



# State of the Union: Ecommerce Page Speed & Web Performance

Fall 2012

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# Executive Summary

In July and August of 2012, we tested the load times and page composition of the home pages of 2,000 leading retail websites. Our key findings are detailed in this report, and are summarized here:

## Key Findings

**1. Pages are getting slower, not faster.** The median page load is 9% slower than our previous survey in November 2011.

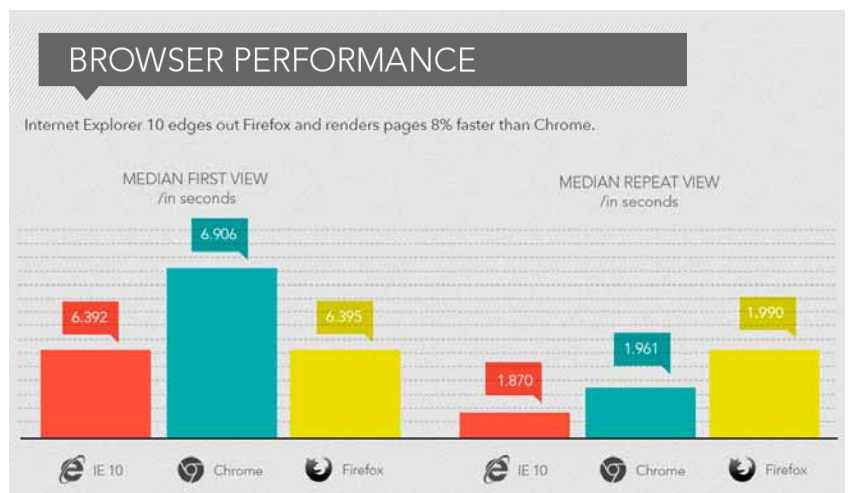
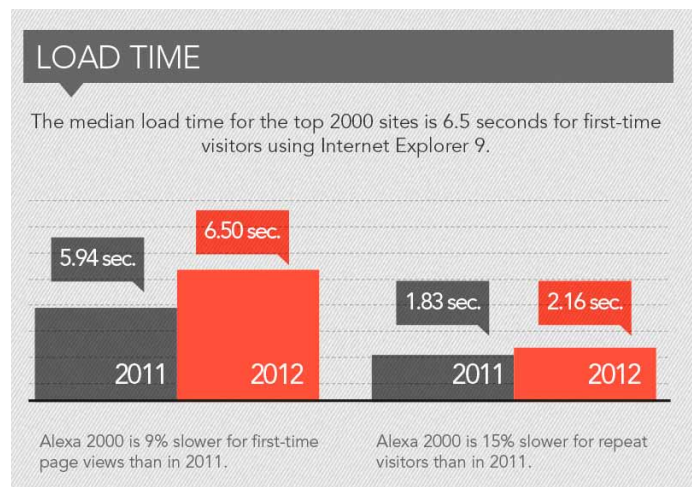
**2. Internet Explorer 10 rendered pages faster than other browsers.** IE10 served pages 8% faster than Chrome 20.

This report contains the results of a study of 2,000 leading retail websites, as ranked by Alexa.com. Each site was tested using a tool called **WebPagetest** – an open-source project primarily developed and supported by Google – which simulates page load times from a real user’s perspective across current browsers: Chrome 20, Firefox 13, and Internet Explorer 7 through 10. The study focuses on the following areas:

- Full page load time – The amount of time it takes for all page objects to fully load in the browser of a typical end user.
- Page resources – The number of elements in each page, from CSS to images to Javascript. Each object represents one server round trip that is needed to pull all the page’s resources to the user’s browser.
- Performance best practices – The letter grades assigned to a site for the site’s implementation of core best practices.

The median test result for each home page was recorded and used in our calculations. These results have been analyzed alongside benchmark data gathered by Strangeloop in two previous annual “state of the union” reports.

