



Everything You Wanted to Know About Web Performance*

*but were afraid to ask

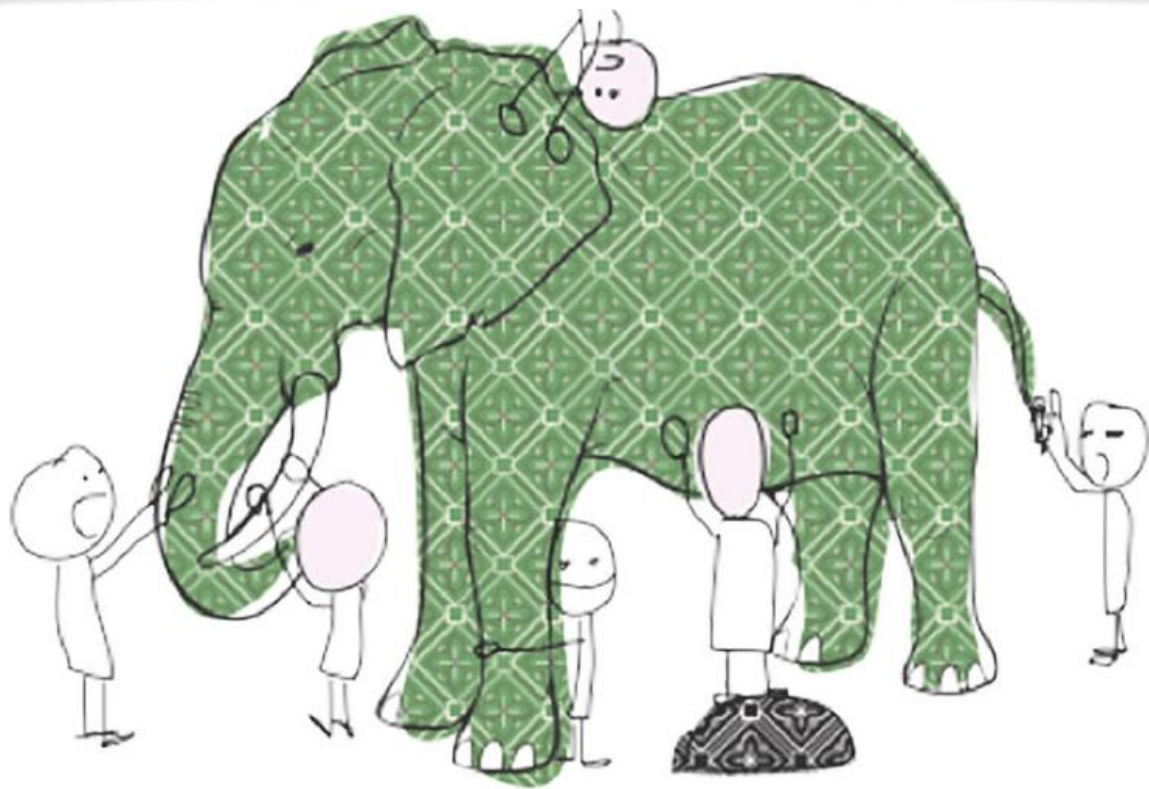
Tammy Everts @tameverts

Kent Alstad @kentalstad

Velocity EU 2014



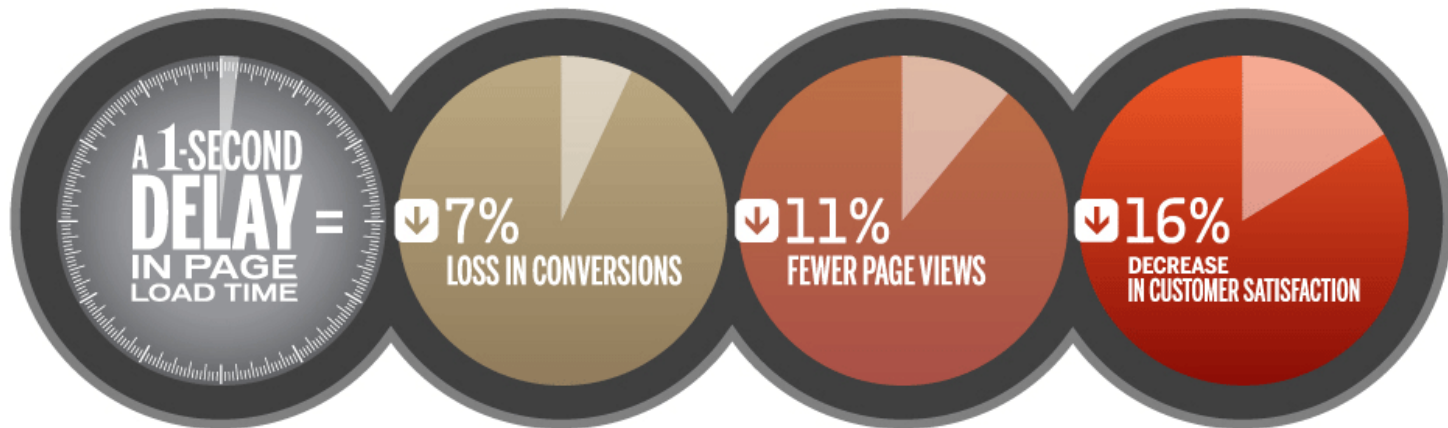
Smart Network. **Smart** Business.



- Impact of performance on business metrics
- Psychology of performance
- Page growth
- Third-party scripts
- Latency and CDNs
- Waterfalls 101
- Design best practices (that are performance worst practices)
- FEO best practices
- Mobile



The Impact of Page Speed on Business Metrics



IN DOLLAR TERMS,
this means that if your site typically earns \$100,000 a day, this year
you could lose **\$2.5 MILLION** in sales.

