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Executive Summary

In recent years, website performance has emerged as a critical business issue. There is an incontrovertible body of evidence proving a direct relationship between page speed and key performance indicators such as bounce rate, conversions, revenue, and customer satisfaction.

There are two persistent assumptions in e-commerce and web development circles:

- **Web pages are getting faster**, thanks to the advent of faster networks and browsers.
- **A typical leading retail website takes between 3 to 6 seconds to load.** While not ideal (the ideal being 2 seconds, as identified by usability experts such as Jakob Nielsen), this time frame is considered by many to be acceptable.

2010: ESTABLISHING A TEST BASELINE

A year ago, at the end of 2010, Strangeloop undertook a research project to test those assumptions. The results were surprising. We found that the average load time for a top 2000 retail site (as ranked by Alexa.com) was 11.21 seconds. We also found that, on average, the top 100 sites were slower, not faster, than the lower-ranked sites. Of the top 100 sites, only 13 had home pages that loaded in less than 5 seconds.

2011: OUR TEST APPROACH REMAINED LARGELY THE SAME

In November 2011, we tested the home pages of the top 2,000 Alexa-ranked retail websites as planned. We also abstracted the results for the top 100 sites for side-by-side comparison. This study focuses on the following performance criteria for first-time and repeat visitors:

- **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 objects** – 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 five primary performance best practices: keep-alive, compress text, cache static content, combine JavaScript/CSS, and use CDN.

**Having established a baseline in 2010, our intent is to measure the load time of Alexa Retail 2000 every year. By measuring the same set of sites using the same set of criteria year after year, we hope to identify changes and trends that will give an indication of the state of the performance community at large.**
NEW AREA OF FOCUS: INTERNET EXPLORER 9, FIREFOX, AND CHROME

Last year’s study focused on performance in Internet Explorer 7, because at that time IE7 was still the world’s third most widely used browser. While IE7 share has dropped since then, we were still interested in studying its current performance for the sake of comparison. However, we also tested each site’s performance in Internet Explorer 9, Firefox 7, and Chrome, to get a sense of how the various browsers performed in relation to each other. While in no way does this study claim to offer the ultimate answer to the “Which browser is fastest?” question, we felt that our sample size was significant enough to add new data to the ongoing debate.

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.

7 KEY FINDINGS

1. The average page load is 10 seconds. (Median load time is 8.4 seconds.)
2. Average repeat view load time is 20% slower than last year.
3. Pages keep getting bigger.
4. Top-ranked sites are slower, not faster, than the rest of the pack.
5. Internet Explorer 9 outperforms other browsers.
6. Page Speed scores have deteriorated.
7. More sites use content delivery networks (CDN), but this still does not correlate to faster load times.
Who was fastest?

Comparing the 10 fastest top retailers of 2011 to the fastest retailers of 2010, there was a fair degree of movement. Nike.com is a newcomer to the list, and it took the top spot with a load time of 2.269 seconds. Online marketplace eCrater.com dropped from first place in 2010 to sixth place in 2011. Other newcomers were JCPenney.com, CDUniverse.com, Adorama.com, and JCREW.com. (It is worth noting that JCPenney.com has received a great deal of press in recent months for its aggressive performance optimization efforts.)

Amazon.com, eMusic.com, WellsFargo.com, and Etsy.com maintained their strong performance. Other sites dropped off this year’s list entirely: FutureShop.ca, 6pm.com, Bodybuilding.com, BestBuy.com, and ShopBop.com.

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<tr>
<th>FASTEST RETAIL SITES OF 2011</th>
<th>FASTEST RETAIL SITES OF 2010</th>
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<tr>
<td>Nike.com</td>
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<td>JCREW.com</td>
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Key findings: Analysis and interpretation

1. THE AVERAGE PAGE LOAD IS 10 SECONDS. (MEDIAN LOAD TIME IS 8.4 SECONDS.)

This marks a 10% improvement over last year, when our survey of the top 2000 sites found that the average page took 11.21 seconds to load for a first-time visitor. To factor out any outliers that could be driving the average up or down, we also calculated the median load time, which is 8.4 seconds.