**Despite having access to more powerful devices, more sophisticated networks, and more advanced browsers, a typical end-user today experiences slower load times than ever.**



# Background and Methodology Changes

Since 2010, Strangeloop has undertaken annual surveys of leading ecommerce sites to test two persistent, widely held assumptions:

- From an end-user's perspective, web pages are getting faster, thanks to the advent of faster networks, devices, and browsers.
- A typical leading retail website takes 2-4 seconds to load for most users.

When we undertook our first broad performance survey in 2010, we were surprised by the results. We found that the average\* load time for the home page of a top 2000 retail site, as ranked by Alexa.com, was 11.21 seconds in Internet Explorer 7. We also found that, on average, the top 100 sites were slower, not faster, than the lower-ranked sites.

Having established a baseline in 2010, our intent was to measure the load time of the Alexa Retail 2,000 every year. By measuring the same set of sites using similar criteria year after year, our goal was to identify big-picture changes and trends of interest to the ecommerce community. In November 2011, we tested the home pages of the top 2,000 Alexa retail sites as planned. We also abstracted the results for the top 100 sites for side-by-side comparison, which yielded the fascinating observation that leading retail sites were slower, rather than faster, than average.

## The shift from annual to quarterly surveys

Based on the popularity of our annual "state of the union" reports, we have committed to conducting these surveys on a quarterly basis, of which this is the first instalment. The goal is to track page trends more closely throughout the year, and to give site owners access to the most relevant, up-to-date data available.

## Browser focus: From Internet Explorer 7 to Internet Explorer 9

Initially, our survey focused on performance in Internet Explorer 7 because it was one of the world's most widely used browsers at the time. In 2011, we added Internet Explorer 9 and the latest versions of Firefox and Chrome, in order to get a sense of how the various browsers performed in relation to each other. In 2012, we have added Chrome 20, Firefox 13, and Internet Explorer 10. (Note: While in no way does this report claim to offer the ultimate answer to the "Which browser is fastest?" question, we feel that our sample size is significant enough to add new data to the ongoing debate.)

\*In our inaugural survey, we focused on averages when identifying trends, but it became apparent that averages can be significantly affected by outlier data. In this report, median results have been used except where specifically noted.

Except where noted otherwise, the results discussed in this survey are for page performance using Internet Explorer 9. While it is arguable that Internet Explorer 8 is more widely used\*, IE9 is rapidly gaining in popularity. For future benchmarking purposes, it is clearer to focus on IE9 (at least for the near future).

For an explanation of the testing methodology, as well as an appendix of the full test results, please refer to the end of this report.

\*Is it time to give up Internet Explorer 8 as our default test browser?, Web Performance Today (July 2012)