SOURCE: Aberdeen Group



Real User Monitoring at Walmart



The Secret Weapons of the AOL Optimization Team

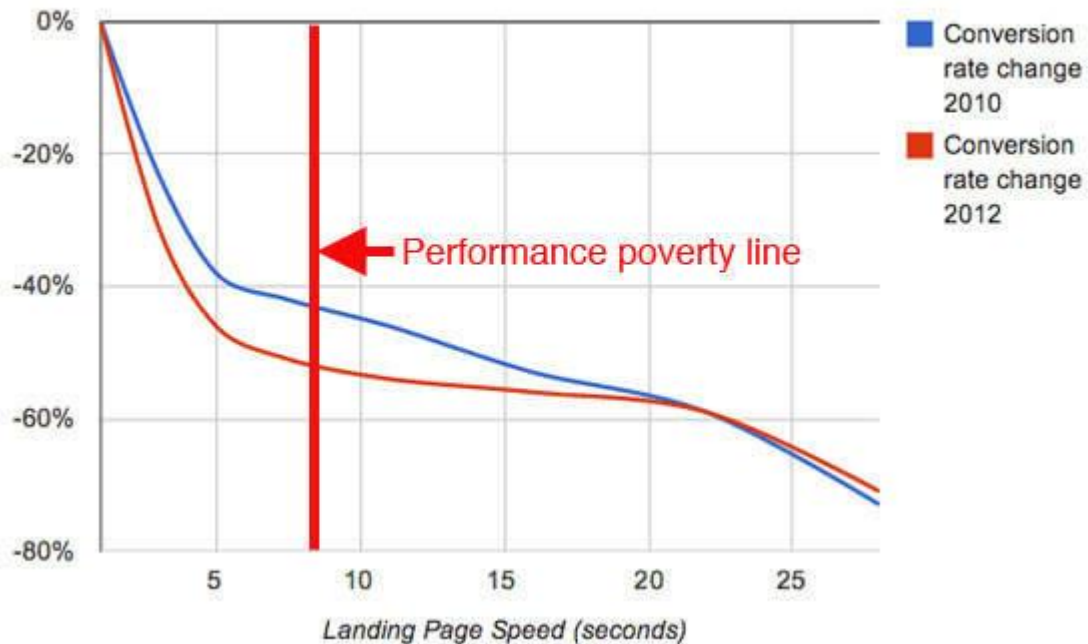
For Smartfurniture.com,
faster pages =

20% more organic traffic

14% more page views

Increased sales

Conversion rate fall-off by landing page speed



	<i>BOUNCE RATE</i>	<i>CONVERSION RATE</i>	<i>CART SIZE</i>	<i>PAGE VIEWS</i>
200 ms	—	—	—	-1.2%
500 ms	-4.7%	-1.9%	—	-5.7%
1000 ms	-8.3%	-3.5%	-2.1%	-9.4%

— NO SIGNIFICANT CHANGE

Case study: The impact of HTML delay on mobile business metrics



The Psychology of User Expectations



- 0-100ms** Instant perception
- 100-300ms** Small perceptible delay
- 300-1000ms** Machine is working
- 1000+ ms** Likely mental context switch
- 10000+ ms** Task is abandoned

Jakob Nielsen, Website Response Times, 2010

We want you to
be able to flick
from one page to
another as quickly
as you can flick a
page in a book.



