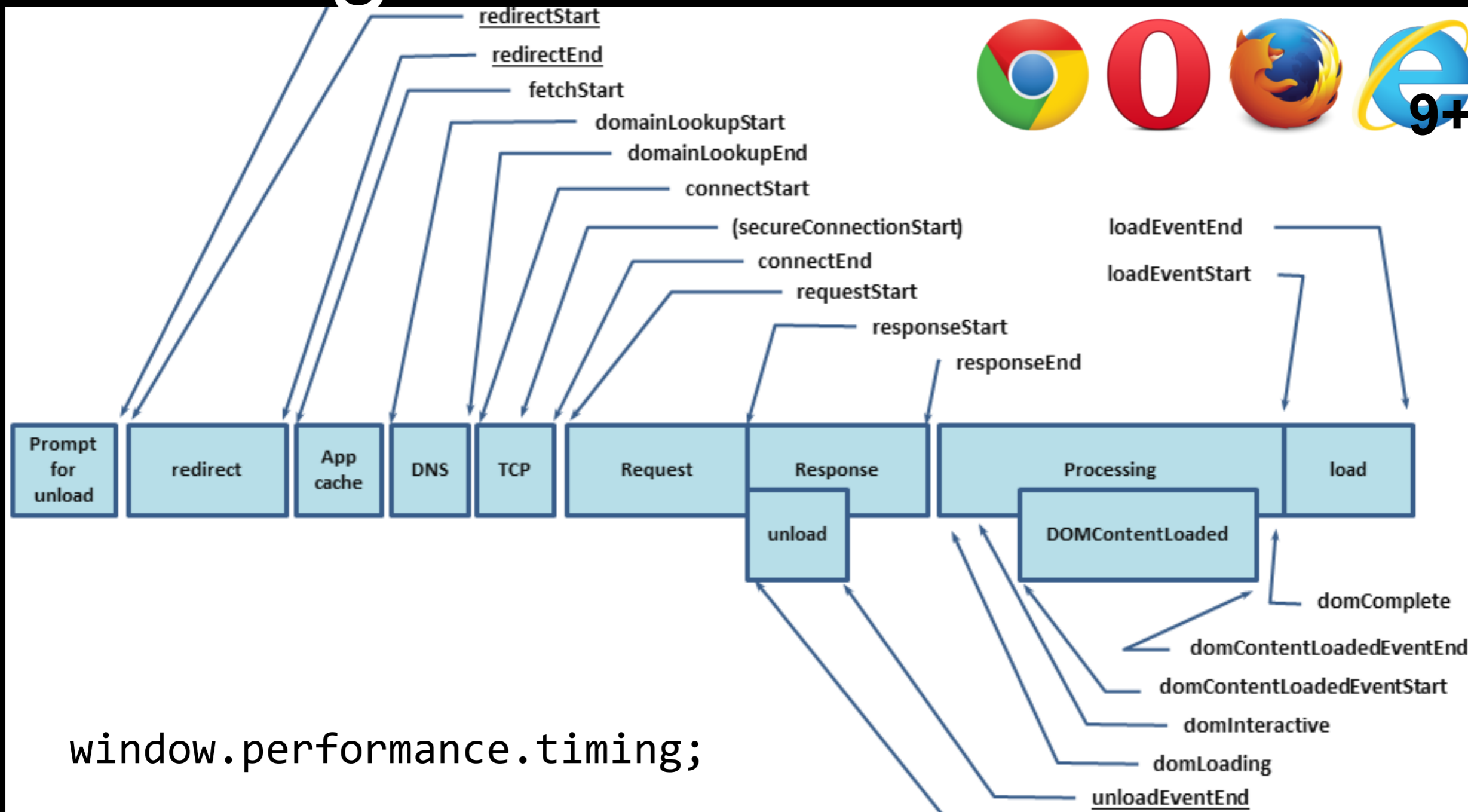
Exact timings vary and depend on carrier NOT device

# Measuring mobile web performance





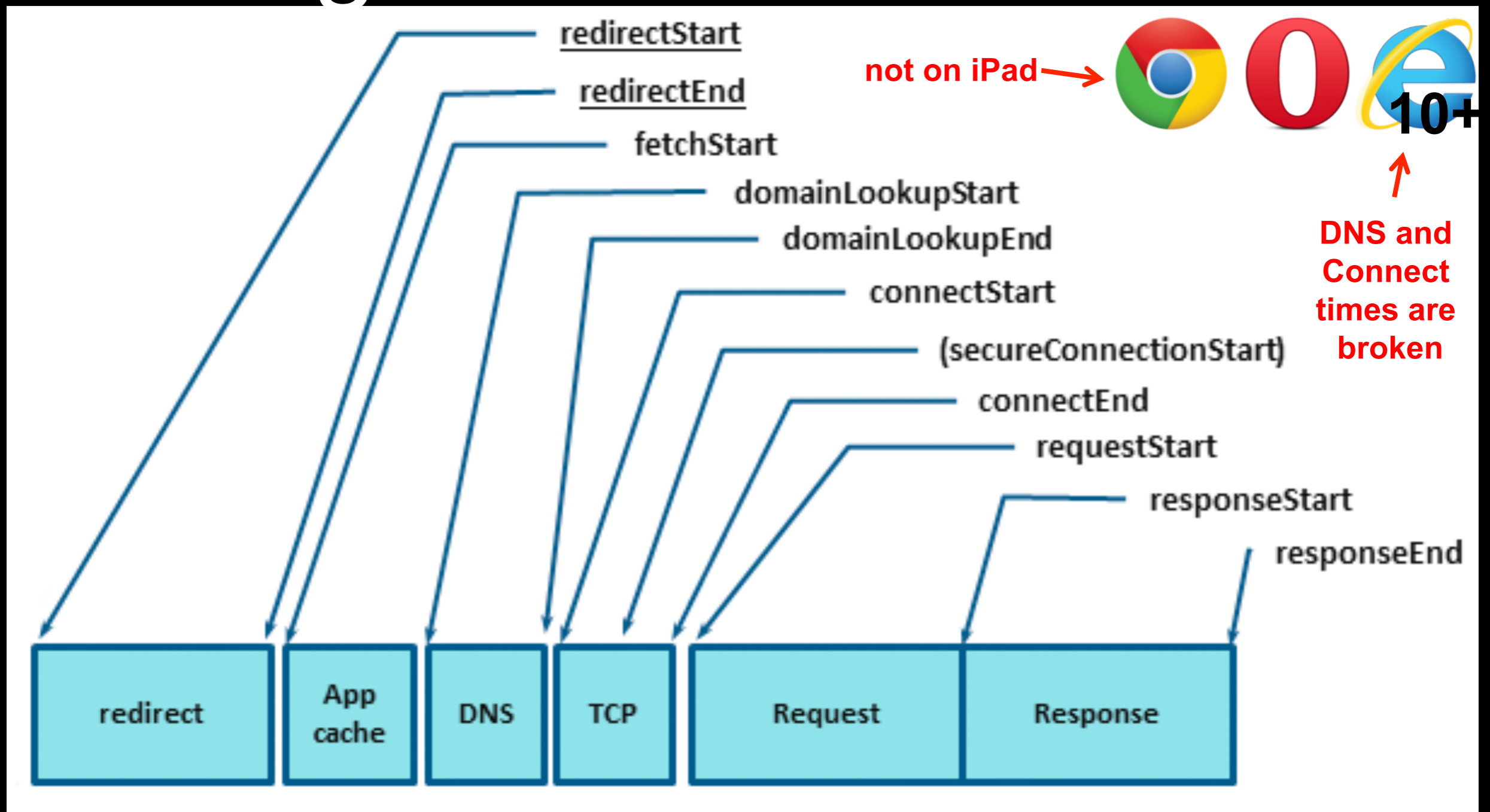
# Navigation Timing API



`window.performance.timing;`

<http://goo.gl/x483FY>

# Resource Timing API



<http://goo.gl/afV9OD>

```
window.performance.getEntries();
```

# First Paint time



```
window.chrome.loadTimes().firstPaintTime;
```



```
window.performance.msFirstPaint;
```

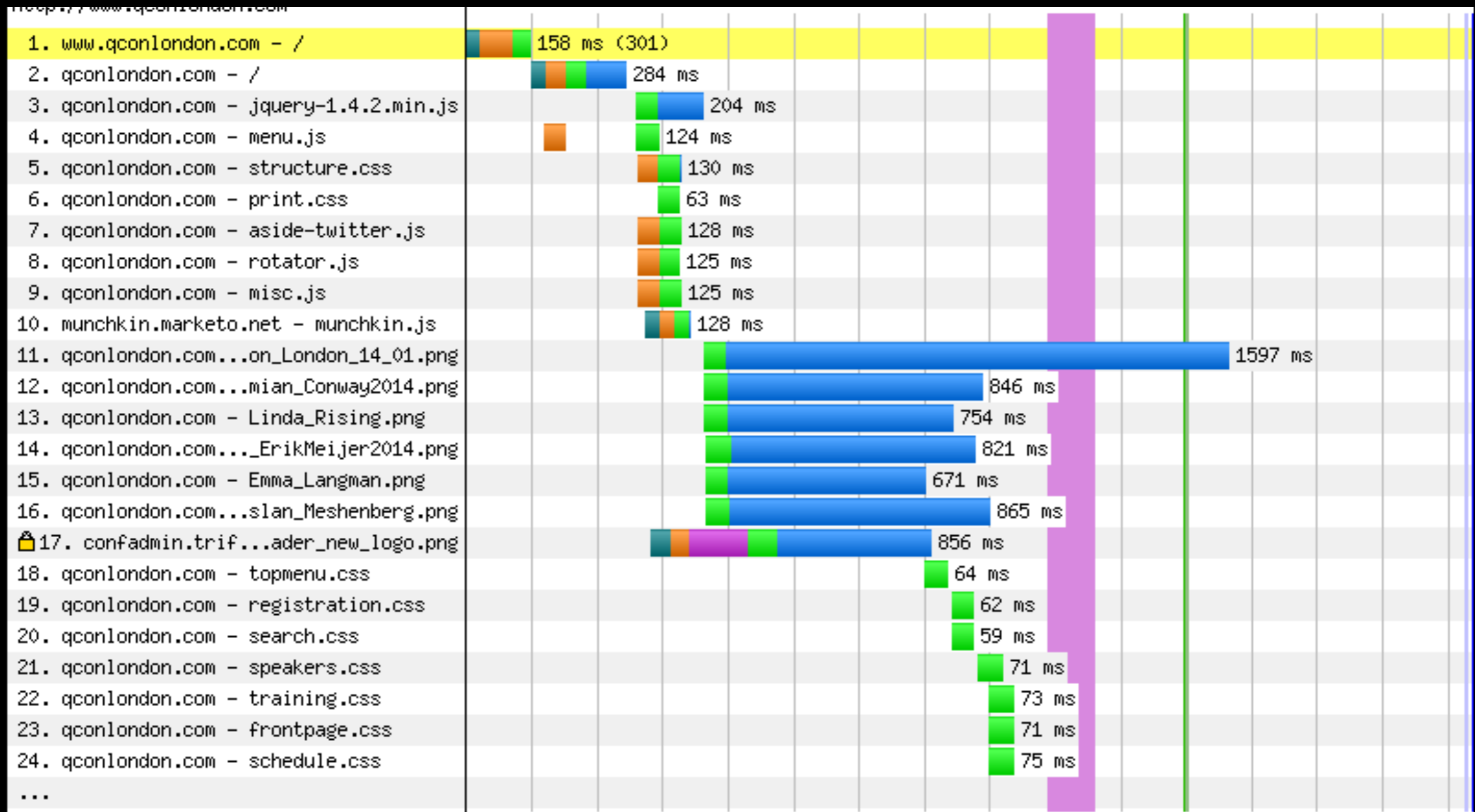
Works on IE  
Mobile?  
Don't know

...



```
firstPaintTime = 'first time MozAfterPaint event fires' -  
window.performance.timing.navigationStart
```

# WebPagetest



# WebPag etest



I built and  
operate WPT.  
I am awesome.