# The 10 Fastest Sites

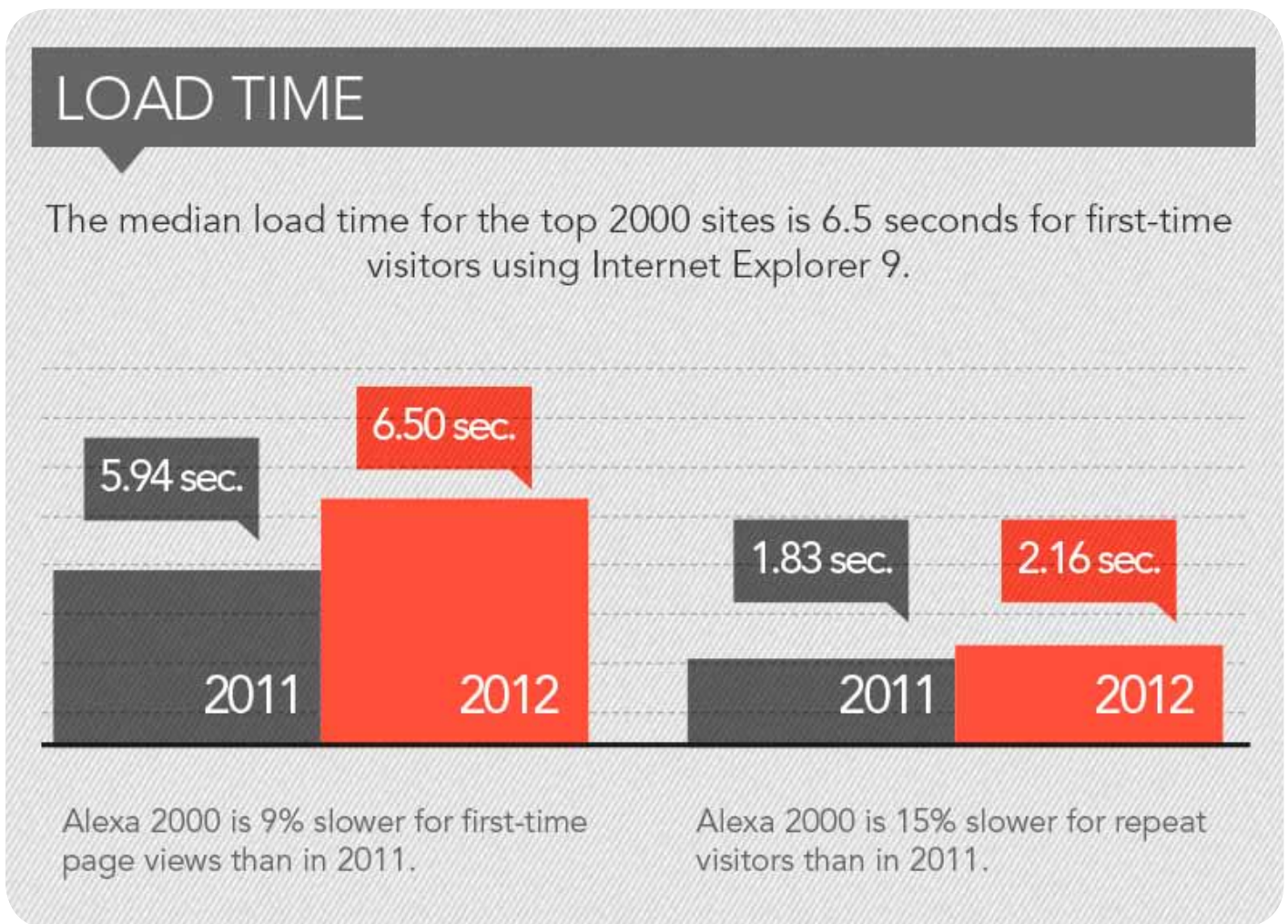
All page load times are measured in seconds. Yellow indicates newcomers to the top 10.

	2012		2011		2010	
1	Polo.com	1.93	Nike.com	2.27	eCrater.com	2.27
2	eCrater.com	1.95	JCPenney.com	2.65	FutureShop.com	2.77
3	BHPhotoVideo.com	2.30	Amazon.com	2.78	Amazon.com	2.94
4	Adorama.com	2.72	eMusic.com	3.28	eMusic.com	3.12
5	Abebooks.com	3.04	Etsy.com	3.40	WellsFargo.com	3.15
6	ShopBop.com	3.09	eCrater.com	3.54	Etsy.com	3.35
7	JCrew.com	3.09	WellsFargo.com	3.81	6pm.com	3.57
8	Audible.com	3.39	CDUniverse.com	3.81	Bodybuilding.com	4.00
9	KodakGallery.com	3.41	Adorama.com	4.08	BestBuy.com	4.40
10	ShopAtHome.com	3.65	JCrew.com	4.24	ShopBop.com	4.41

# Key Finding #1: Pages are 9% slower than in 2011

Except where specifically noted, the results discussed in this section are for pages tested on Internet Explorer 9. (Read “Browser Focus” in the background section of this report to understand why.)