SO WE'RE
aiming very, very

HIGH

...at something like

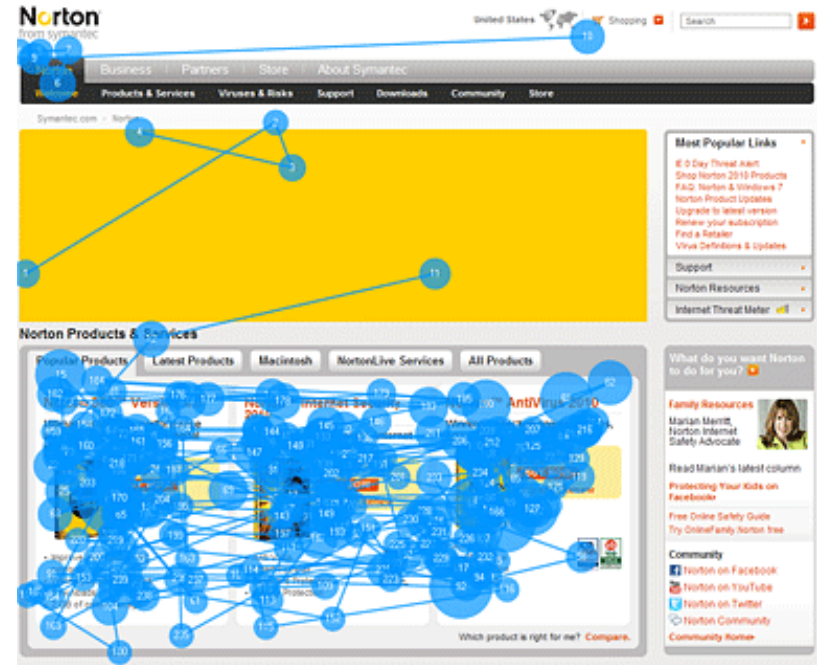
100

MILLISECONDS

Urs Hölzle,
Senior VP Operations, Google



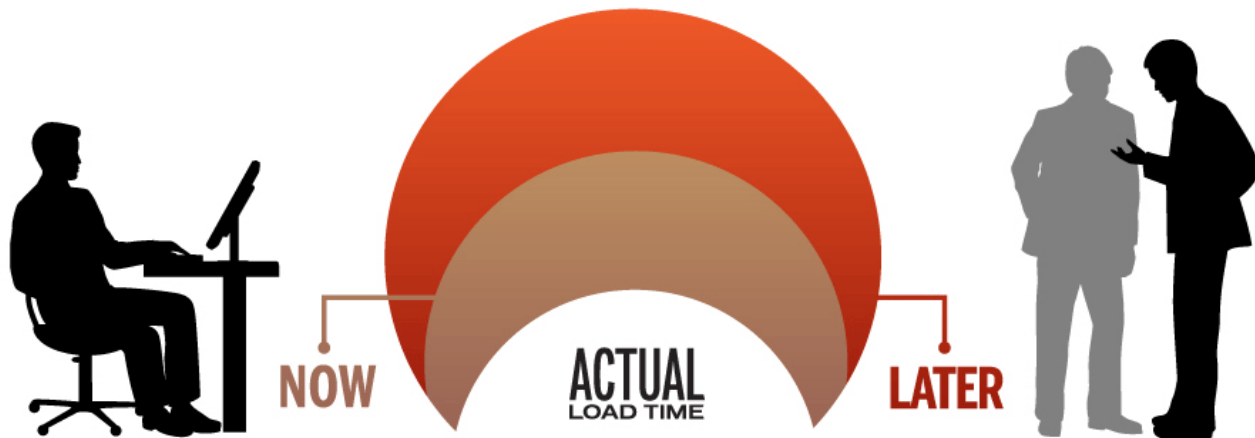
Optimal load time



8-second delay

Jakob Nielsen: Website Response Times

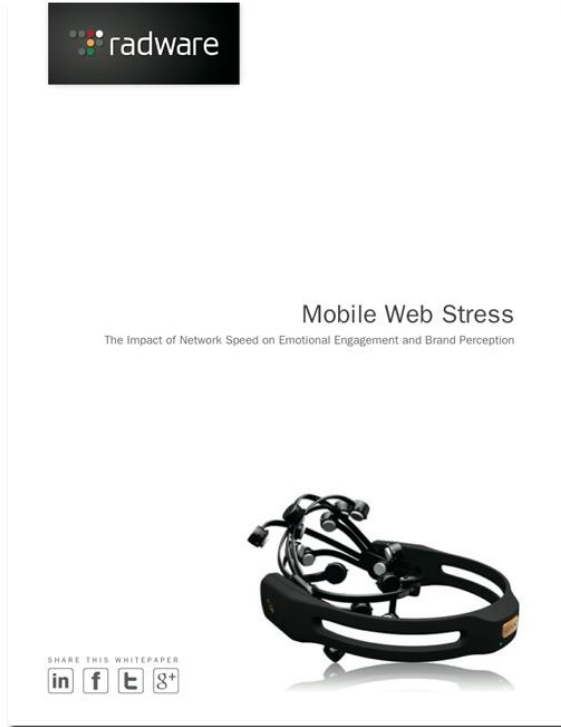
INTERNET USERS HAVE FAULTY PERCEPTIONS OF TIME.



The average person perceives page load time as being about **15% slower** than actual page load time.

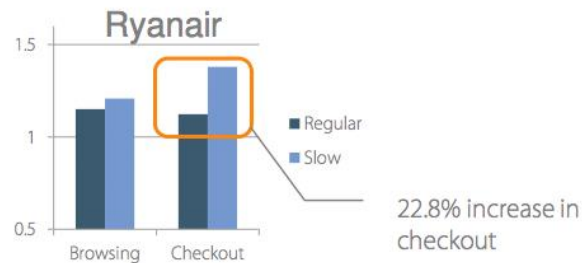
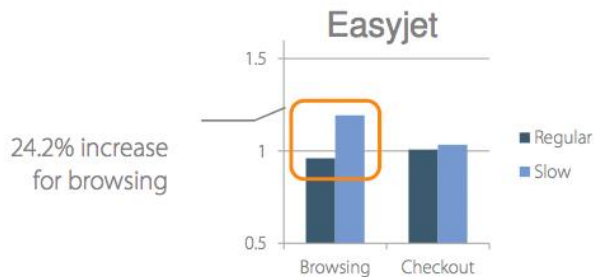
When recounting their experience to others, they will recall that the page was **35% slower** than it actually was.