- Best tool to analyze web performance
- Real browser, many locations around the globe
- IE6-11, Firefox, Chrome, Android, iPhone, iPad...
- Specify connection speeds, packet loss
- Extensive API (eg. multi-page testing)
- Run your own private instance!

# Appurify's WebPagetest

Many devices

Many carrier  
profiles

All located in San  
Francisco

<http://appurify.webpagetest.org>

<https://androidwpt.appurify.com>

✓ iPhone 4s iOS 6.1.3 - Safari  
iPhone 4s iOS 6.1.3 - Chrome  
iPhone 5 iOS 6.1.3 - Safari  
iPhone 5 iOS 6.1.3 - Chrome  
iPad Air iOS 7.0.3 - Safari  
iPad Air iOS 7.0.3 - Chrome  
iPhone 5 iOS 7.1 - Safari  
iPhone 5 iOS 7.1 - Chrome  
Amazon Fire\_8.5\_HDX Kindle 3.0 - Silk  
iPhone 5 iOS 6.1.4 - Safari  
iPhone 5 iOS 6.1.4 - Chrome  
iPhone 5 iOS 7.0 - Safari  
iPhone 5 iOS 7.0 - Chrome  
iPhone 5s iOS 7.1 - Safari  
iPhone 5s iOS 7.1 - Chrome  
Amazon Fire\_7.0\_HDX Kindle 3.0 - Silk  
iPad Air iOS 7.1 - Safari  
iPad Air iOS 7.1 - Chrome  
iPhone 5s iOS 7.0 - Safari  
iPhone 5s iOS 7.0 - Chrome  
iPhone 5c iOS 7.0 - Safari  
iPhone 5c iOS 7.0 - Chrome  
iPhone 5c iOS 7.1 - Safari  
iPhone 5c iOS 7.1 - Chrome  
iPhone 5s iOS 7.0.2 - Safari  
iPhone 5s iOS 7.0.2 - Chrome  
iPad HD iOS 6.1.3 - Safari  
iPad HD iOS 6.1.3 - Chrome  
iPad Mini iOS 7.1 - Safari  
iPad Mini iOS 7.1 - Chrome

UK

UK - Vodafone-4G

UK - Virgin-3G

UK - Virgin-4G

UK - Vodafone-3G

UK - Vodafone-2G

UK - Orange-4G

UK - Orange-3G

UK - Orange-2G

UK - O2-4G

UK - O2-3G

UK - O2-2G

UK - T-Mobile-2G

UK - T-Mobile-3G

UK - T-Mobile-4G

Verizon (VZ)

Verizon (VZ) - 3G 1 Bar

Verizon (VZ) - 3G 5 Bars

Verizon (VZ) - 3G 4 Bars

Verizon (VZ) - 3G 3 Bars

Verizon (VZ) - 3G 2 Bars

Verizon (VZ) - 4G LTE

Verizon (VZ) - Very Poor Connection

WiFi

WiFi - Starbucks Average

WiFi - Target Good

WiFi - Target Average

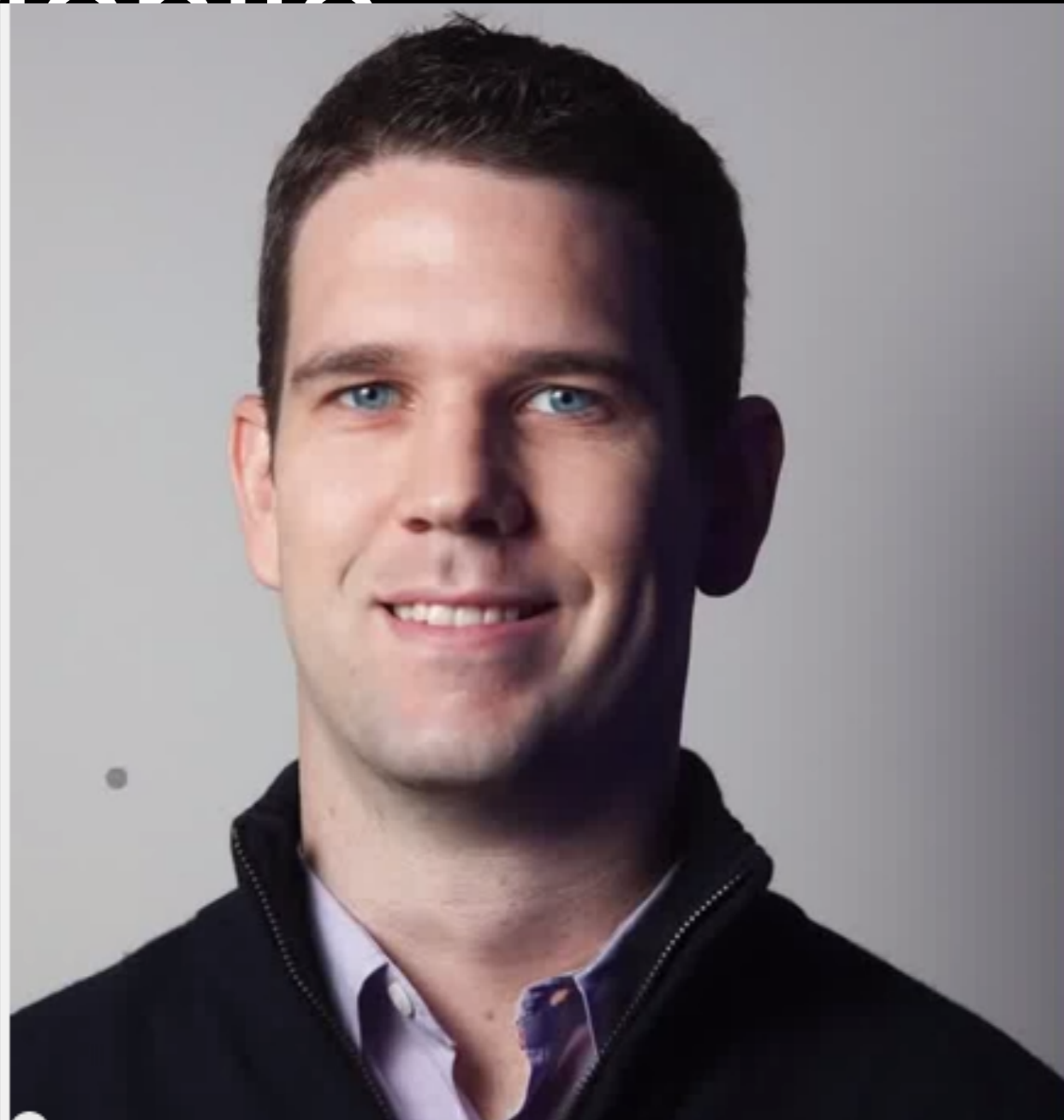
WiFi - Target Bad

WiFi - Starbucks High Traffic

WiFi - Starbucks Good

WiFi - WiFi

# Chrome DevTools For Mobile



Chrome DevTools for Mobile

Paul Irish

Chrome Dev Summit  
NOV. 20-21, 2013. MOUNTAIN VIEW, CA.

<http://goo.gl/jfKyAN>

<http://goo.gl/WS5N8E>

# Finding the problems





nbcnews.  
com



0.0

Dulles, VA, Motorola G – Chrome, Shaped 3G (1.6 Mbps/768 Kbps, 300ms RTT)

