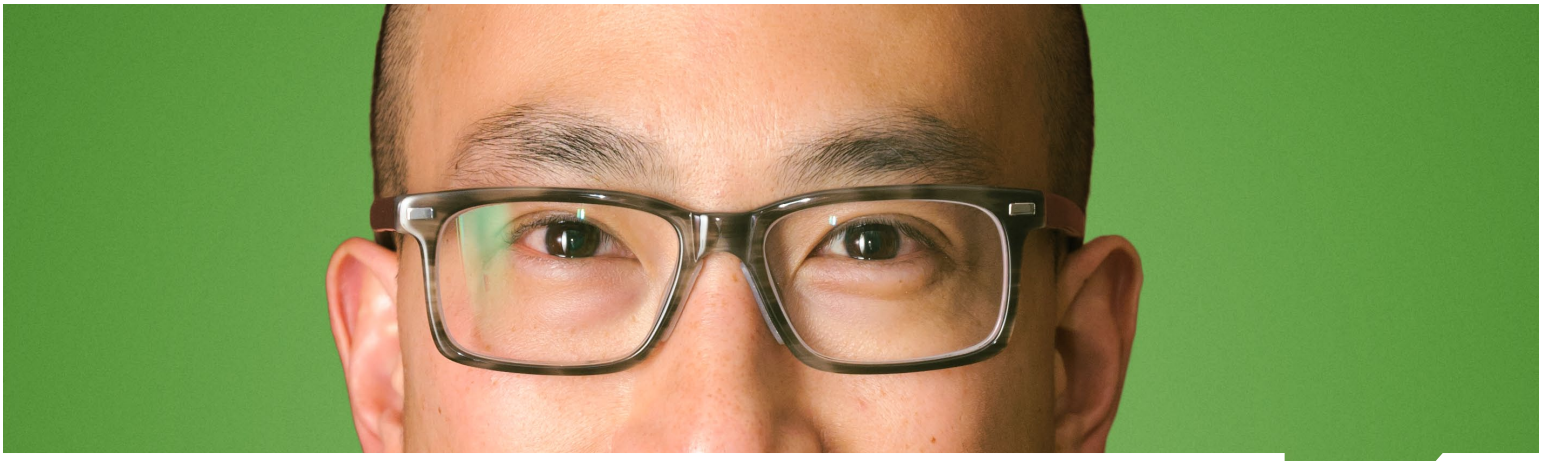

Speak<geek>
Tech Brief

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RichRelevance Infrastructure: a robust, retail-optimized foundation

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RichRelevance Infrastructure: a robust, retail-optimized foundation

Internet powerhouses Google, Microsoft and Amazon may not see eye-to-eye on much, but they do agree on one thing: in the online environment, business is gained (or lost) with every millisecond of response time.[1] For online retailers, speed is an even stronger currency. That extra fraction of a second required for a product image or video clip to load can mean the difference between a sale or a bounced session. A shopper's perception of page load time can risk not just a lost transaction, but can potentially damage retention and loyalty over a customer's lifetime value.

More than ever, the stability and performance of any server infrastructure associated with an ecommerce site is of utmost importance. For most online merchants, this includes any third party onsite solutions (such as recommendations, ratings and reviews) that are supported by outside server environments.

This Speak Geek tech brief will discuss the importance of choosing vendors like RichRelevance that have doubled down on infrastructure, architecting a cutting-edge system that remains lightning-fast, regardless of the levels of a retailer's site traffic. During non-peak periods, RichRelevance serves 1,200 requests per second, with response times consistently under 70ms—less than 1/5 the time it takes for the blink of an eye. During peak shopping periods this changes little, and we remain well under our servers' capacity.

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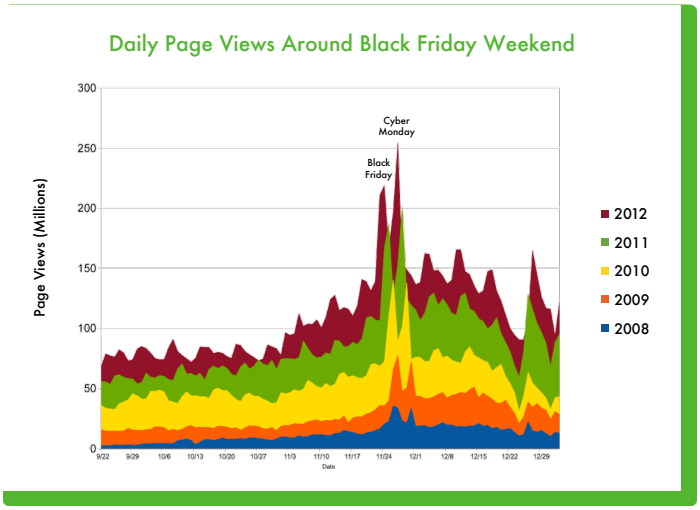
1 Kohavi, R., and R. Longbotham, "Online Experiments: Lessons Learned," Computer 40, no. 9 (2007): 103-105. The Amazon statistic was taken from a presentation by Greg Linden at Stanford: http://home.blarg.net/~glinden/StanfordDataMining.2006-11-29.ppt

Award-Winning[2] Capacity and Speed

RichRelevance delivers recommendations to shoppers based on real-time data collected about user behavior, catalog data, inventory status, and trends combined with historical user and product information. In order to keep each recommendation relevant, recommendation models are rebuilt up to 12 times a day based on complex mathematical models. To manage such a tremendous amount of data, RichRelevance uses a cloud-computing model organized over seven geographically diverse data centers equipped with load-balanced tier-1 servers using solid state drives. This system provides the highest-possible throughput with the lowest latency.