SOURCE: Stoyan Stefanov, Psychology of Performance



<http://www.radware.com/mobile-eeg2013/>

500ms delay: Peak frustration results



500ms delay: Average engagement results





A Brief History of Page Growth

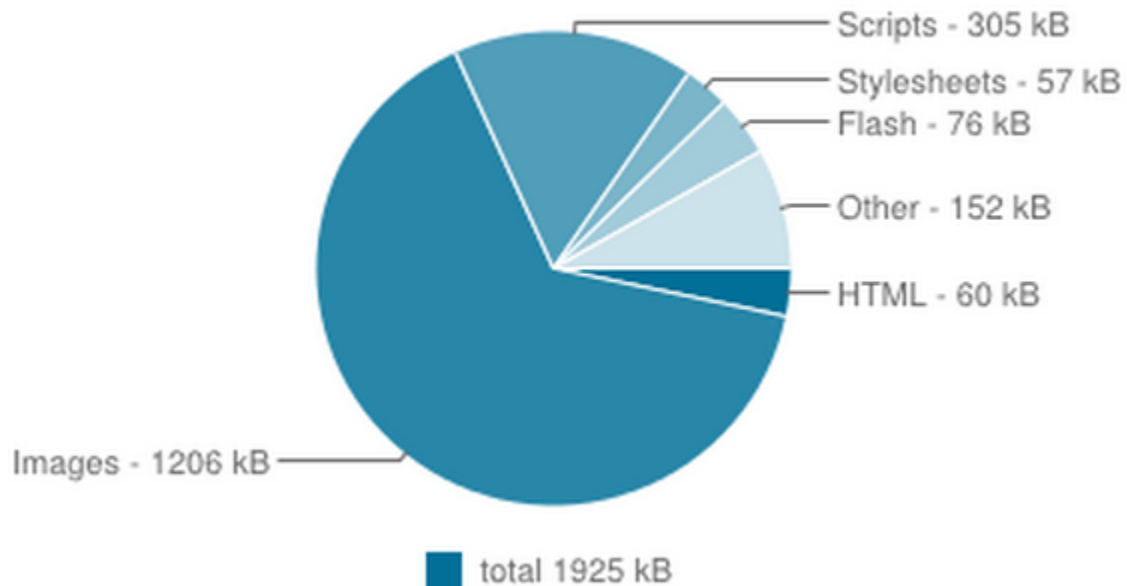


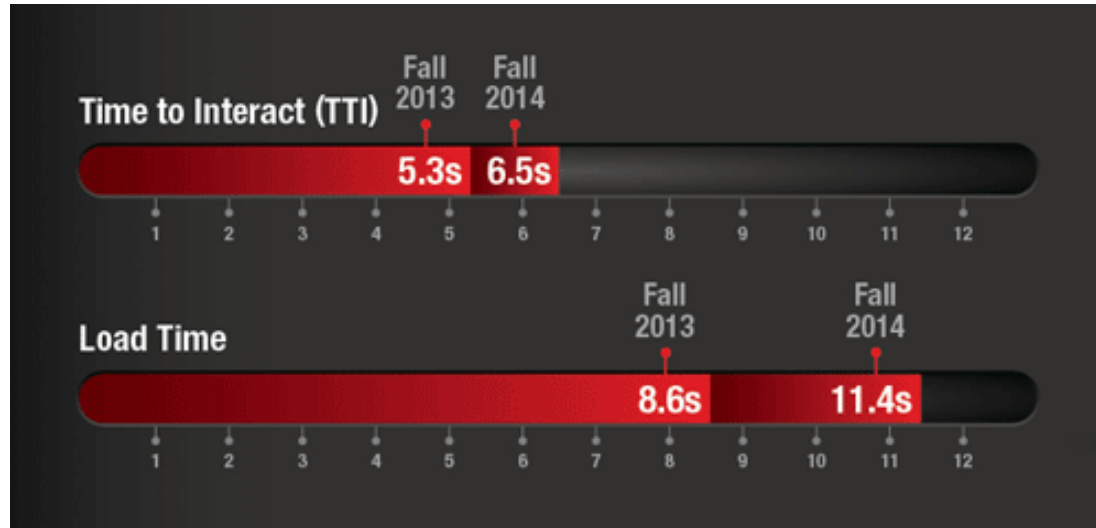
1995
14.1 KB
2.3 resources

2010
498 KB
75 resources

2014
1925 KB
100+ resources

Average Bytes per Page by Content Type

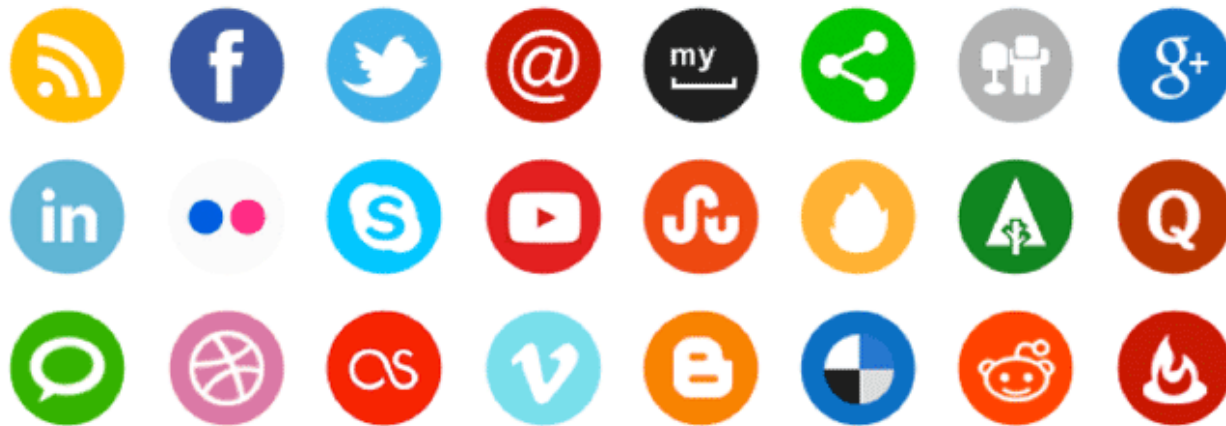




Radware, State of the Union for Ecommerce Web Performance (Fall 2014)



What You Don't Know About Third-Party Scripts Can Hurt You



Third-party calls can make up
>50% of page requests.

Steve Souders on High Performance Web Components

Third-party calls are
**the single greatest
potential point of failure**
for web pages.

Increase page weight

Increase number of hosts and connections

Introduce additional latency

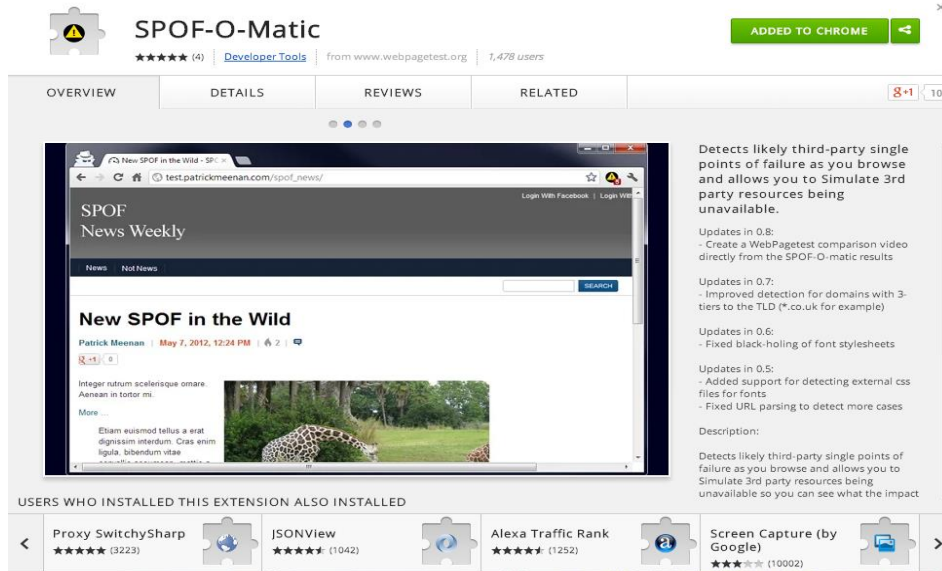
Can compromise user security/privacy

Prevent pages from loading

Wait... what the heck
is a **fourth-party** call?