# nbcnews.com

## 18.7 sec

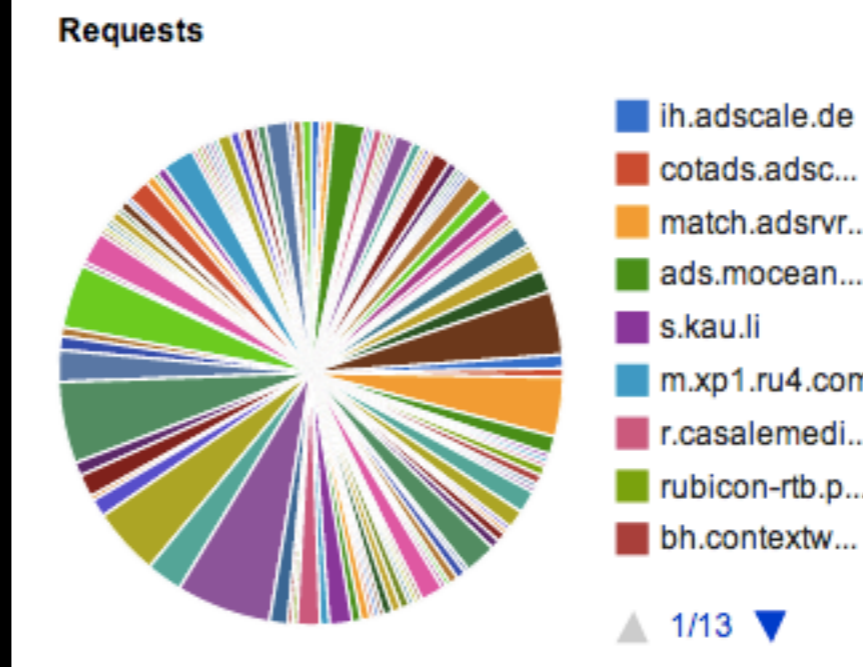
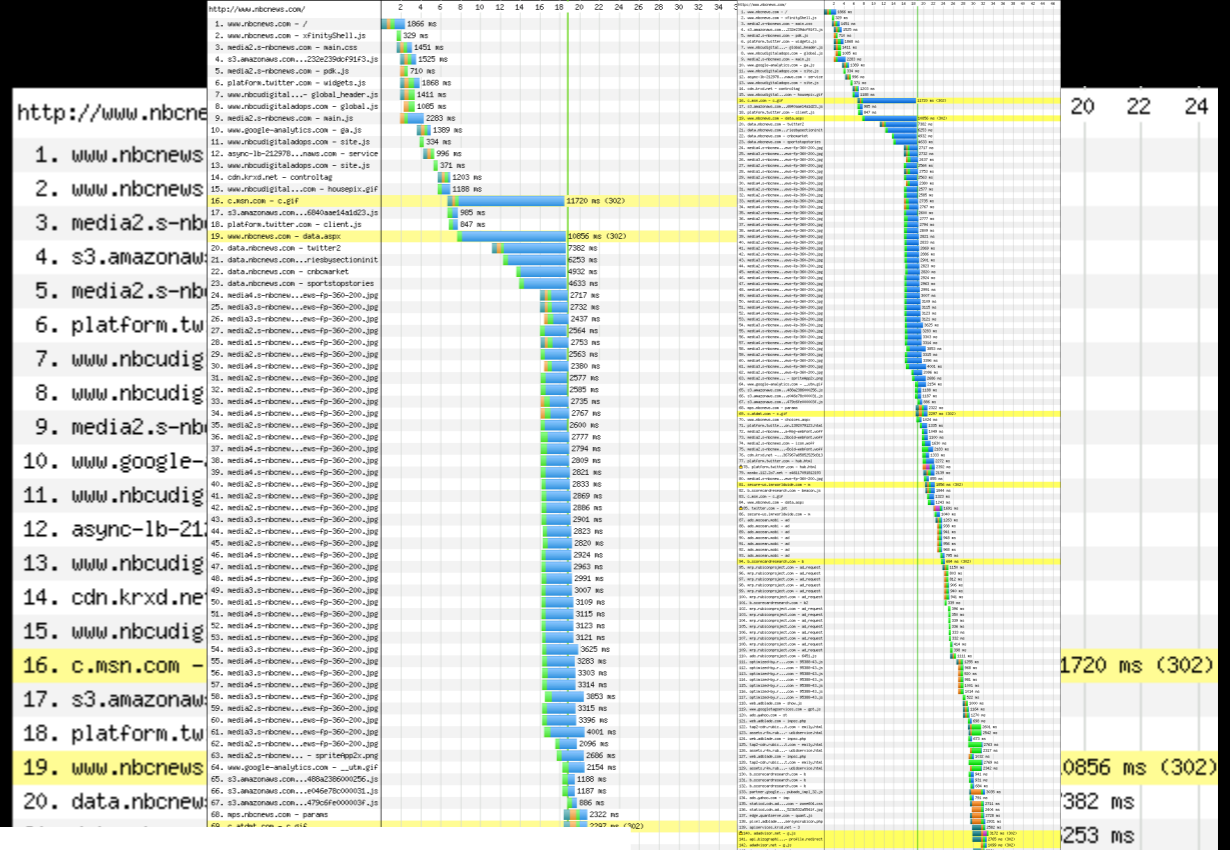
### Start Render Time

## 344 !

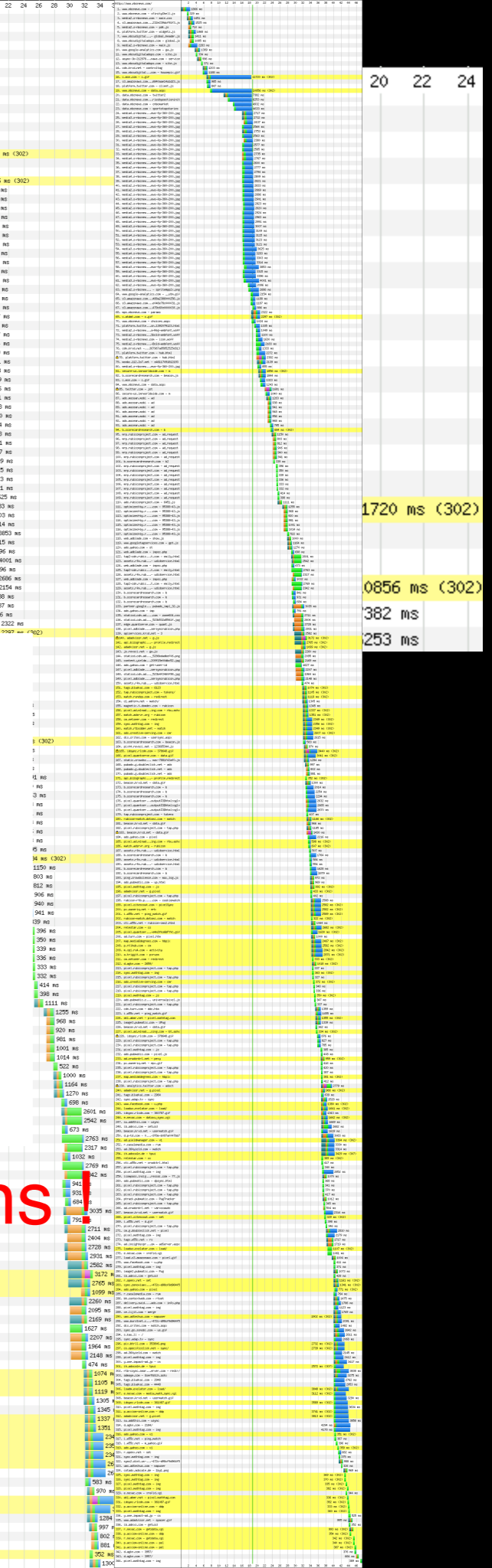
### Requests

## 1523 KB

### Total Transfer Size



## 115 different domains



htc.co  
m



0.0

# htc.com

## 9.4 sec

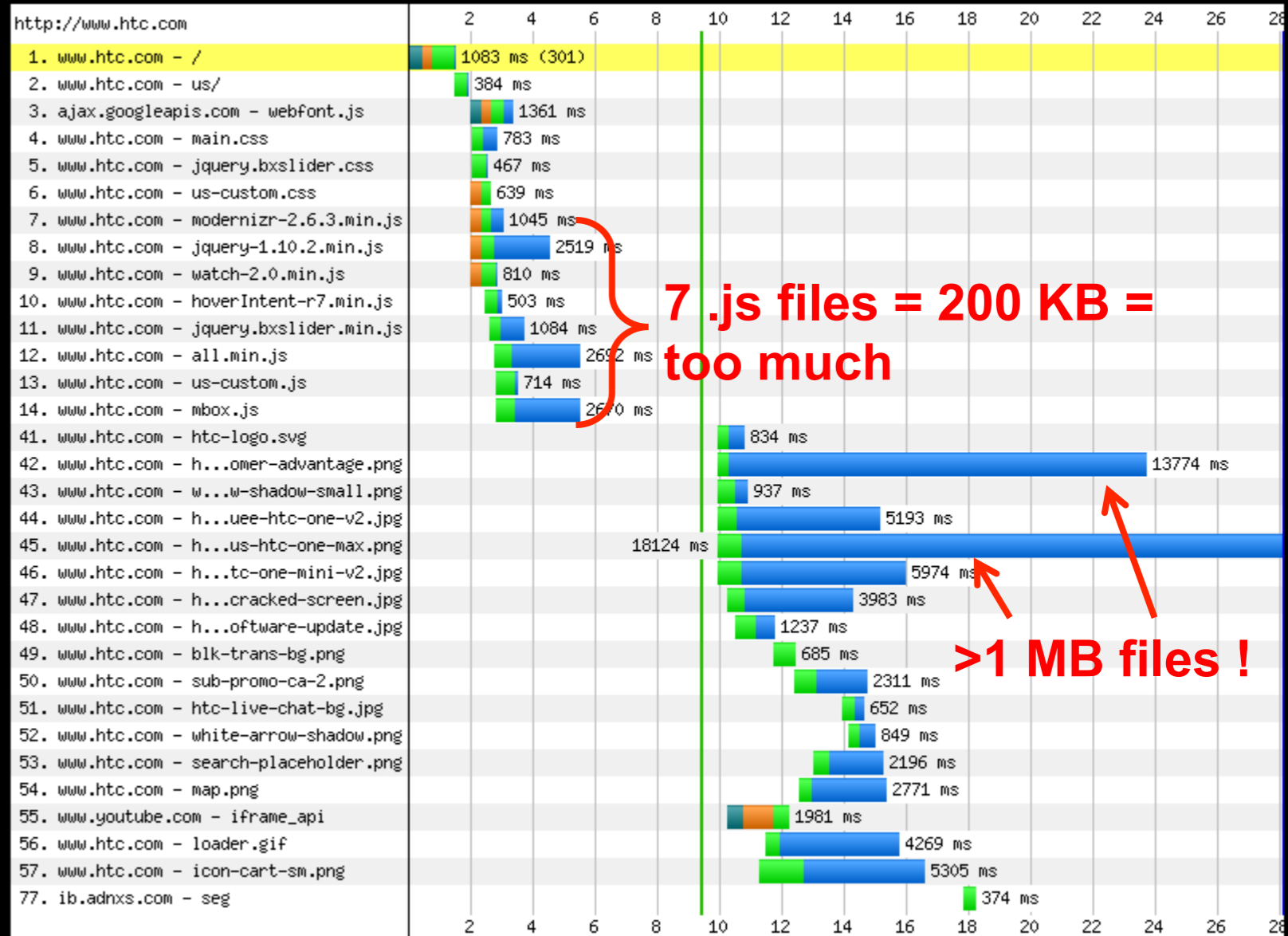
Start Render Time

## 77

Requests

## 3,256 KB !

Total Transfer Size



Solving the problems:  
make it faster!