WHAT THIS MEANS: While any improvement is encouraging, neither 10 nor 8.4 seconds is even close to the ideal load time of 2 seconds, as identified by more than 40 years of research into human-computer interaction^v. This slowness has direct consequences: a 2010 study found that 57% of web users will abandon a site after just 3 seconds^v.
2. AVERAGE REPEAT VIEW LOAD TIME IS 20% SLOWER.

We compared repeat views for pages today versus repeat views for pages one year ago. While load times for first-time visitors may have improved, load times for return visitors suffered. Last year, the average repeat view load time was 5.20 seconds. In just one year, this swelled to 6.6 seconds.

WHAT THIS MEANS: An e-commerce site’s returning shoppers are its most valuable customers. Site owners work hard to encourage consumer loyalty through mailing lists and loyalty programs, but are missing an important opportunity to cultivate greater customer satisfaction by delivering a superior user experience.
3. PAGES KEEP GETTING BIGGER.

The average home page requires 98 requests for objects, up from 86 requests one year ago. Every web page consists of a set of objects — everything from CSS files, images, and JavaScript. Each of these objects 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 takes between 20 and 50 milliseconds — a number that can add up quickly when pages contain dozens of objects.

WHAT THIS MEANS: “Reduce round trips” is a core principle of website performance optimization. Site owners are clearly challenged to follow this principle. According to data from the HTTP Archive, images and third-party scripts are the primary culprits. 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 vi.

While “Reduce round trips” is an easy principle to state, in reality it’s a difficult principle to follow. Online shoppers expect to see multiple detailed product images. Third-party e-commerce widgets, such as recommendation engines, offer a significant bump in conversion rates. E-commerce 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.
4. TOP-RANKED SITES ARE SLOWER, NOT FASTER, THAN THE REST OF THE PACK.

While the average site took 10 seconds to load, the average top 100 site — ranked by Alexa according to their size and profitability — was 4% slower, with a load time of 10.36 seconds. You only have to look as far as the number of resource requests to find out why: a top-ranked site has, on average, 98 resource requests, 35% more than the overall average of 77 requests. As described in point 3, above, images and third-party scripts are the greatest source of requests.

WHAT THIS MEANS: While top sites are somewhat slower than the entire test sample, the performance gap is much smaller than the number of requests would lead you to expect. From this, it is fairly safe to assume that these sites enjoy better-than-average implementation of performance best practices, which mitigates the impact of their greater number of resources.
5. INTERNET EXPLORER 9 OUTPERFORMS OTHER BROWSERS.

Not surprisingly, pages loaded 29% faster in Internet Explorer 9 than in Internet Explorer 7. We also found that, for the Alexa Retail 2000, IE9 rendered pages faster than both Firefox 7 and Chrome. The average page took 7.124 seconds to load in IE9, edging out Firefox 7 (7.153 seconds) and about 5% faster than Chrome (7.505 seconds).

WHAT THIS MEANS: In the past year, speed has emerged as a highly competitive issue in browser development. Every major browser now markets speed as a key feature, from Chrome’s self-described “lightning speed” to Internet Explorer 9’s slogan “Fast is now beautiful.” 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. It is encouraging to see that browser developers appear to take speed seriously. All indicators point to the fact that speed will remain a top priority.
6. PAGE SPEED SCORES HAVE DETERIORATED.

Google Page Speed is a third-party tool that measures how a site performs in core performance best practices, including: enable keep-alives, compress text, compress images, and cache static content. A year ago, we found that the average site earned a Page Speed score of 83%. In 2011, that score dropped to 75%.

WHAT THIS MEANS: The Page Speed score measures a page’s implementation of core best practices, but front-end performance optimization is a quickly developing field. Dozens — and possibly even hundreds — of new proprietary techniques have been developed and implemented over the past two years. Page Speed does not take these techniques into consideration. (Note that this is not a criticism of the tool. Tracking and measuring every new optimization treatment is an impossible task.)