+ 3.773	0.386	494	728	GET	302	●	U	https://secure.fastclick.net/w/tre?ad_id=17855;evt=13815;cat1=15657;cat2=15658
+ 3.773	0.097	521	692	GET	302	●	U	https://secure.leadback.advertising.com/adcedge/flb?site=695501&srvc=1&beta=_____cs=1&betq=8056=400090
+ 3.779	0.095	513	657	GET	302	●	U	https://www.googleadservices.com/pagead/conversion/1072669029/?label=yAIAOzKuQE5cK-_wM&guid=ON&
+ 3.780	0.234	464	786	GET	200	●	U	https://ad.yieldmanager.com/pixel?id=1291498&t=2
+ 3.787	0.082	524	692	GET	302	●	U	https://secure.leadback.advertising.com/adcedge/flb?site=695501&srvc=1&beta=_____cs=1&betq=9421=407896
+ 3.788	0.096	521	666	GET	302	●	U	https://www.googleadservices.com/pagead/conversion/1008538725/?label=2Oc0COOB6g1Q5a04AM&guid=ON&script=0
+ 3.789	0.239	464	786	GET	200	●	U	https://ad.yieldmanager.com/pixel?id=1223548&t=2
+ 3.790	0.244	464	659	GET	200	●	U	https://ad.yieldmanager.com/pixel?id=1216526&t=2
+ 3.790	0.329	464	611	GET	200	●	U	https://view.atdmt.com/action/MMN_____
+ 3.791	0.363	479	3874	GET	200	●	U	https://cts.w55c.net/ct/ct-76c5c2f14fdd432b923069e28a252d47.js
+ 3.791	0.431	508	1467	GET	200	●	U	https://avs.netmg.com/?aid=203&tax=homepage
+ 3.791	0.535	463	426	GET	302	●	U	https://tag.yieldoptimizer.com/ps/ps?t=s&p=1058
+ 3.797	0.523	483	1492	GET	302	●	U	https://www.bizographics.com/collect/?fmt=gif&url=_____com&pid=1032
+ 3.797	0.090	680	296	GET	302	●	U	https://adfarm.mediaplex.com/ad/bk/932-47571-3840-0?Onewway_Retarget=&Oneway_Rt=&Home=08&mpuid=Thursday, July 14, 20
+ 3.871	0.816	458	2024	GET	302	●	U	https://secure.adnxs.com/seg?add=864788&t=2
+ 3.876	0.147	574	603	GET	200	●	U	https://googleads.g.doubleclick.net/pagead/viewthroughconversion/1072669029/?label=yAIAOzKuQE5cK-_wM&guid=ON&ctc_id=C
+ 3.885	0.351	458	744	GET	302	●	U	https://secure.adnxs.com/seg?add=865688&t=2
+ 3.886	0.406	583	1192	GET	200	●	U	https://googleads.g.doubleclick.net/pagead/viewthroughconversion/1008538725/?label=2Oc0COOB6g1Q5a04AM&guid=ON&script=0
+ 3.889	1.006	737	956	GET	302	●	U	https://mp.apmef.com/ad/bk/932-47571-3840-0?Onewway_Retarget=&Oneway_Rt=&Home=08&mpuid=Thursday, %20July%2014,%
+ 4.025	0.128	464	786	GET	200	●	U	https://ad.yieldmanager.com/pixel?id=1121853&t=2
+ 4.036	0.028	750	431	GET	200	●	U	https://adfarm.mediaplex.com/ad/bk/932-47571-3840-0?Onewway_Retarget=&Oneway_Rt=&Home=08&mpuid=Thursday, %20July%2
+ 4.160	0.028	529	674	GET	302	●	U	https://www.googleadservices.com/pagead/conversion/1032669722/?label=tAb5CNbrwgEQmpS17AM∓guid=ON&script=0
+ 4.189	0.023	631	803	GET	200	●	U	https://googleads.g.doubleclick.net/pagead/viewthroughconversion/1032669722/?label=tAb5CNbrwgEQmpS17AM∓guid=ON&script=0
+ 4.237	0.025	505	649	GET	302	●	U	https://www.googleadservices.com/pagead/conversion/1047949563/?label=kJbICM3r4gEQ--H28Wm8
+ 4.242	0.030	505	649	GET	302	●	U	https://www.googleadservices.com/pagead/conversion/1047949563/?label=EjJlCM2NzAEQ--H28Wm8
+ 4.263	0.029	646	487	GET	200	●	U	https://googleads.g.doubleclick.net/pagead/viewthroughconversion/1047949563/?label=kJbICM3r4gEQ--H28Wm8&ctc_id=CA1VAgAAAB
+ 4.273	0.029	646	537	GET	200	●	U	https://googleads.g.doubleclick.net/pagead/viewthroughconversion/1047949563/?label=EjJlCM2NzAEQ--H28Wm8&ctc_id=CA1VAgAAAB
+ 4.321	0.164	629	549	GET	302	●	U	https://ad.yieldmanager.com/pixel?id=123864&t=2
+ 4.328	0.360	501	1509	GET	200	●	U	https://tag.yieldoptimizer.com/ps/ps?t=s&p=1058&ctc=250007041
+ 4.487	0.018	568	746	GET	200	●	U	https://secure.adnxs.com/seg?add=1116508&t=2
+ 4.693	0.328	494	387	GET	200	●	U	https://securetags.w55c.net/rs?id=76c5c2f14fdd432b923069e28a252d47&t=marketing
+ 4.695	0.204	529	674	GET	302	●	U	https://www.googleadservices.com/pagead/conversion/1033198129/?label=ci2-CI2j_gEQsbTV7AM∓guid=ON&script=0
+ 4.695	0.353	660	642	GET	200	●	U	https://ad.yieldmanager.com/pixel?adv=444739&code=0A2esjrcyX&t=2
+ 4.695	0.202	590	726	GET	200	●	U	https://secure.adnxs.com/setuid?entity=6&code=187388756
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+ 4.698	0.283	537	662	GET	302	●	U	https://cm.g.doubleclick.net/pixel?nid=yo
+ 4.699	0.302	481	613	GET	200	●	U	https://bh.contextweb.com/bh/rtset?do=add&pid=532623&ev=187388756
+ 4.888	0.121	644	642	GET	200	●	U	https://ad.yieldmanager.com/pixel?id=1253969&t=2
+ 4.889	0.145	498	679	GET	200	●	U	https://pixel.rubiconproject.com/tap.php?v=7726&nid=2242&put=187388756&expires=365
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+ 4.890	0.085	497	769	GET	302	●	U	https://ids.interclick.com/Segment.aspx?sid=4761888b-4251-4912-8743-09bf2fc2ed75
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+ 4.899	0.039	671	537	GET	200	●	U	https://googleads.g.doubleclick.net/pagead/viewthroughconversion/1033198129/?label=ci2-CI2j_gEQsbTV7AM∓guid=ON&script=0
+ 4.900	0.038	671	537	GET	200	●	U	https://googleads.g.doubleclick.net/pagead/viewthroughconversion/1044284962/?label=vyl_CkQwkQ1Qooz68QM∓guid=ON&script=0

<http://www.webperformancetoday.com/2011/07/14/fourth-party-calls-third-party-content/>



SPOF-O-Matic
★★★★ (4) | [Developer Tools](#) | from www.webpagetest.org | 1,478 users

ADDED TO CHROME

OVERVIEW | DETAILS | REVIEWS | RELATED

8+1 | 10

Detects likely third-party single points of failure as you browse and allows you to Simulate 3rd party resources being unavailable.

Updates in 0.8:
- Create a WebPagetest comparison video directly from the SPOF-O-matic results

Updates in 0.7:
- Improved detection for domains with 3-tiers to the TLD (*.co.uk for example)

Updates in 0.6:
- Fixed black-holing of font stylesheets

Updates in 0.5:
- Added support for detecting external css files for fonts
- Fixed URL parsing to detect more cases

Description:
Detects likely third-party single points of failure as you browse and allows you to Simulate 3rd party resources being unavailable so you can see what the impact

USERS WHO INSTALLED THIS EXTENSION ALSO INSTALLED

- Proxy SwitchySharp ★★★★★ (3223)
- JSONView ★★★★★ (1042)
- Alexa Traffic Rank ★★★★★ (1252)
- Screen Capture (by Google) ★★★★★ (10002)

<https://chrome.google.com/webstore/search/spof-o-matic>

Original: 3.5s



SPOF: 22.7s

Optimized for page load speed

On the internet, page load time is critical. Since the Optimizely code snippet needs to load before your page, we have a duty to minimize the load time of our snippet.