> Minimize  
transfer size

Send less bytes... A LOT LESS

# Send text based files compressed



**Savings: 10% – 80% !!!**

# Minimize image dimensions





# Crunch images



Served by apple.com

**380 KB**

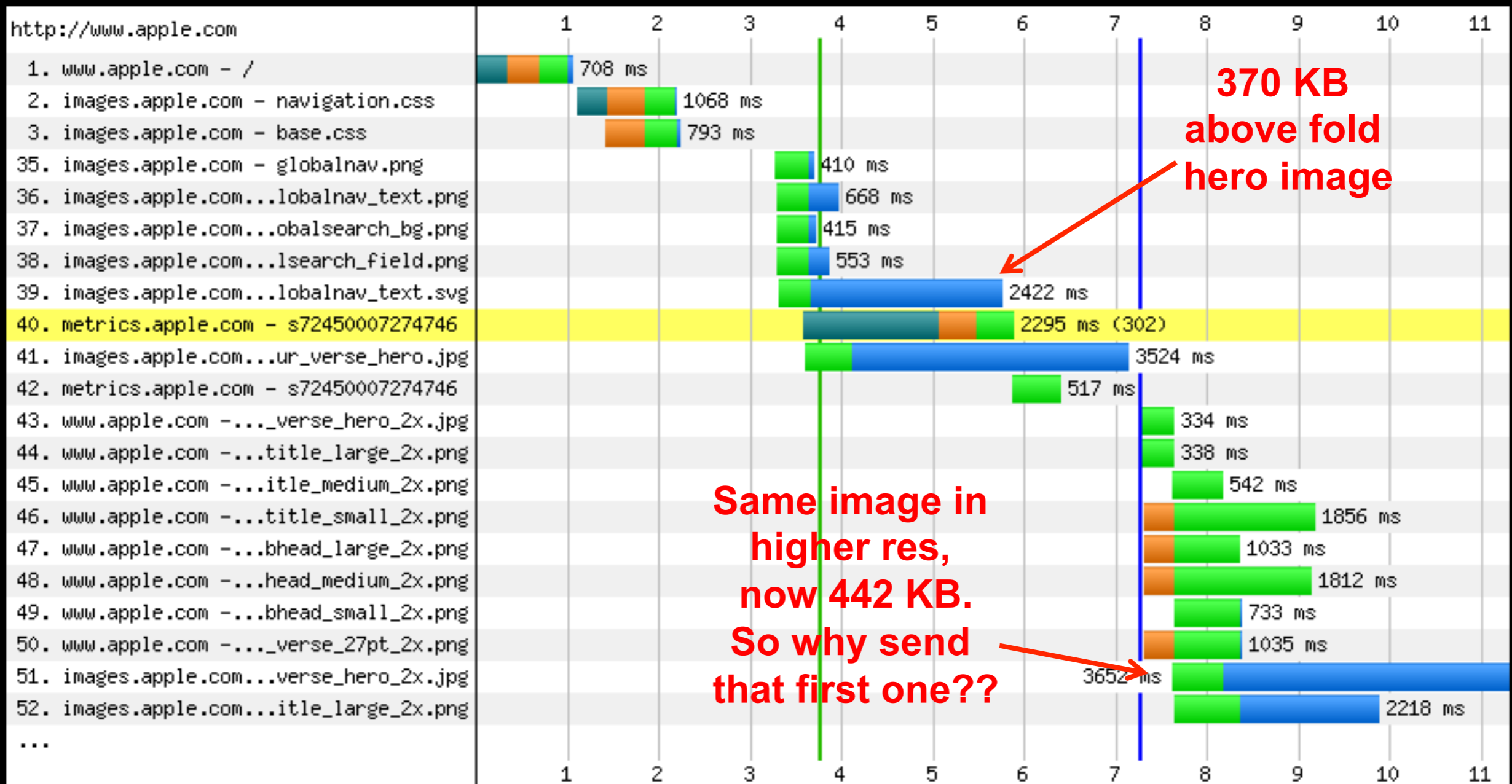


Optimized with ImageOptim

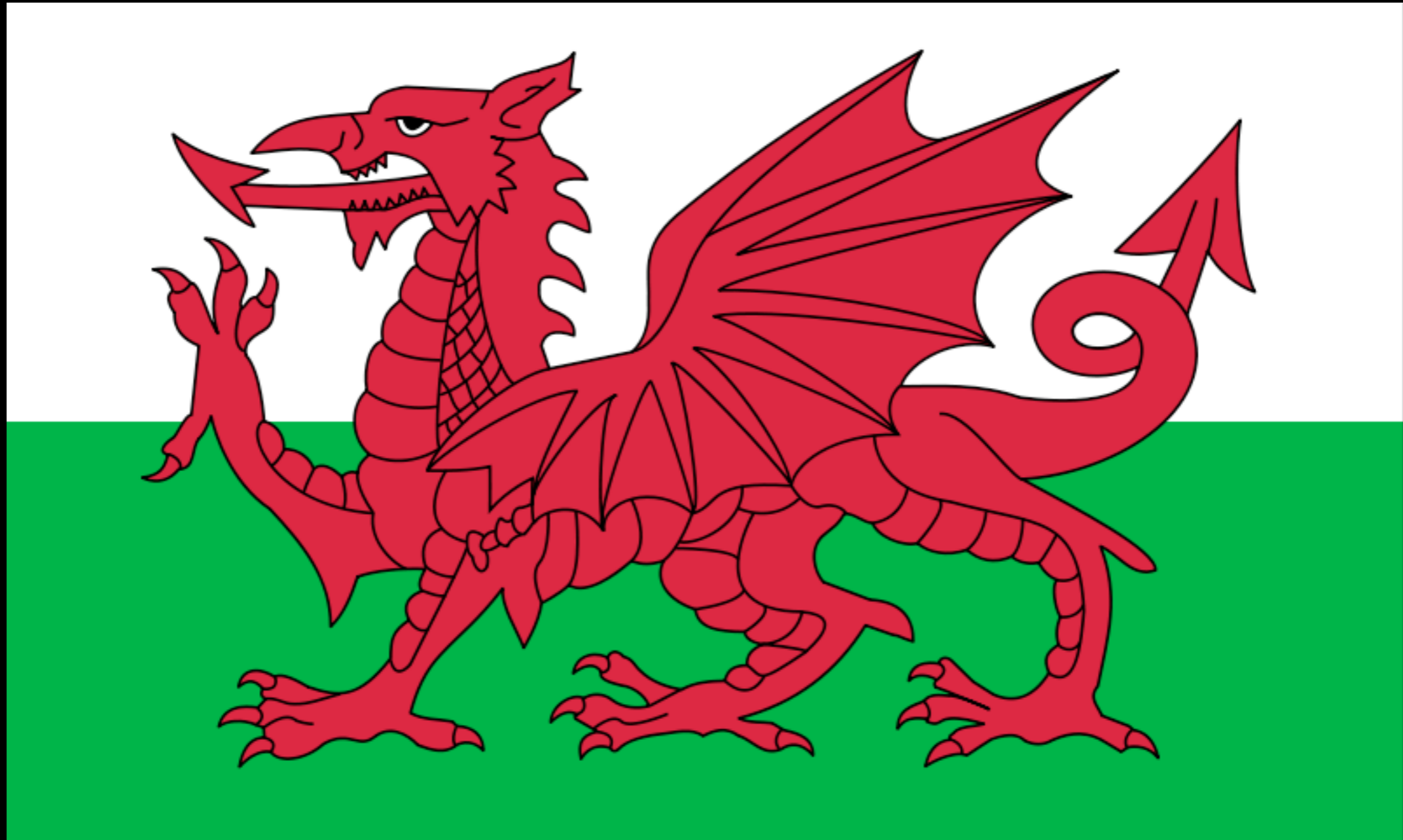
**179 KB**

# Don't send what is not needed

apple.com on Nexus 7



Use vector  
graphics instead?



SVG: 12 KB vs PNG: 86KB

# Icon fonts



Heydings by Heydon Works

&#x2605; ★

&#x2606; ☆

&#x2665; ♥

&#x2601; ☁

“Bog Standard Font”

# Use CSS

```
border-radius: 20px;
```



```
background: linear-gradient(left, #f06, #ff0);
```



Some combinations produce poor paint performance

# Webfonts? Maybe better not

4.5 seconds ... blocking!

http://www.htc.com

...

3. ajax.googleapis.com - webfont.js

26. fonts.googleapis.com - css

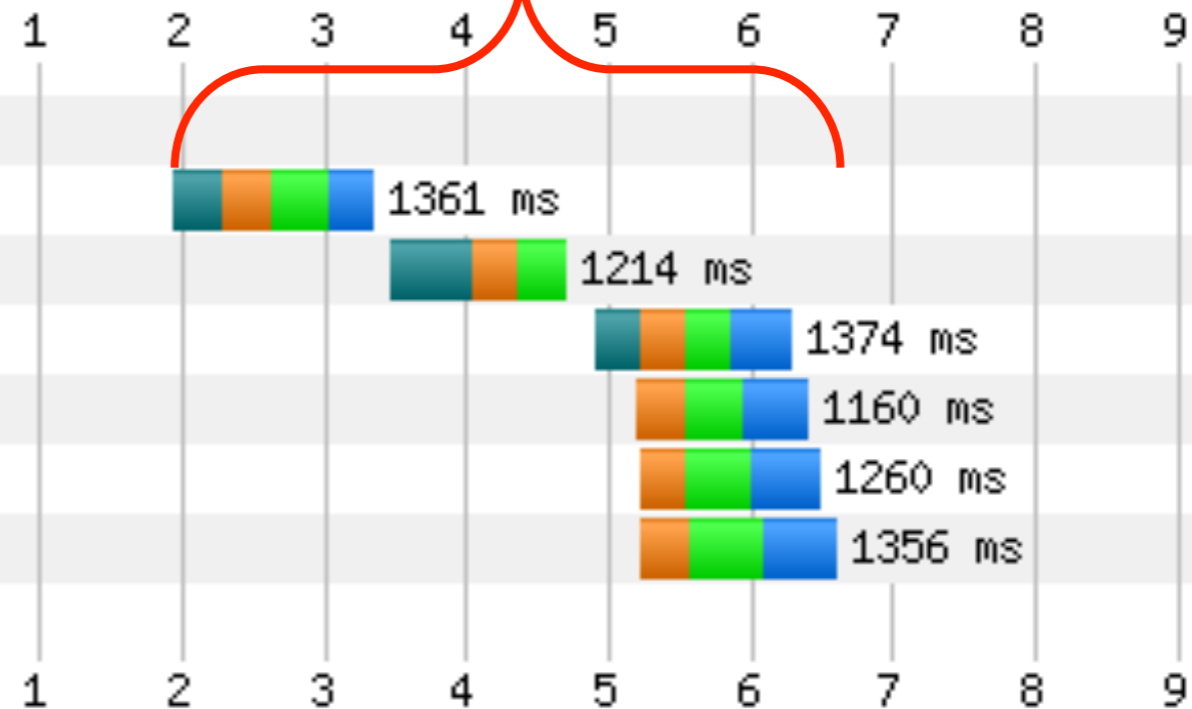
27. themes.googleus...UstqEm5AM1Jo4.woff

28. themes.googleus...-xsNq047m55DA.woff

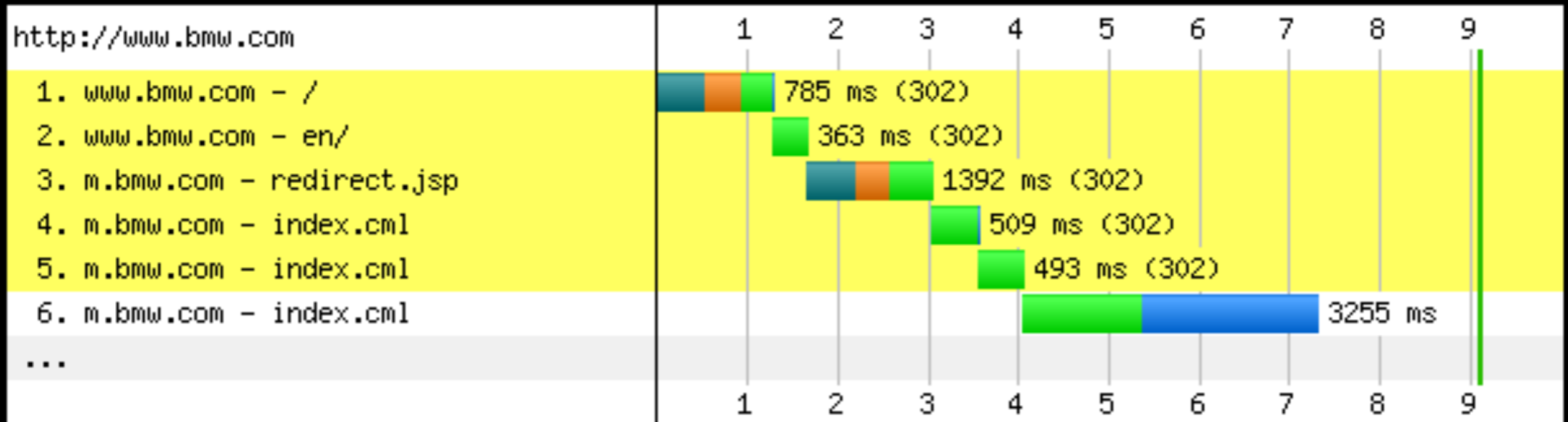
29. themes.googleus...UstqEm5AM1Jo4.woff

30. themes.googleus...UstqEm5AM1Jo4.woff

...