In November 2011, the median load time for first-time visitors to a home page in the Alexa Retail 2000 was 5.94 seconds. **At 6.5 seconds, the current median load time is 9% slower – a significant change.** Load times for repeat visitors suffered even more; at 2.16 seconds, the median page load was 15% slower than in 2011.



As we found in 2011, top-ranked sites are not immune to this effect. While the Alexa Retail 2000 has slowed down by 9%, the top 100 sites have suffered even more. **At 7.14 seconds, the median load time for the Alexa Retail 100 is 12% slower for first-time visitors than it was in 2011.** Load time for repeat views has also deteriorated.

Alexa Retail 100	2011	2012
First view	6.5 seconds	7.14 seconds
Repeat view	1.96 seconds	2.21 seconds

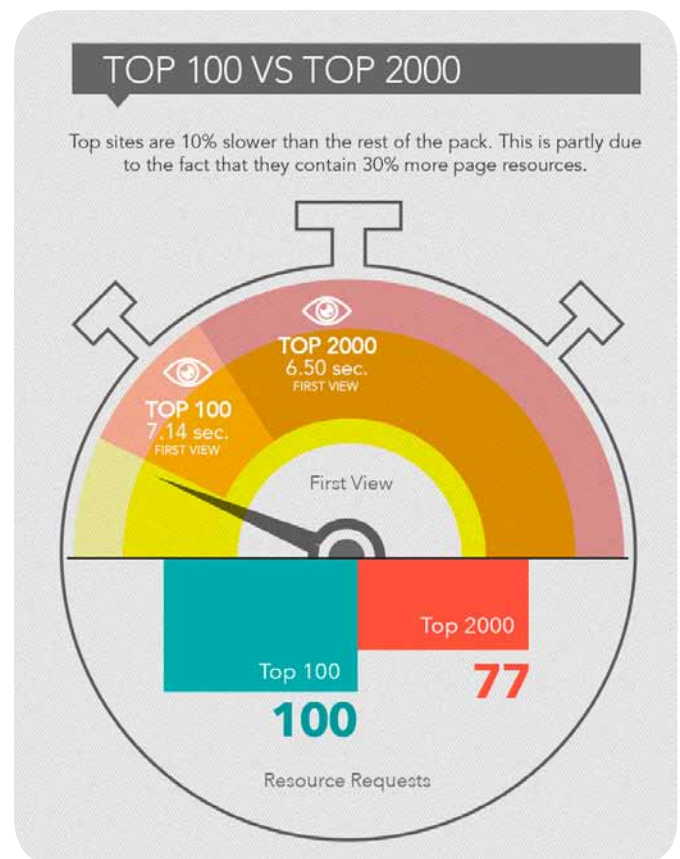
While the median Alexa 2000 site took 6.5 seconds to load, the median Alexa 100 site was 10% slower, with a load time of 7.14 seconds.

You only have to look as far as the number of resource requests to understand why: **the median top-ranked site has 100 resource requests, 34% more than the Alexa 2000 median of 77 requests.** As described earlier in this document, images and third-party scripts are the greatest source of requests.

**What this means:** There is a general belief that, as devices and browsers continue to evolve, web performance must be evolving as well. As these results attest, this evolution is not taking place. **There is a sizable body of research demonstrating that the average internet user has a wait time threshold of 3 seconds or less\***, and that this threshold may even be shrinking as user expectations continue to grow. If web pages maintain this downward performance trend, the gulf between user demands and page performance will continue to widen.

While top sites are slower than the entire test sample, the performance gap is smaller than the number of requests would lead you to expect. From this, it is reasonable to assume that these sites enjoy better-than-average implementation of performance best practices, which mitigates the impact of their greater number of resources.

**These findings have serious implications for mobile users. Up to one-third of mobile users choose to view the full site rather than the m.site on their devices. Yet due to challenges such as processor power and 3G networks, these users can suffer seriously impeded performance, resulting in pages that can take up to ten times longer to load than on the desktop\*\*.**



\* Website abandonment happens after 3 seconds. PhoCusWright, 2010.