- the code snippet is compressed with the Google Closure Compiler
- the typical code snippet is ~35kb and loads in ~120 ms
- we host the code snippet on Akamai's content delivery network (CDN)
- tracking requests are made asynchronously and don't affect page load time
- uploaded images are loaded with the rest of your site's images and won't block page load
- uptime monitoring is available for Gold and Platinum customers

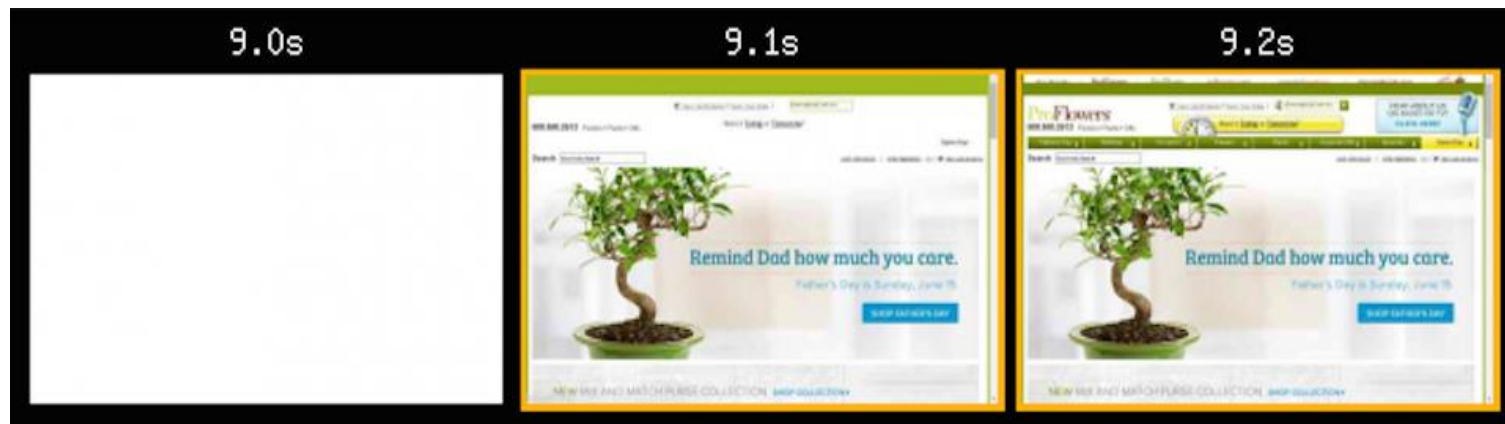
<https://www.optimizely.com/security>



When Design Best Practices Become Performance Worst Practices

Worst practice #1

Pages that are blank, then populate all at once...



...or pages that load nav elements first
and primary content last



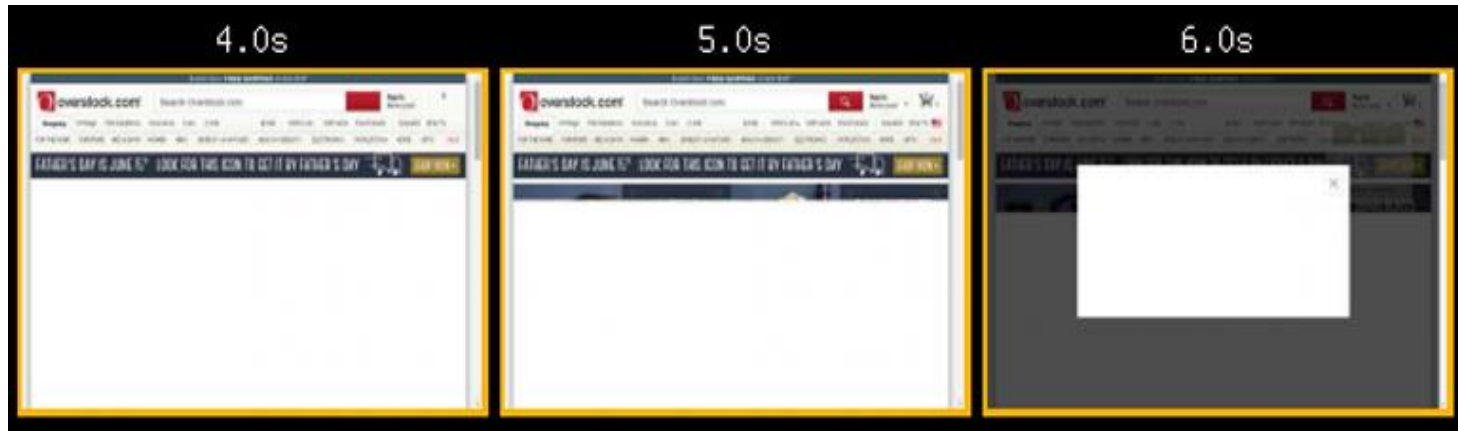
Worst practice #2

Pages in which the CTA is the last thing to render



Worst practice #3

Pop-ups that block the rest of the page





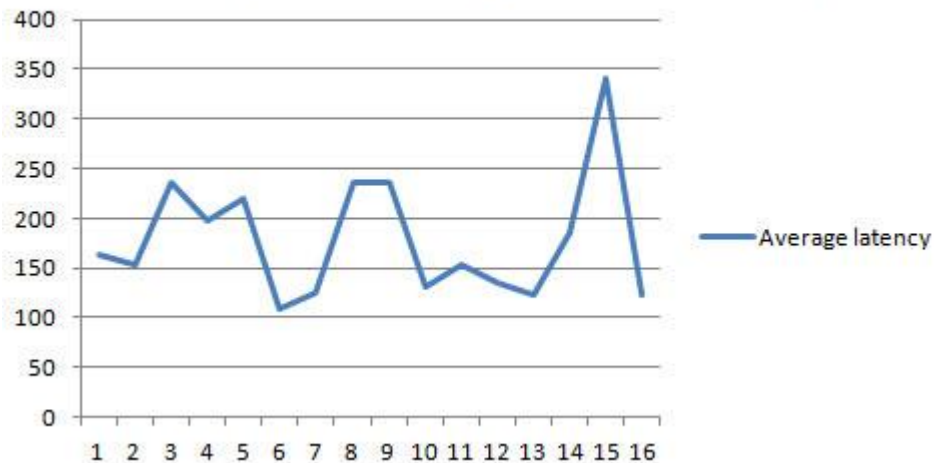
What Is Latency (and Why Is It Such a Big Deal)?