# > Minimize number of requests



# > Increase initcwnd

initial congestion window is a server parameter

`initcwnd = 10` means server sends initially 10 packets (~14KB) over a TCP connection

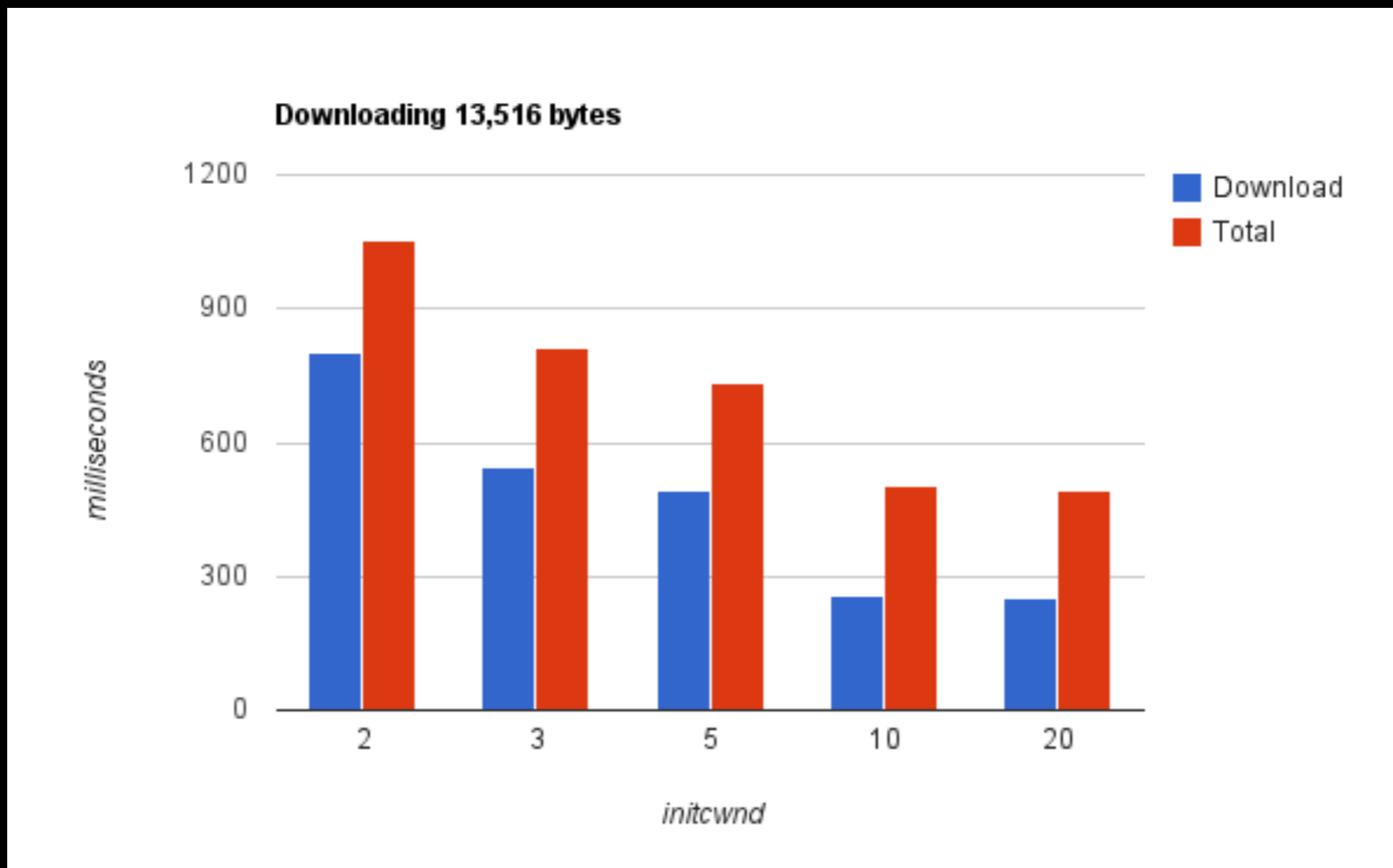
Default value is 10 in Linux 2.6.39+

Most CDNs use 10, but some as high as 26



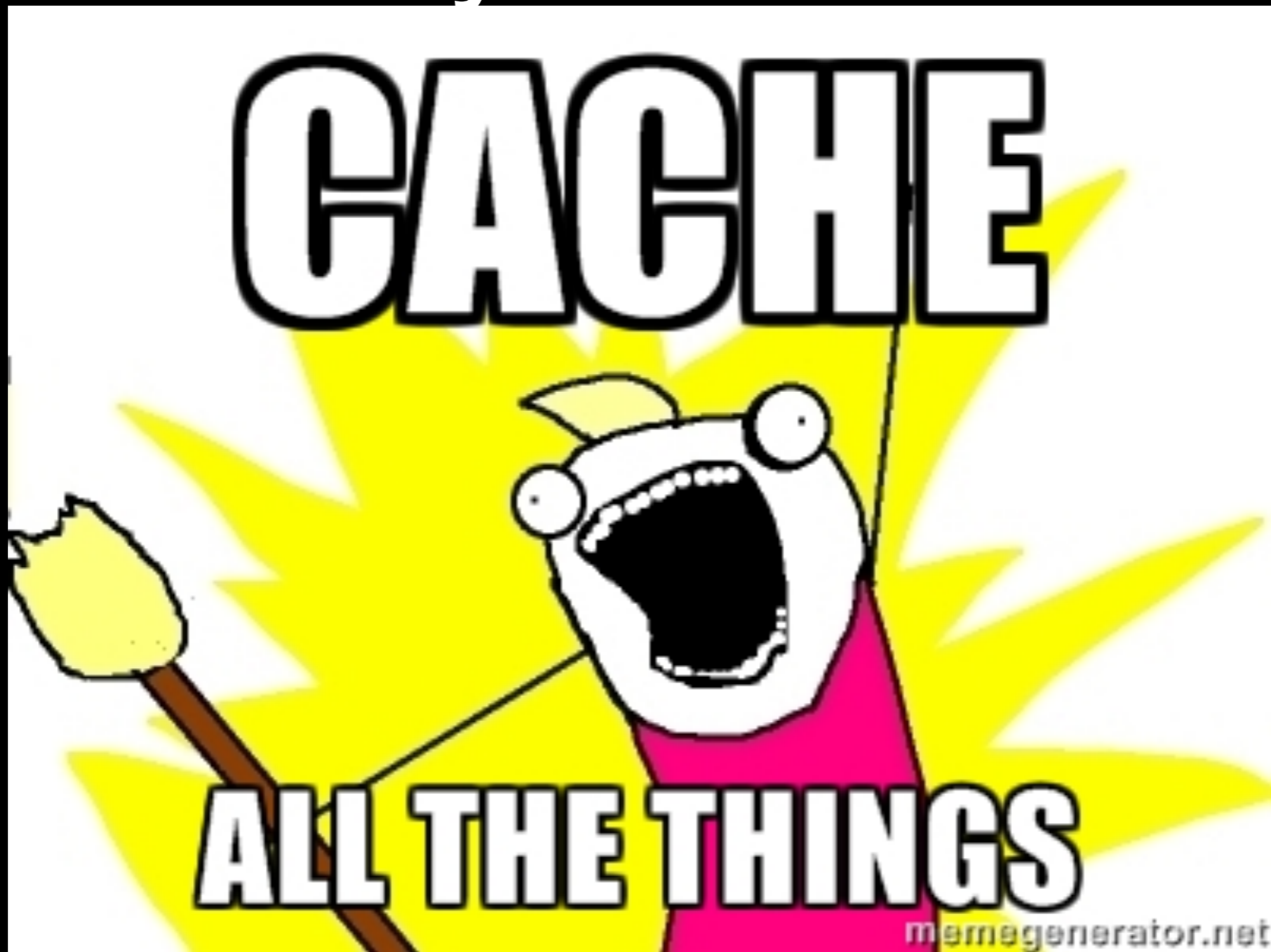