This approach means that large spikes in traffic are handled easily without affecting performance. During the peak of 2012 holiday traffic, RichRelevance operated at less than one-sixth of capacity despite serving 8 billion product recommendations at a rate of up to 9,100 responses per second. Even if all retail customers were to experience a 100% spike in traffic, performance would remain unaffected, enabling business as usual.



The system is also architected in such a way that requests are directed to the nearest geographical data center. Globally, we pull a recommendation from our servers every few seconds to test response times and average sub-70ms per response worldwide. For individual data centers that use local responses, we average sub-40ms. We continually test response times; one test is run every 4 seconds across 26 cities to verify response rate and availability. We pick cities not only for diversified locations but also for carrier (ISP), to capture any anomalies that a region may have. In this manner, we can capture latency, bad content, timeouts, etc.

2 RichRelevance won the 2009 Intel/CIO Magazine Premier IT Knowledge Award for its innovative IT infrastructure

Our servers automatically failover first to a data center within their own region (e.g. VA to NY), then region by region. As a result, any single data center failure does not affect recommendations or the user experience. Because each data center has a constantly updated, local cache, individual recommendation requests do not depend on communication with other data centers. This distributed architecture safeguards against downtime, setting RichRelevance apart from other technology vendors who rely on centralized infrastructure or just one data center.

Early Adoption of Speedy Solid State Drives

To further enhance the system's speed and efficiency, RichRelevance utilizes SSDs (solid state drives) that slash page load times and enable the system to simultaneously run more complex, data-intensive recommendation algorithms. With such algorithms, data not available in cache often needs to be accessed. Using SSDs, these can be accessed with performance comparable to RAM, up to 1,000 times faster than traditional, disc-based hard drives.

In 2008, RichRelevance chose to work with the Intel X25-M for its capacity to make concurrent random writes and reads at a high level, and its early investment in SSDs paid off: the company won the 2009 Intel Premier IT Knowledge Award. SSDs have come a long way since 2008; today we are a few generations beyond the X-25M. There exist a much wider variety of SSDs with desirable performance profiles, so we

Quick Fixes In-House:

What Merchants Can Do To Improve Page Load Speed

- Build pages so that rendering can begin before all of the page is downloaded.
- Optimize the order that first- and third-party components are called:
  - Prioritize the most critical data and fast components (such as RichRelevance products) so that they are visible to the user first, regardless of the status of other components.
  - Allow components that can download asynchronously to do so as early as possible.
- Ensure that cacheable resources are configured to utilize browser caching.
- Take advantage of content compression on all valid resources from all sources—that includes all text!

utilize those that best accommodate our workload and data reliability requirements. As part of Intel's SSD beta test team for new technology, we remain on the cutting edge of SSD learning, and update our investment in SSDs every 12 to 16 months.

Raising the Bar on Innovative Infrastructure

Since its founding, RichRelevance has remained principled and steadfast in its commitment to a robust, innovative IT infrastructure. There are two major components in how we achieve low latency and lightning fast response times: we were early adopters of SSD technology, and we continue to refine our use of latency minimizing technology within our data centers. Our multiple-data-center, geographically-load-balanced architecture significantly reduces the latency between the shopper and our data centers.

When selecting a third-party technology provider, an investment in a partner with world-class infrastructure that directly supports your site needs is critical for today's highly competitive environment.

Any weakness in a provider's infrastructure is a direct reflection on your site and your brand. Slow load times, impaired functionality, and even downtime can result from a faulty provider. Not only do slower page load times cost a business lost sales, it can bring about long-term adverse consequences on user experience, customer retention and brand reputation. After a poor online experience, 88 percent are less likely to return to a site, 47 percent have a less-positive perception of the company and 42 percent have discussed it with family, friends and peers, or online on social networks.[3]

Site speed and reliability are inextricably tied to the gold standard for site performance and future success. By raising your partner requirements for innovative infrastructure, you are guaranteeing a seamless customer shopping experience that ultimately protects your bottom line.

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3 Compuware; http://www.gomez.com/resources/whitepapers/when-more-website-visitors-hurt-your-business-are-you-ready-for-peak-traffic/; 7/25/2012

About RichRelevance

RichRelevance delivers over one billion product recommendations daily, powering the personalized shopping experiences for consumers shopping the world's largest and most innovative retail brands like Walmart, Sears, Target, Marks & Spencer and John Lewis. Founded and led by the e-commerce expert who helped pioneer personalization at Amazon.com, RichRelevance helps retailers increase sales and customer engagement by recommending the most relevant products to consumers regardless of the channel they are shopping. RichRelevance has delivered more than $8 billion in attributable sales for its retail clients to date, and is accelerating these results with the introduction of a new form of digital advertising called Shopping Media which allows manufacturers to engage consumers where it matters most—in the digital aisles on the largest retail sites in world. RichRelevance is headquartered in San Francisco, with offices in New York, Seattle, Boston, London, Munich and Paris.

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Dynamic Personalization for Commerce