BEYOND CDN:
A NEW MODEL FOR DIGITAL EXPERIENCE OPTIMIZATION

Successful strategies for improving end user experience across multiple platforms to maximize business impact

YOTTAA
WHITE PAPER

Contents

Executive Summary

Today's web applications make unprecedented demands on browsers, delivery systems, and devices. Web apps now provide a wide assortment of media and interactive elements to the end user, including high resolution graphics, social media links, widgets, video, analytics, and eCommerce tools.
Notably, the content delivery network (CDN) infrastructure currently in wide use is no longer up to the task of efficiently delivering these heavy and complex pages.

New techniques are needed to extend the optimized delivery path to the user's device. Currently, the capability of a CDN ends at the edge of the Internet – the points of presence (POPs) that are relatively close to the user, where cached portions of a website are stored. The technology does not address the last mile, where the website is delivered through an ISP or cell network to the end user, or the increasingly complex ballet of content rendering by the browser.

This paper examines the existing CDN model as it applies to the end user browsing experience, and examines a newer, more effective model now being established in the marketplace.

Understanding Content Delivery Networks

The early era of the public Internet, during the 1990's, was a simple time for content delivery. By necessity, web applications incorporated mostly lightweight images and text, since the dialup modems in wide use at this time denied users fast access to large or complex apps.

Later, as cable and DSL services gained market share, Internet use experienced massive growth in both the number of users and time spent online, and also spread outward from developed countries to nearly everywhere in the world. Until this time, the web's user base had fully expected and accepted that using the web involved long waits for pages to load and frequent errors. With new access technology in play, expectations for fast, consistent page loads began to take hold for the first time, and with it, savvy end users established the need for User Experience Optimization to maintain a consistent Quality of Experience online.

For online businesses seeking to meet and exceed these expectations, issues of server capacity and geographic latency (caused by sending data across long distances) and server capacity became the biggest obstacles. It became apparent that the method of simply sending a web page directly from origin servers to users everywhere would no longer be sufficient.

This period marked the commercial rise of the Content Delivery Network (CDN), a system of content delivery that had been developing for several years. Content Delivery Networks distribute online content via a number of POPs around the world. The Internet's amalgamation of backbones, servers and pipes vary in terms of speed, reliability, and capacity – and content delivery networks proved effective in moving data efficiently through this chaotic "middle mile". By reducing strain on origin servers at times of heavy traffic CDNs offered companies greater consistency and uptime, and also dramatically reduced geographic latency.

Avoiding Mobile Mistakes

In the mid-2000s, the advent of Web 2.0 and social media substantially changed the composition of web apps. They began to incorporate larger, higher-resolution images and video, plus new forms of interaction and eCommerce that demanded higher levels of security and reliability.

Around this same time, Application Delivery Network (ADN) technology was brought to market to enhance the CDN structure and meet the demands of increasingly sophisticated applications. ADN added intelligent routing and load balancing capability to existing CDNs, and helped speed the delivery of uncacheable, personalized application components. Essentially, ADN technology was able to intelligently identify the best route for data to take through a CDN network.

Traditional large-scale CDN providers embraced ADN and continued to sell their reliability factor, offering IT managers the comfort of enhanced data delivery within an established and powerful market presence. It was revealing, however, that promoters of CDN and ADN continued to rate the value of their service by milliseconds, with metrics like "time-to-first-byte" which describes the elapsed time until the first byte of data is received by a user's browser. Although this data is useful for IT managers and other technical people, it says nothing of the user's actual experience viewing the page.

The Need for Better Control and Transparency

App owners expect and demand better control and transparency over their data, both inbound and outbound. In many organizations, the IT department must deliver quantifiable results to senior management, since application performance, in conjunction with social media interaction, is becoming a higher priority in the C-suite.

Senior decision-makers are starting to recognize that optimizing an application no longer just means choosing the color of a button or page layout. They must think holistically and strategically – "How is the delivery of my application affecting performance, and how can I quantify those results to make sure I'm getting a return on investment?"

There is also the issue of international expansion, which refers to the way in which Web page data is served and routed across the planet. An Australian company, for example, might be interested only in serving the Australian market, but, through their relationships with e-commerce providers, their content may be served from locations as far away as China, the United States, Canada, or the United Kingdom.

Longer distances mean more connection points and a broader variety in the quality of transmission, which may significantly impact the user experience, especially in terms of load speed and availability of components. One of the ways to improve upon this is by rerouting these assets before they are handed off to traditional CDN edge caches. Instead of pulling data from 10,000 miles away for every component of a website, a reroute facility is establi-

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The Shift to the Front End: FEO

By the end of the decade, industry watchers noticed that applications were rapidly growing in both "weight," as measured in bytes, and complexity. As a result, average page load times and other indicators of user experience were worsening.