\*\*The relationship between faster mobile sites and business KPIs: Case studies from the mobile frontier. Joshua Bixby, Velocity Europe, 2011.



## Why pages are slower: The number of page resources has increased by 5%.

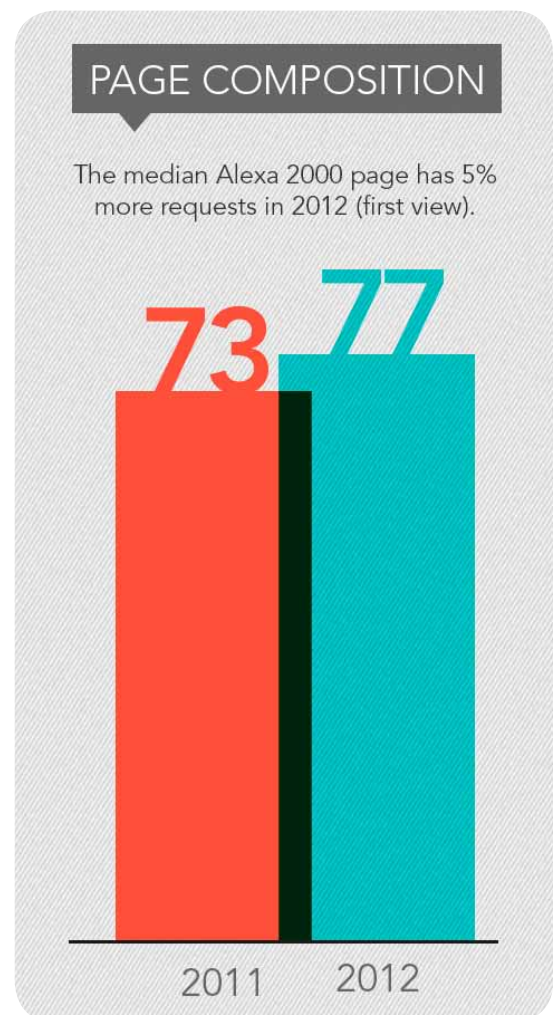
To gain some understanding of why load times have deteriorated, we need to look at the composition of typical web pages. In 2011, the median Alexa 2000 page required 73 server requests for page objects such as images, JavaScript, and CSS files. That number has crept up to 77 requests – a 5% increase in less than one year.

Each resource makes a round trip from the user’s browser, which requests the file from the host server, which in turn delivers the file to the browser. **Each of these round trips can take between 20 and 50 milliseconds for desktop browsers – and up to a full second each for mobile browsers** – numbers that add up quickly when pages contain dozens of objects.

“Reduce round trips” is a core principle of web performance optimization, but when it comes to following this principle, site owners face serious challenges, from shoppers who expect to see multiple detailed product images to marketing departments wishing to implement the latest conversion-boosting recommendation engines. Ecommerce sites are in a perpetual struggle to balance the competitive advantage of offering bandwidth-intensive content against the inevitable lost revenue caused by slower pages.

**Images and third-party scripts are the primary contributors to page bloat.** Images account for more than half of a page’s total payload, while third-party scripts – such as ads, page analytics, and social sharing buttons – are the fastest-growing area of page growth.

**Not only do pages contain more content than ever, this content is housed in more locations than ever.** The average Internet Retailer 200 site contains seven third-party scripts, with some sites containing as many as 25 scripts, each of which pulls resources from a different server location.\* Each of these scripts represents a potential single point of failure (SPoF) that, if not properly optimized, could slow down pages or prevent them from loading altogether.



\*How vulnerable is your site to third-party failure, Web Performance Today (October 2011)

## Why pages are slow: A significant number of sites are still not following core performance best practices.

Keep-alives and compression are two of the easiest-to-implement techniques available to site owners, yet 12% of Alexa 2000 sites failed to implement keep-alives and 30% failed to use compression.