# > Increase initcwnd

A higher initcwnd really helps, especially with small object delivery



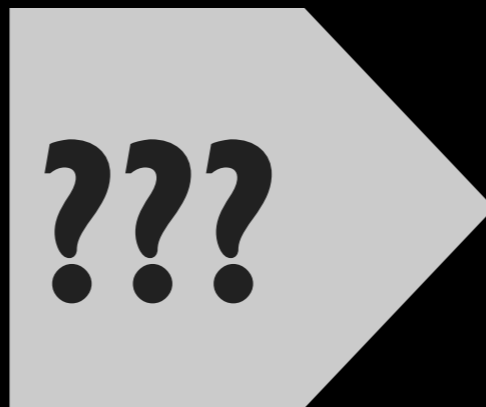
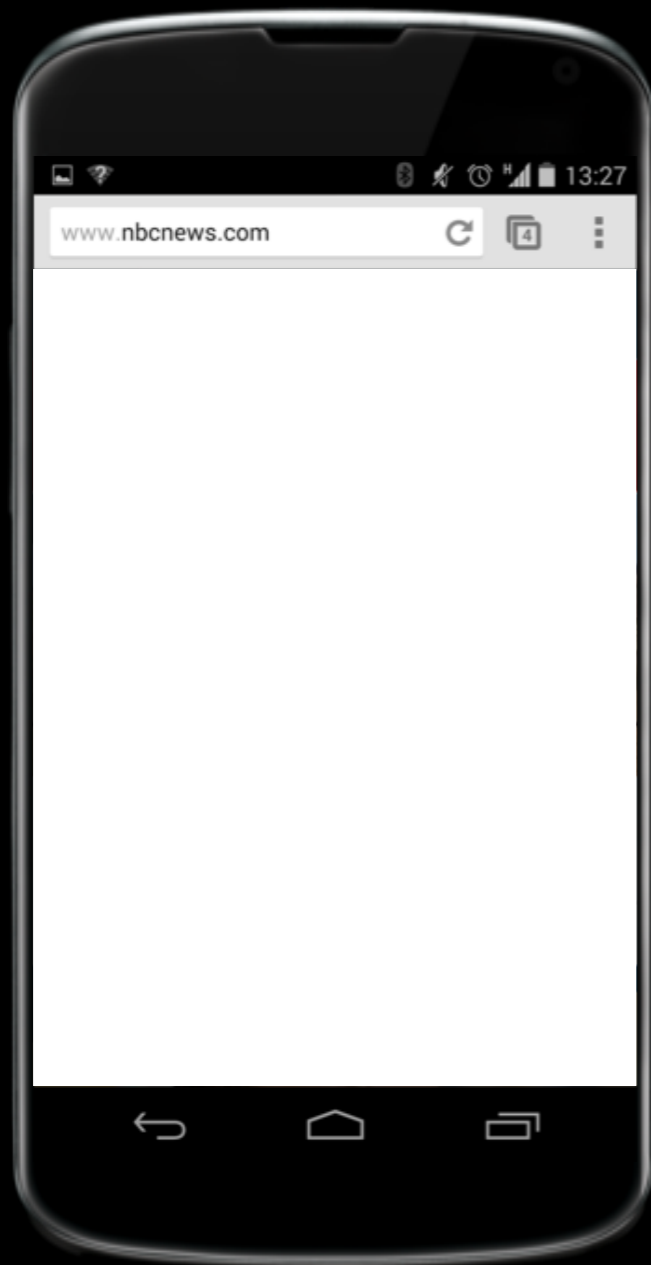
<http://goo.gl/ee0xBs>

> Cache  
aggressively



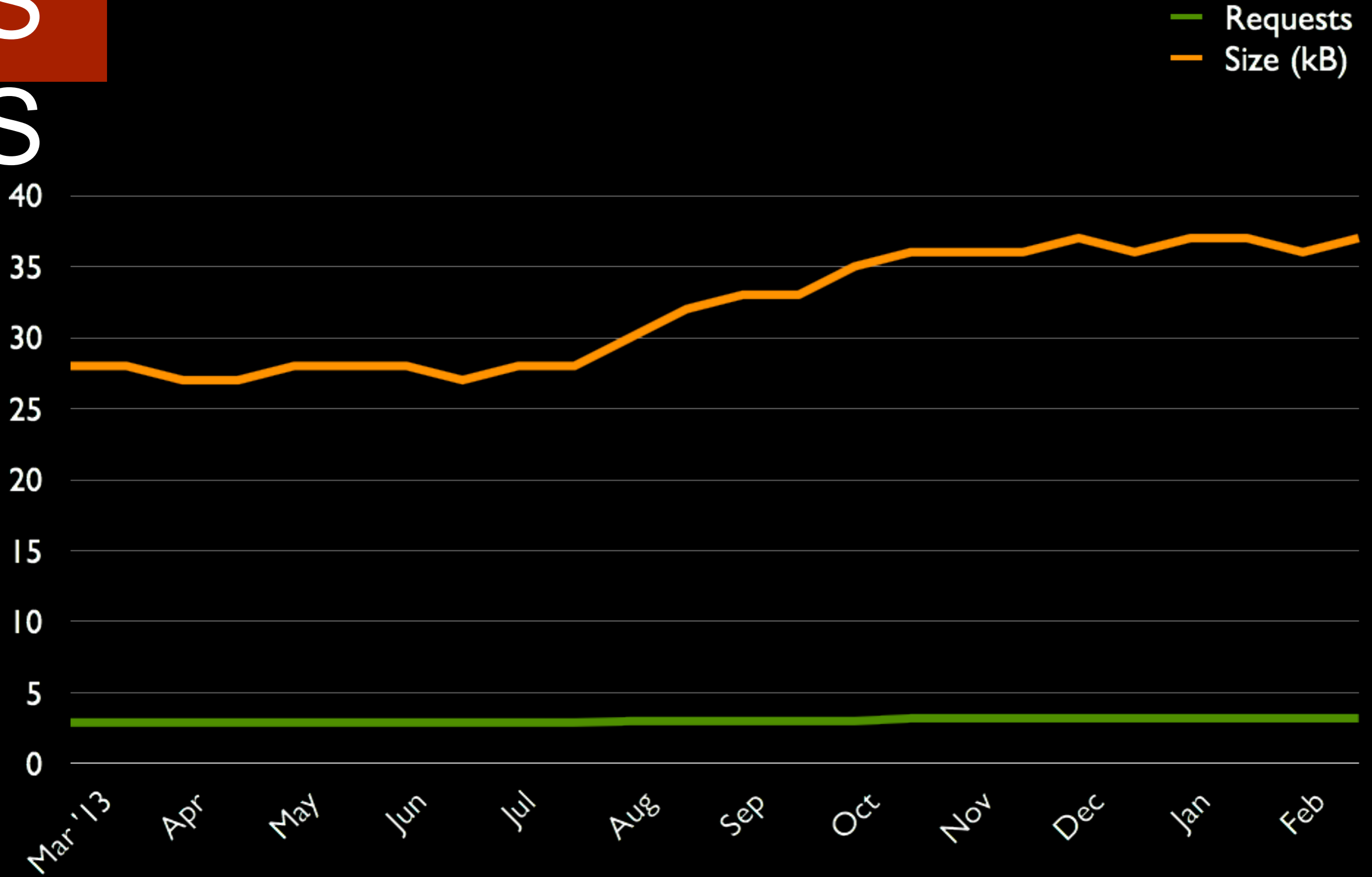


# Fonts, Stylesheets, JavaScript block rendering



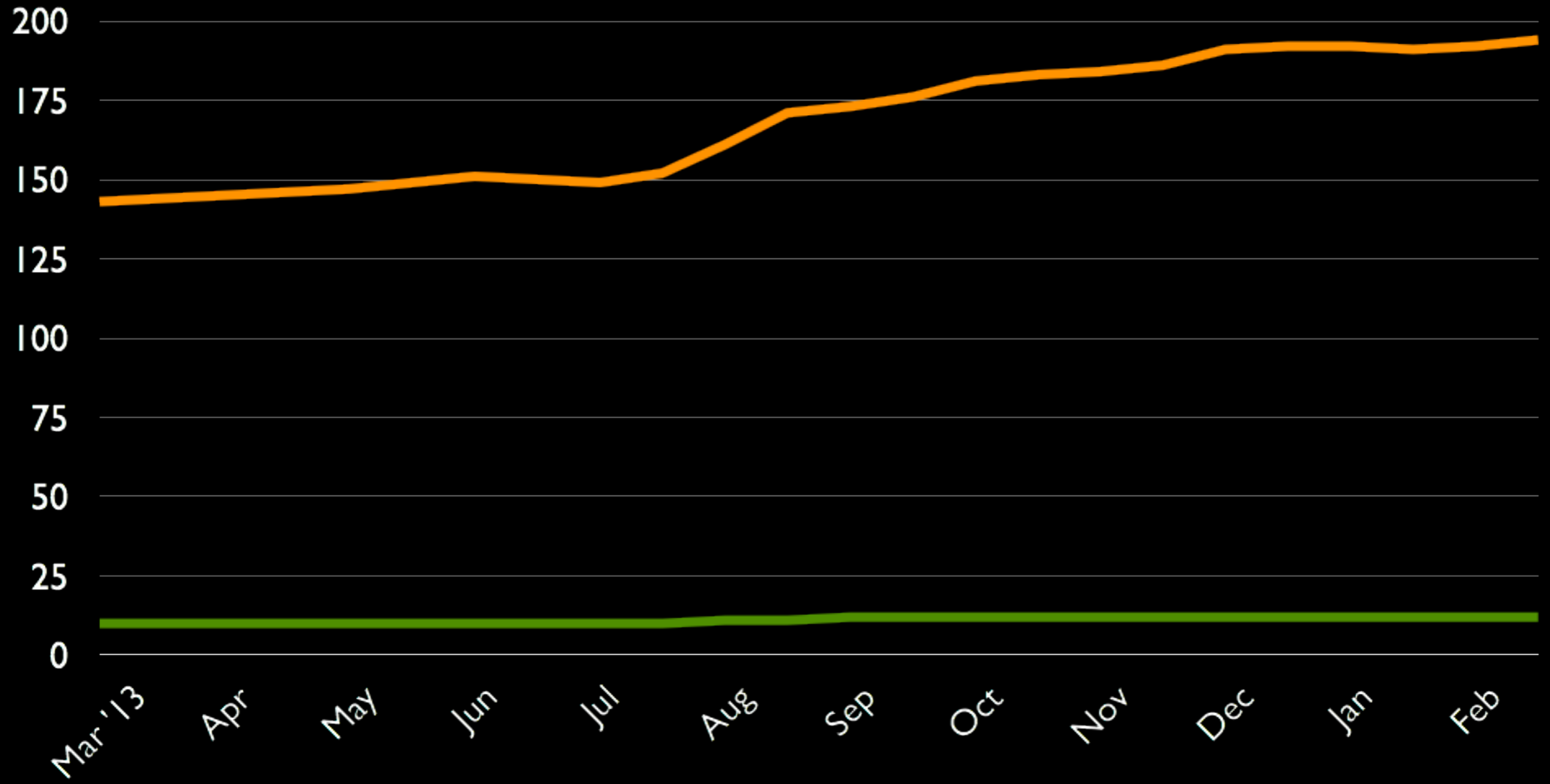
# CS

# S



# Java cript

Requests  
Size (kB)