The amount of time it takes for a host server to **receive, process, and deliver** on a request for a page resource.

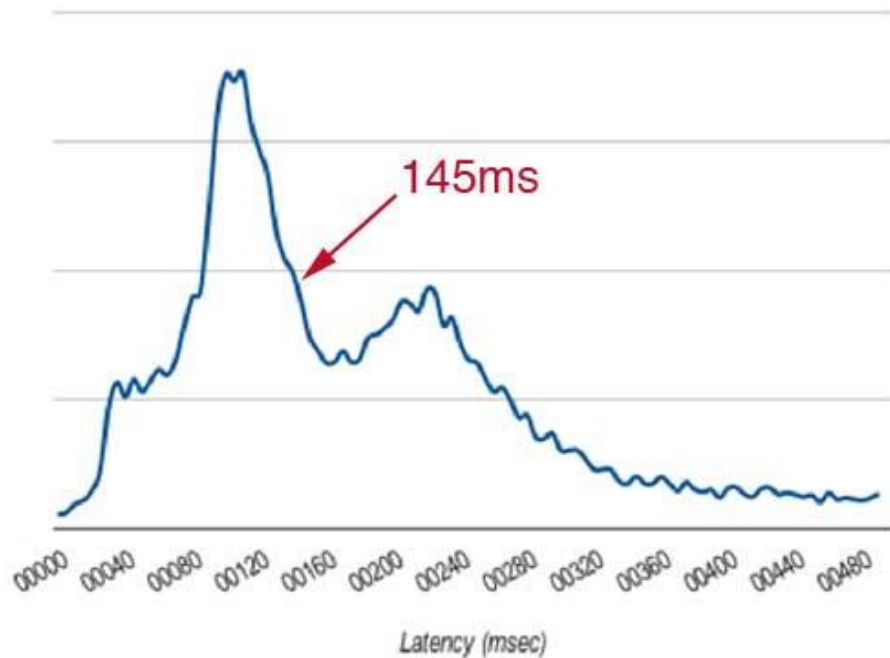
Depends largely on **how far away** the user is from the server.

Can be mitigated by a **content delivery network (CDN)**.

Average 3G latency (from my house)



Latency Per Visit



For every **20ms improvement** in latency,
we have a linear improvement
in page loading times.

Ilya Grigorik, Latency: The New Web Performance Bottleneck

50% of your 1-second page load time budget on mobile is taken up by network latency overhead.

Don't count on LTE to be your mobile savior.

3G is going to be around till the '20s.

If you're designing for mobile, it's safest to assume you're going to incur **2000ms of 3G latency.**

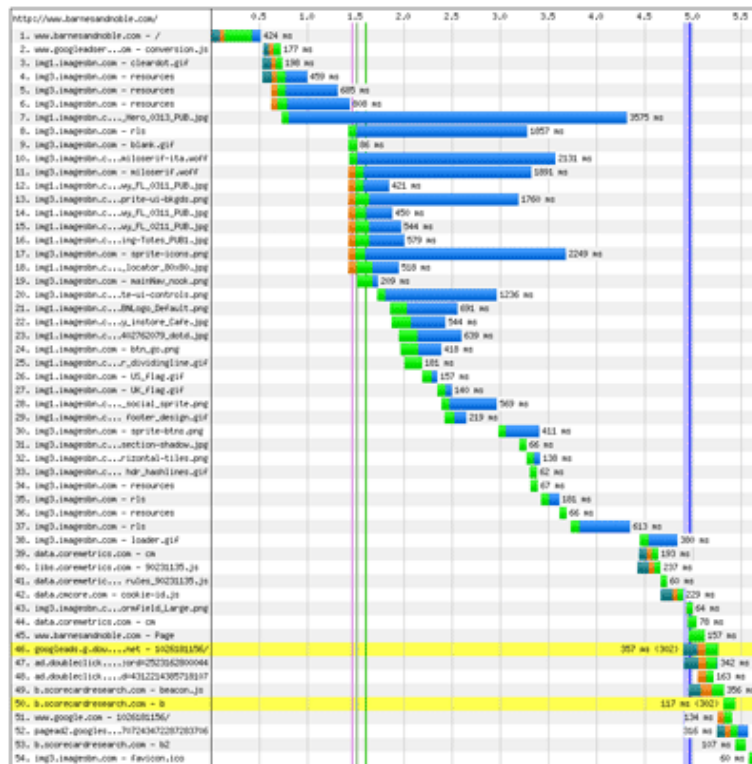
CDNs may be only **somewhat effective**
for mobile traffic.

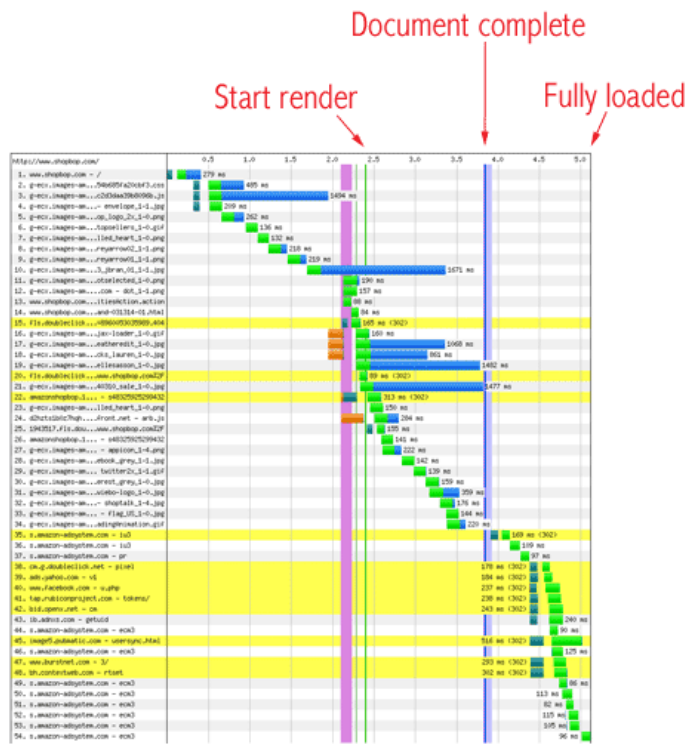
Radware, Case study: How effective are CDNs for mobile visitors?