**Enabling keep-alives** allows site owners to control how many times the TCP connection takes place. (TCP connection is the process by which both the user and the server send and receive acknowledgment that a connection has been made and data can begin to be transferred. Too many TCP connections will slow down a site.)

**Compressing resources** can reduce the number of bytes sent over the network.

Implementing these two techniques can have a dramatic impact on page speed:

- Up to 52% improvement in start render time
- Up to 40% improvement in document complete
- Up to 31% improvement in time to fully load

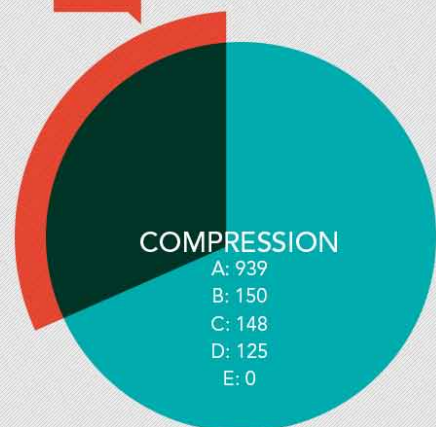
### CORE BEST PRACTICES

12% of sites failed to implement keep-alives, and 30% failed to use compression. These two simple techniques can improve start render time by up to 52%.

247  
GRADE F



592  
GRADE F

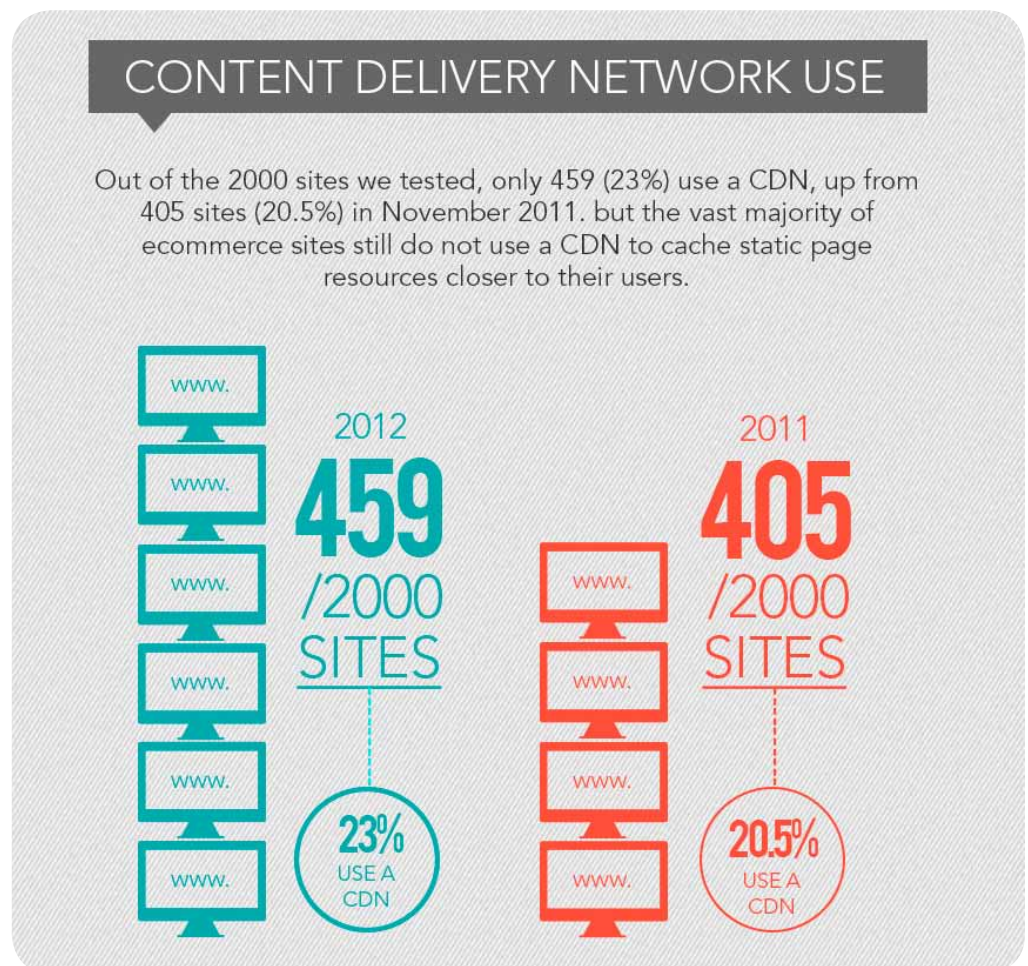


## Why pages are slow: Content delivery network (CDN) use has not increased significantly.

An end-user's proximity to the web server(s) hosting a page's content has a significant impact on response times. Caching content across multiple, geographically dispersed servers makes pages load faster. A content delivery network (CDN) is a collection of web servers distributed across multiple locations to deliver content more efficiently to users.