# Etsy

Added **160kB** to page  
Bounce rate increased  
by **12%** on mobile

We've fallen in love  
with web fonts

A TYPOGRAPHIC ANATOMY LESSON

Typographic

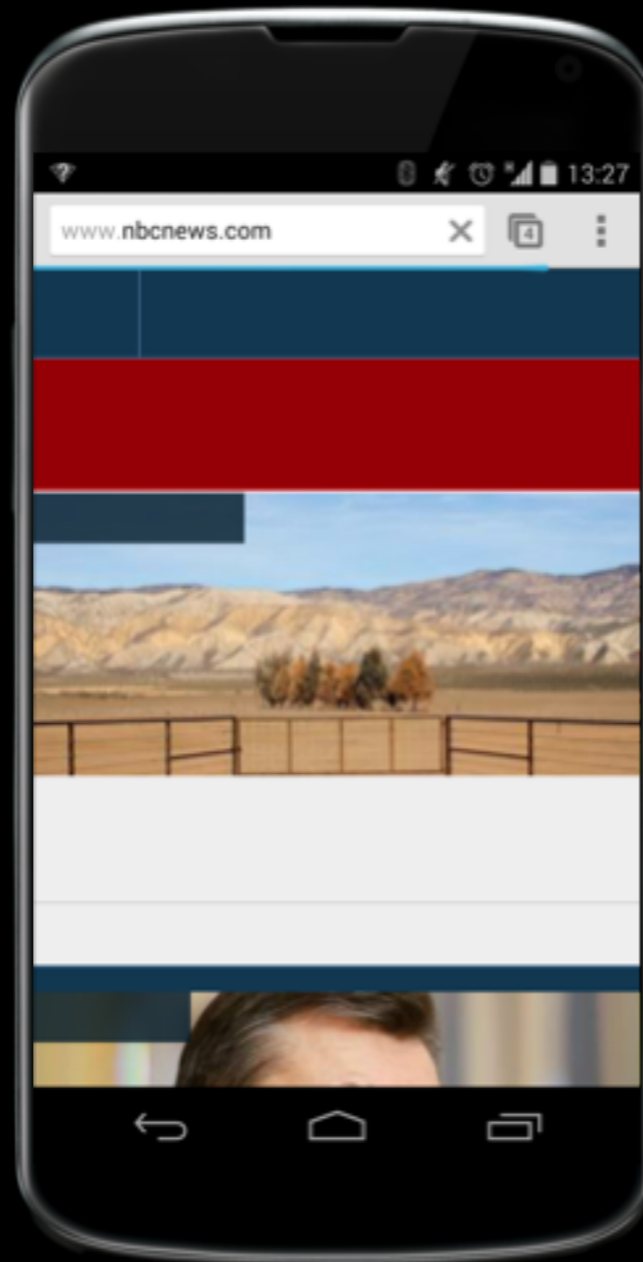
The word 'Typographic' is written in a black serif font on a set of three horizontal dashed lines. Red lines and arrows point to specific parts of the letters: 'ARM' points to the top bar of the 'T'; 'TAPER' points to the top curve of the 'P'; 'EAR' points to the top curve of the 'g'; 'LINK' points to the curve connecting the 'o' and 'g'; and 'LOOP' points to the bottom curve of the 'g'.

is know

The word 'is know' is written in a black serif font on a set of three horizontal dashed lines. Red lines and arrows point to specific parts of the letters: 'BEAK' points to the top curve of the 's'; 'LEG' points to the bottom curve of the 'k'; 'ARC' points to the top curve of the 'o'; and 'VERTEX' points to the bottom point of the 'w'.

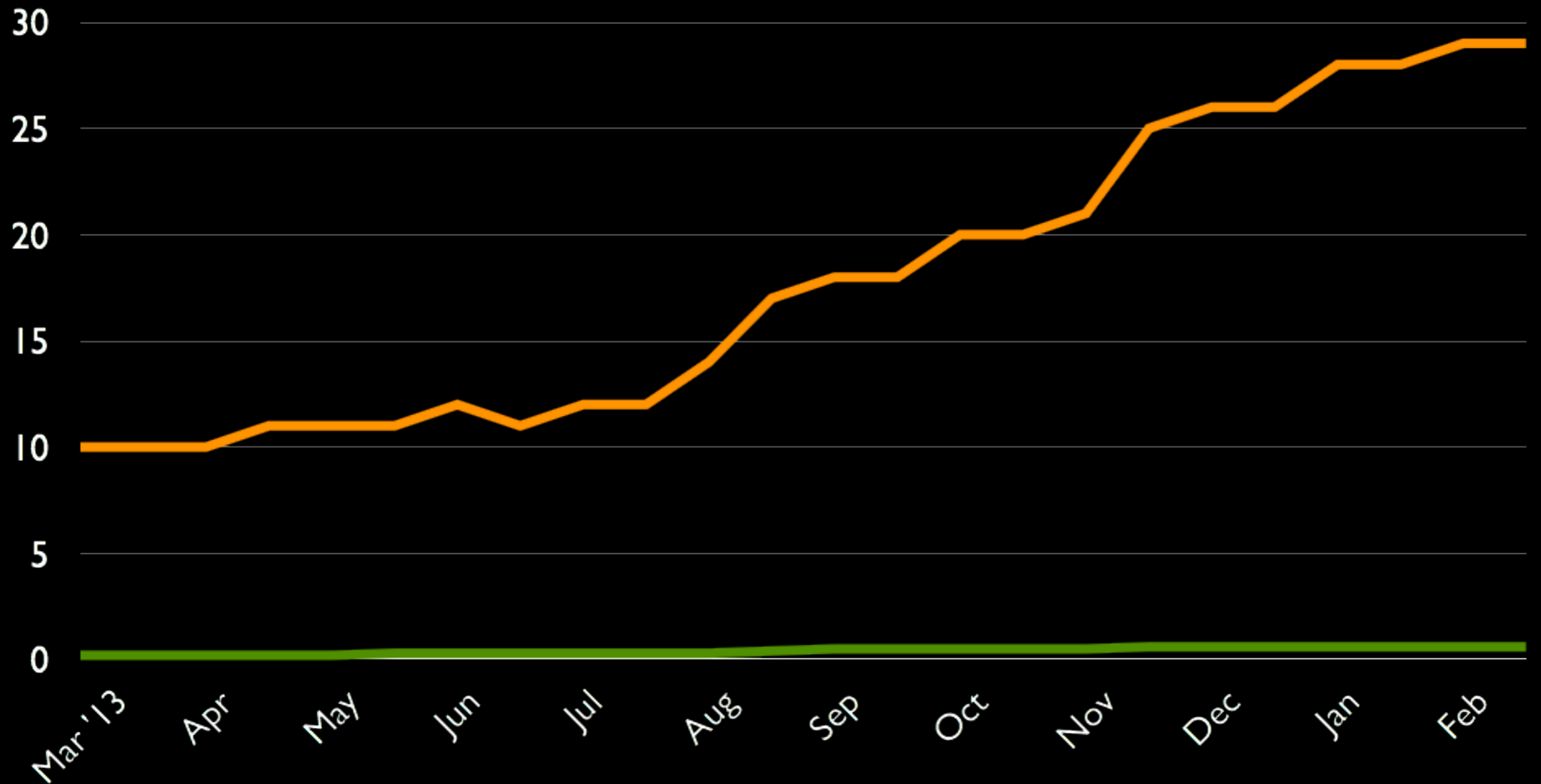


But at what  
cost?



# Use of Web Fonts is Growing

Requests  
Size (kB)









# Provide hints before a resource is discovered

```
<link rel="dns-prefetch" href="other.hostname.com">
```

```
<link rel="subresource" href="/some_other_resource.js">
```

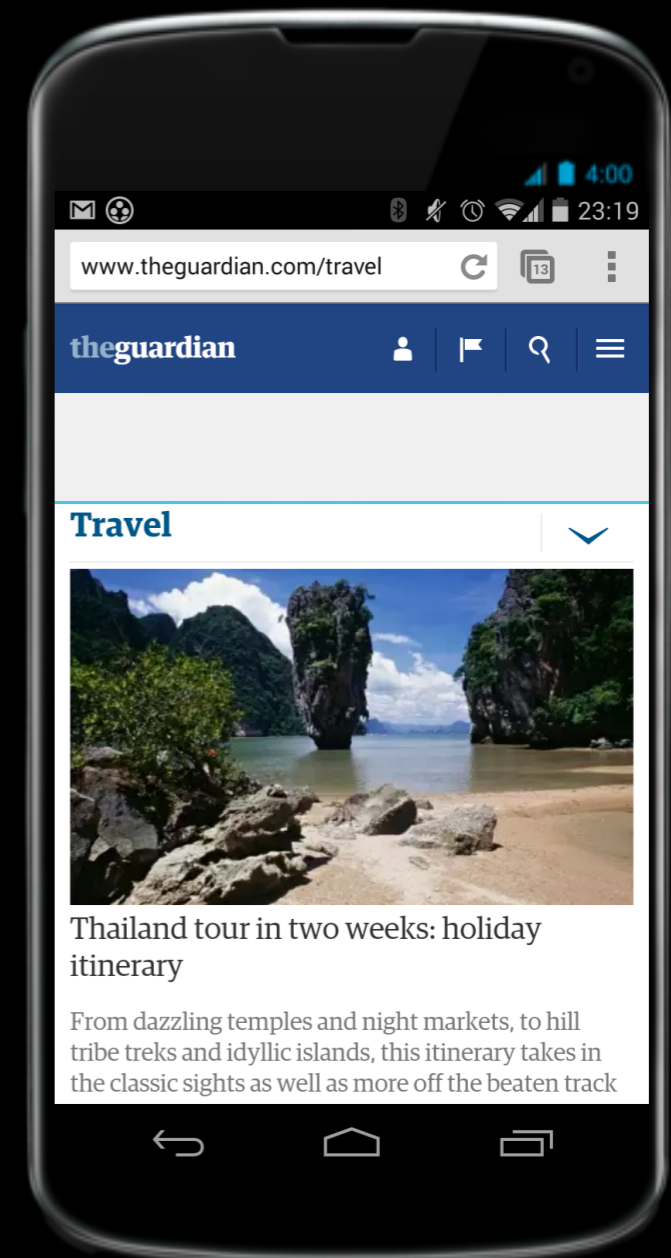
```
<link rel="prefetch" href="/some_other_resource.jpeg">
```

```
<link rel="prerender" href="//domain.com/next_page.html">
```

# Prioritise the Content

Guardian divide page into:

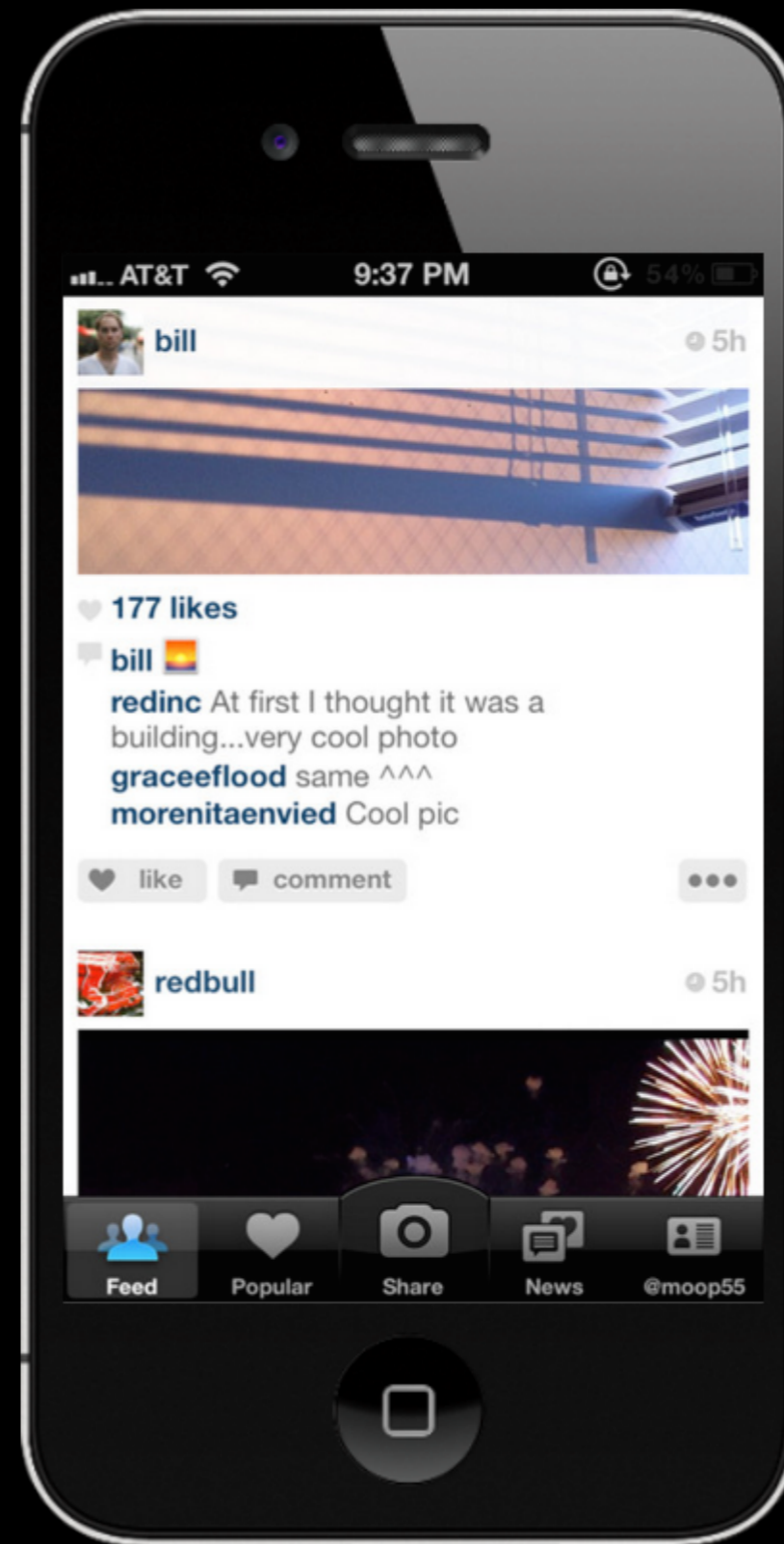
- Content
- Enhancements
- Leftovers



What can we put off  
until later?

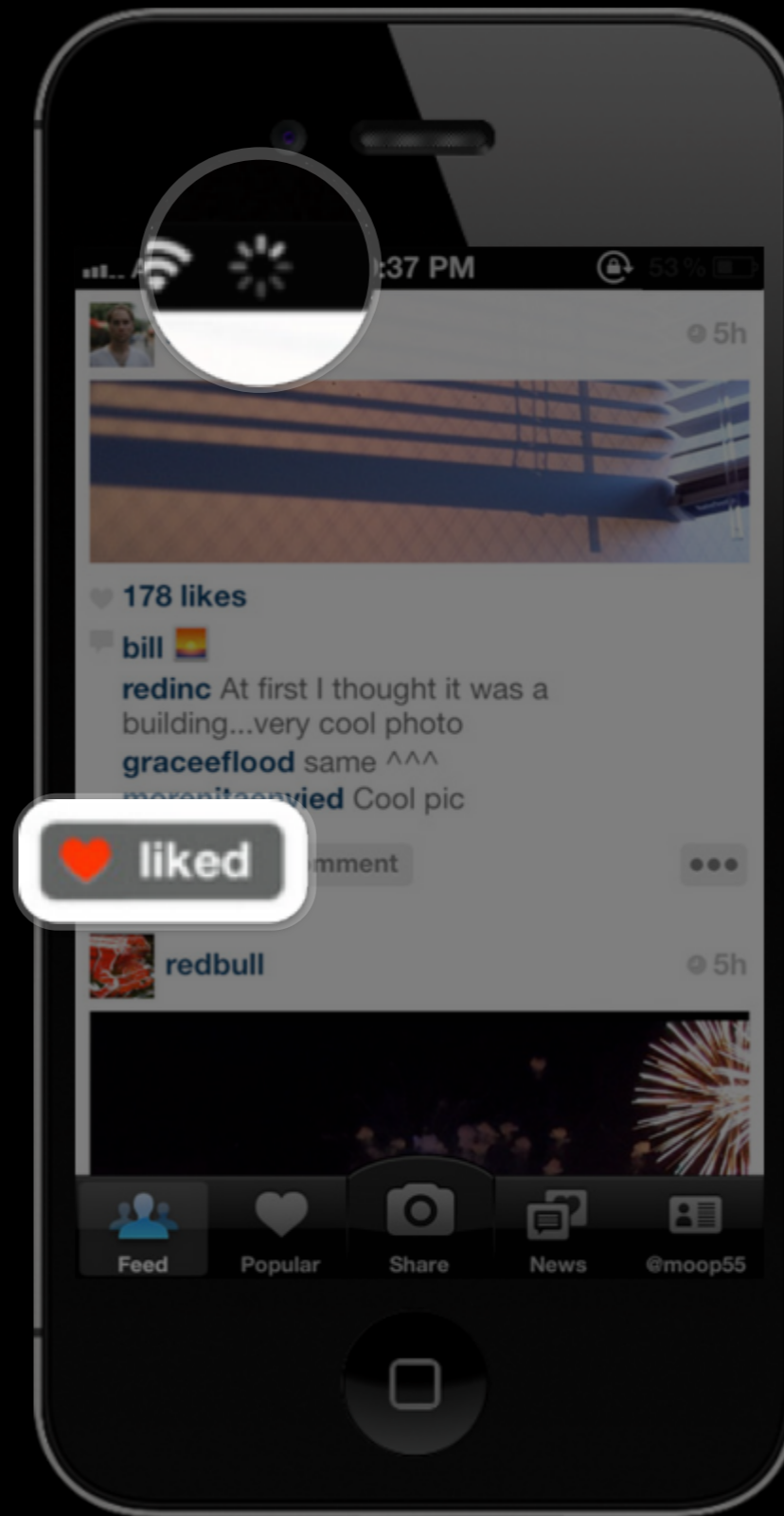






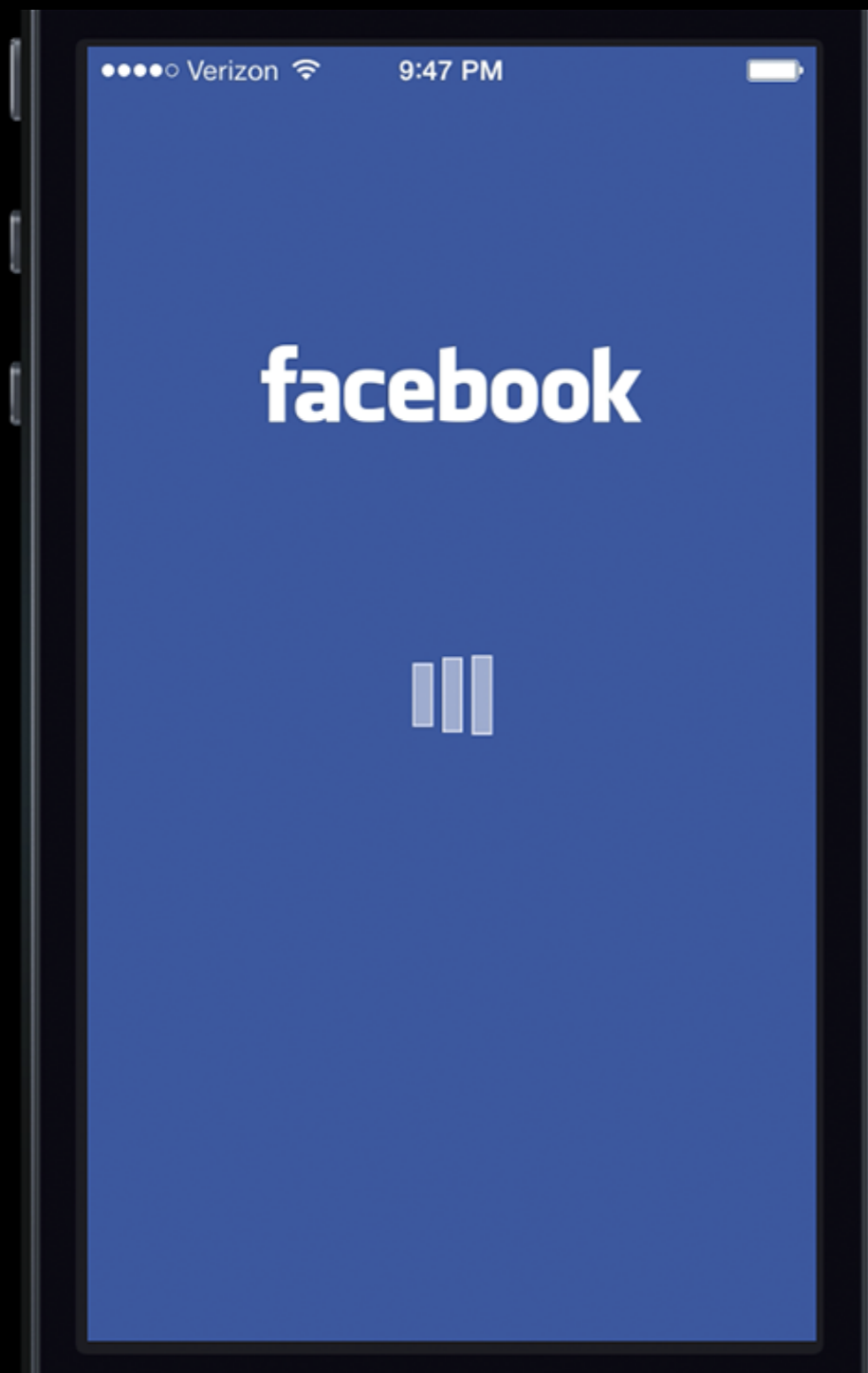
Network request  
still in progress

User gets  
feedback



# Magic, the Art of Misdirection





Embrace  
Constraints... Set a  
budget



# Embrace Constraints... Set a budget



“Usable within 10 seconds on GPRS connection” - BBC News

“SpeedIndex under 1000” - Paul Irish, Google

Requests, page size etc. are easier to measure but may not represent real world experience

# For a faster mobile site:

- ★ Measure
- ★ Move less bytes
- ★ Prioritise what you move
- ★ Move them while no-one is looking
- ★ Distract the visitor!

# Thank You!

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@andydavies

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<http://slideshare.net/andydavies>



Please evaluate  
my talk via the  
mobile app!