Some newer advanced optimization techniques can result in lower Page Speed scores. It’s not rare for a web page to earn a Page Speed score of 100%, then undergo advanced optimization that cuts load time in half but results in a new score of 74%\(^\text{vii}\). Conversely, it’s possible to have a Page Speed Score of 85% and a total load time of 69 seconds\(^\text{viii}\).

While Page Speed score is a useful measurement, it should not be considered the only indicator of a page’s performance health.
7. MORE SITES USE CONTENT DELIVERY NETWORKS (CDN), BUT THIS STILL DOESN’T CORRELATE TO FASTER LOAD TIMES.

In the past year, the number of sites that use a content delivery network (CDN) to bring their content closer to their users has grown by 17%; however, this has not translated to faster overall load times. The average load time for a site that uses a CDN is 10.058, while the average for a site that does not use a CDN is 9.72.

WHAT THIS MEANS: There are several possible interpretations for this finding. The Alexa Retail 2000 comprises a wide range of e-commerce sites. As discussed above, in point 4, more successful sites contain, on average, more content than sites that appear lower in the ranking. Sites that do not use a CDN may not choose to do so because their pages are more lightweight, with fewer page objects, smaller file sizes, and less complexity than top-ranking sites. Another interpretation is that sites that 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.
Site speed is a constantly moving target, and the pursuit of high performance websites is a neverending task. As web pages continue to grow, largely due to the proliferation of images and third-party content, site owners are barely managing to keep pages from slowing down even further.

Relying on a single performance measurement tool can be misleading. The best way to measure performance is with a real-time monitoring tool that measures how real users interact with a site on an ongoing basis.

While newer browsers offer superior performance to older browsers, they are not a catch-all solution. Browsers can mitigate some performance issues, but they cannot fix pages that are excessively bulky, poorly designed, or badly optimized.

Using a content delivery network (CDN) is just one tool in a website’s performance toolkit. CDNs cache content closer to end users, shortening the trip from server to user, but a CDN cannot transform the content itself so that it renders more quickly in the browser. Content optimization offers an enormous opportunity for further acceleration.

STRANGELOOP MAKES WEBSITES FASTER.
Talk to a Performance Expert and get all the answers to your web performance questions.
Methodology

This study used WebPagetest – a third-party tool that measures page load times from a real user’s perspective – to test each site’s home page via the WebPagetest server in Dulles, VA, as the site would appear to a visitor using the following browsers on DSL:

- Internet Explorer 7
- Internet Explorer 9
- Firefox 7
- Chrome

In some cases, WebPagetest was not able to render a result. These instances are represented as null in the test appendix.

ABOUT STRANGELOOP

This report was compiled by Strangeloop, a company that develops and implements advanced web content optimization (WCO) solutions. Companies like eBay/PayPal, Petco, Visa, Wine.com, and O’Reilly Media rely on Strangeloop solutions to accelerate their websites and enterprise applications. As the earliest entrant in the WCO 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. Strangeloop also offers a mobile-specific optimization product: its Mobile Site Optimizer is the only advanced optimization solution that addresses the unique challenges of delivering faster sites to mobile devices.
Sources

i Customers Are Won or Lost in One Second, Aberdeen Group (2008); Consumer Reaction to a Poor Online Shopping Experience, Jupiter Research (2006); The User and Business Impact of Server Delays, Additional Bytes, and HTTP Chunking in Web Search, Amazon and Google (2009); When Seconds Count, Gomez (2010)

ii Website Response Times, Jakob Nielsen (2010); Response Time in Man-Computer Conversational Transactions, Robert R. Miller (1968)

iii State of the Union for Page Speed and Website Performance, Strangeloop (2011)

iv See note ii, above.

v Consumer Response to Travel Site Performance, PhocusWright and Akamai (2010)

vi HTTP Archive: Nine Months, Steve Souders (2011)

vii Front-End Web Performance Optimization: It isn’t over till it’s over, Web Performance Today (2011)

viii See results for Target.com on line 9 of the appendix in this report.

APPENDIX
To receive detailed test results, please email us at info@strangeloopnetworks.com