Of the 2,000 sites tested, 459 (23%) use a CDN, an increase from 405 (20.5%) in November 2011. **But the vast majority of ecommerce sites still do not use a content delivery network to cache static resources closer to their users.**

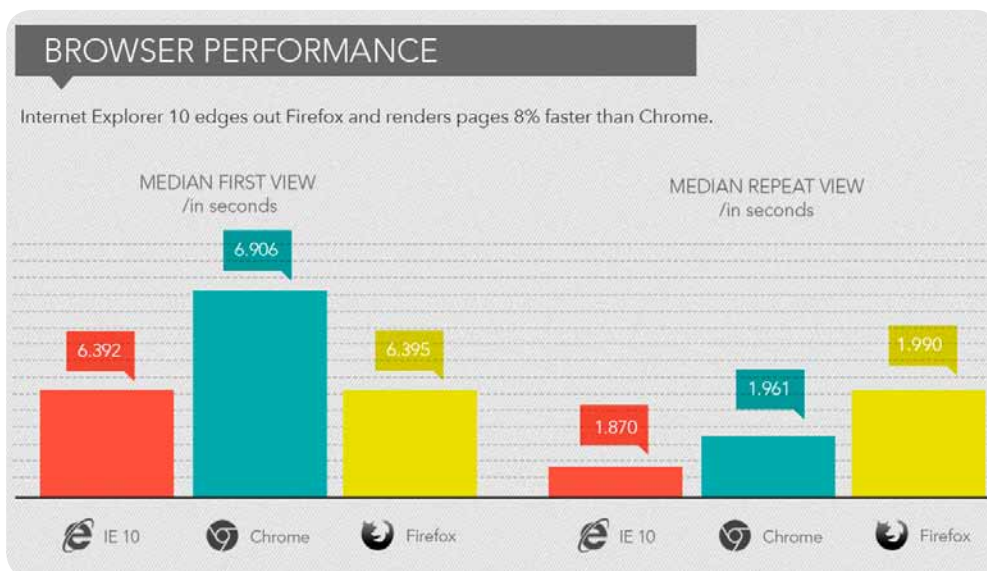
While a CDN is an effective strategy for addressing web latency challenges, the costs can be prohibitive for smaller companies. Site owners that do not use a CDN may not choose to do so because their consumer base is not widely dispersed; however, any company that is seeking to expand its audience geographically will quickly realize that a CDN is an essential tool. By the opposite token, **sites that do use a CDN may feel that their CDN offers a catch-all solution to performance optimization. As a result, they may be missing out on opportunities to leverage other optimization strategies.**



# Key Finding #2: Internet Explorer 10 was the fastest browser

## Internet Explorer 10 rendered pages faster than other browsers. IE10 served pages 8% faster than Chrome 20.

Not surprisingly, pages loaded faster in Internet Explorer 10 than in Internet Explorer 7 through 9. We also found that, for the Alexa Retail 2000, IE10 rendered pages faster than both Firefox 13 and Chrome 20. The average page took 6.392 seconds to load in IE10, edging out Firefox 13 (6.395 seconds) and 8% faster than Chrome 20 (6.906 seconds).