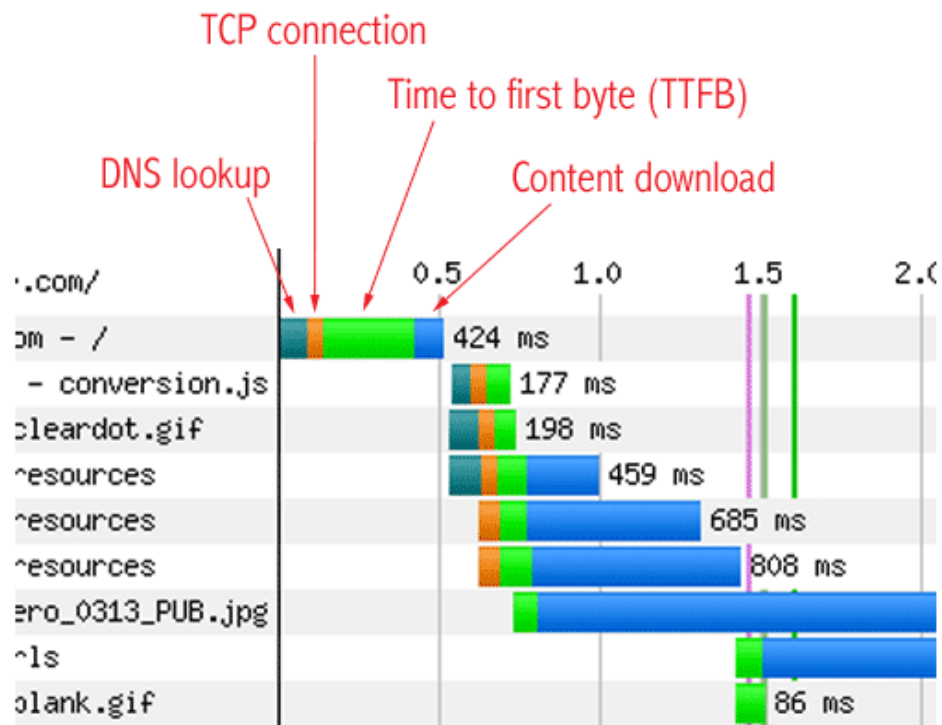


Waterfalls 101

<http://www.webperformancetoday.com/2014/03/18/waterfalls-101-how-to-use-a-waterfall-chart-to-diagnose-performance-pains/>









How to Use FEO in the Real World

Only 3.6% of all page views
are WPO-accelerated.

Inlining

Round trip reduction

Payload reduction

Image resizing and compression

Content reordering

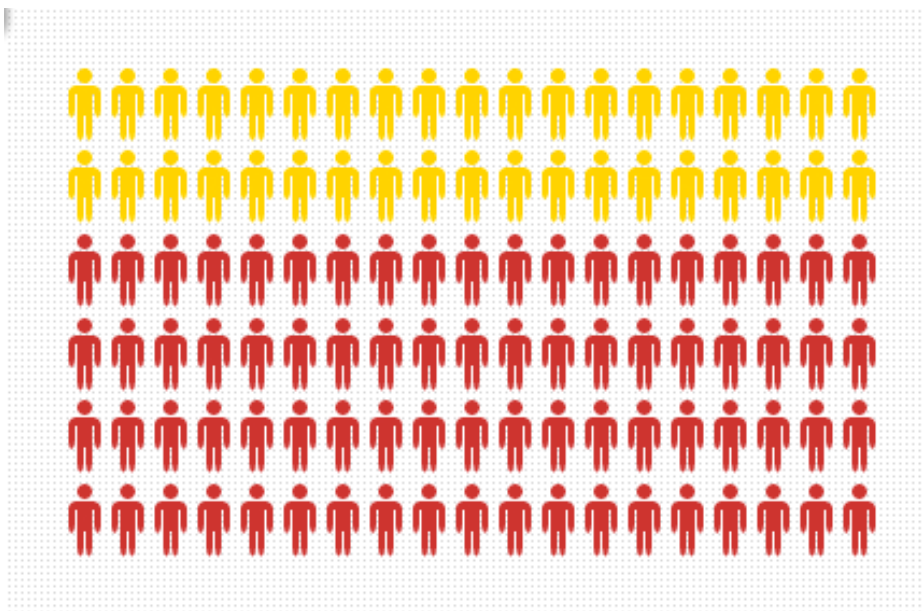
CSS at the top

Deferral

Eliminate JavaScript blocking



What Makes Mobile Performance Different?



>4 seconds <4 seconds

Keynote, 2012 Mobile User Survey

Sources

Web Stress: A Wake-Up Call for European Business

http://www.ca.com/us/~media/files/supportingpieces/final_webstress_survey_report_229296.aspx

2012 Mobile User Survey (Keynote)

<http://www.keynote.com/docs/reports/Keynote-2012-Mobile-User-Survey.pdf>

2013 State of the Union: Mobile Ecommerce Performance (Radware)

<http://www.radware.com/mobile-sotu2013/>

The Danger of a Poor Mobile Shopping Experience

<http://www.getelastic.com/the-danger-of-a-poor-mobile-shopping-experience-infographic/>

Case study: The impact of HTML delay on mobile business metrics

<http://www.webperformancetoday.com/2011/11/23/case-study-slow-page-load-mobile-business-metrics/>

Real User Monitoring at Walmart

<http://minus.com/msM8v8nvh/1e>

Shopzilla's Site Redo: You Get What You Measure

<http://www.scribd.com/doc/16877317/Shopzilla-s-Site-Redo-You-Get-What-You-Measure>

Firefox & Page Load Speed – Parts 1 & 2

<http://blog.mozilla.org/metrics/category/website-optimization/>

YSlow 2.0

<http://www.slideshare.net/stoyan/yslow-20-presentation>

AutoAnything Cuts Page Load Time in Half and Revs Up Sales by 13%

<http://www.radware.com/Products/FastView-Resources/>

No Framework Needed

<https://signalvnoise.com/posts/3103-no-framework-needed>

State of the Union: Ecommerce Page Speed & Web Performance

<http://www.radware.com/summer-sotu2014>



Questions?

[@tameverts](#)

[@kentalstad](#)