**What this means:** In recent years, speed has emerged as a highly competitive issue in browser development. As with performance in general, browser performance is nuanced and cannot be summed up simply. These test results are just one part of the bigger picture.

We cannot claim that this study definitively answers the question of which browser offers the best performance, but we do feel that this sample size is significant enough to merit including these findings in the ongoing debate.

**Important note:** Our tests were able to simulate how fast each site loads for a **real user who is viewing only one site at a time within the browser**. The tests did not include:

1. Browser performance under stress from having multiple tabs open simultaneously.
2. Browser performance degradation over time (i.e., the longer the browser remains open, its likelihood of crashing).
3. Browser performance when visiting sites that use HTML5 or Flash, or when watching videos.
4. Usability. This often boils down to personal preference. E.g., some users prefer minimalistic browser functionality, while others embrace add-ons.

# Takeaways

## 1. Optimal website performance is an elusive goal.

As web pages continue to grow, largely due to the increasing use of images and third-party content, site owners are challenged to prevent their pages from slowing down further.

## 2. Real-world testing is crucial.

Site owners should test their sites routinely across a variety of browsers, as the site would perform for a real user, and track the results over time.

## 3. Load time is not the only important metric.

While this survey has focused on load time as a means of drawing attention to the issue of web performance, site owners should measure their sites' performance using a variety of metrics including: response time, time to start render, and time to first paint.

## 4. Ensure that your site is following core performance best practices.

Enabling keep-alives and compression can lead to, among other things, response time improvements of up to 52%. Don't miss out on a relatively easy speed-boosting opportunity.

## 5. Audit and optimize third-party content.

Know your site's third-party scripts and ensure that, wherever possible, these scripts have been optimized to either load asynchronously or be deferred until the primary page content has loaded.

### Strangeloop makes websites faster.

Talk to one of our Performance Experts and get answers to all your performance-related questions.

[www.strangeloopnetworks.com/talk-to-a-performance-expert](http://www.strangeloopnetworks.com/talk-to-a-performance-expert)

# Methodology

The tests in this study were conducted using a tool called **WebPagetest** – an open-source project primarily developed and supported by Google – which simulates page load times from a real user’s perspective using real browsers. We tested the home page of every site in the Alexa Retail 2000 three times in a row. (The system clears cache between page loads.) The median test result for each home page was recorded and used in our calculations. The tests were conducted over a three-week period – July 10 to August 1, 2012 – via the WebPagetest.org server in Dulles, VA, using the following browsers on a DSL connection:

- Internet Explorer 7, 8, 9, and 10
- Firefox 13
- Chrome 20

In very few cases, WebPagetest.org rendered a blank page or an error in which none of the page rendered. These instances are represented as null in the test appendix. Also, in very few cases, Webpagetest.org rendered a page in more than 60 seconds (the default timeout for webpagetest.org). In these cases, 60 seconds was used for the result instead of null.

To receive the detailed test results, email us at [info@strangeloopnetworks.com](mailto:info@strangeloopnetworks.com).

## About Strangeloop Networks

Strangeloop Networks is the leader in providing next-generation web acceleration solutions. Companies like eBay/PayPal, Visa, and Petco rely on Strangeloop to speed up their websites and enterprise applications. As the earliest entrant in the front-end acceleration space, Strangeloop was the first company to market an automated solution – the Strangeloop Site Optimizer – with the ability to tackle front-end performance problems as a service via the cloud. The Strangeloop Mobile Optimizer is the only advanced optimization solution that addresses the unique challenges of delivering faster sites to mobile users. Strangeloop is based in Vancouver, BC. For more information, visit [www.strangeloopnetworks.com](http://www.strangeloopnetworks.com).