This insight led to the conclusion that the so-called "bottleneck" of internet delivery had shifted away from the middle mile, toward the end user's browser itself. While web content was being delivered ever-more efficiently across the Internet thanks to the continued adoption of CDNs, actual user experience was degrading due to the increasingly hard work of browsers to parse, download, and render content.

In an effort to keep CDNs current with this changing landscape, a number of providers have turned to Front-End Optimization (FEO) as a "last-mile" solution. FEO techniques alter the website content itself, making it easier for browsers to render. This mostly involves compressing files and combining them into fewer requests, thereby reducing the weight and complexity of apps.

Home-grown optimization has been performed by individual developers for years, but now several CDN providers have gained, through acquisition, technology to automate FEO. This marks a change along the path of innovation in the space from hardware-based to software-based solutions.

The adoption of FEO tech by CDN providers amounts to an acknowledgment that the challenges of content delivery have changed. Moreover the industry-wide shift to focus more on improving the end user's experience is a big step forward. Progress on this goal has been incremental at best, however. Complexity is still rising, and the user experience delivered by major players – the companies that form the client base for high-end CDNs – is still declining [1]. The top 500 retail sites, for example, became 47% slower between 2012 and 2014 [2].

[1] [http://www.radware.com/newsevents/pressreleases/summer-sotu2014/]

[2] [http://blog.radware.com/applicationdelivery/applicationaccelerationoptimization/2014/04/report-state-of-the-union-for-ecommerce-web-performance-spring-2014/]

shed locally – in Sydney, for example – to serve HTTP content, JavaScript, CSS, images, and HTML more quickly and reliably.

Economies can also be realized through data storage. Companies needing to expand their data center space can utilize a provider's rerouting abilities to choose facilities in lower cost areas, rather than being tied to a particular home country.

Operational spending and capital costs can be vastly reduced while user experience is enhanced. Long-term contracts required by traditional CDN suppliers can be replaced by a more versatile relationship with a supplier of choice.

When CDNs Fall Short

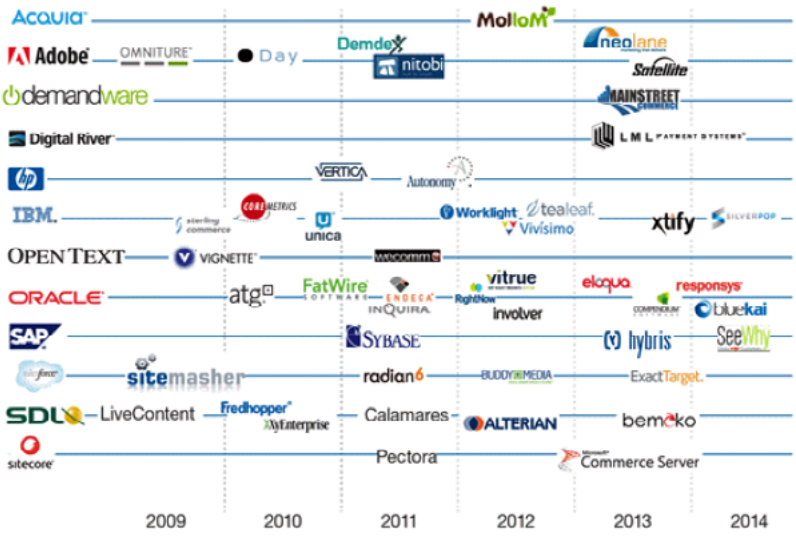
The main reason that CDNs are failing to make an impact on global trends in user experience has to do with their core model, which reflects the legacy challenge they were built to serve. CDNs function "inside-out," in that online material is gathered, optimized and pushed out to users upon request. Efforts to improve CDNs, such as the addition of software addressing front-end performance, have not changed this essential tenet of the platform.

The proliferation of devices, platforms, and network types demands a new model. In fact, a reversal of the "inside-out" model has proven effective for many firms that seek to address the varying needs of today's Internet. This "outside-in" model takes input from the individual users' circumstances, such as their location, device type, screen size, and operating system, and tailors deliverables to meet specific needs.

The trend toward a new model is seen in the busy acquisition landscape in the "digital experience" category. The acquiring companies in the figure below are major players in online infrastructure and software, many in industries adjacent to or overlapping with CDN. Their acquisition activity tells of a multifaceted digital world, including companies specializing in automation, personalization, and mobile integration – many of them reliant on the "outside-in" model. CDNs are notably absent from the list of acquirers. In this light, recent acquisitions that have been made by Akamai, a CDN industry leader, seem more like bandages than splints: they are not reflective of the new model.

The Forrester Wave™: Digital Experience Delivery Platforms, Q3 2014 [3]

It is "meant to be a representative of the digital experience delivery acquisitions over the past five years by those vendors in [the] Forrester Wave evaluation



[3] [http://www.forrester.com/The+Forrester+Wave+Digital+Experience+Delivery+Platforms+Q3+2014/fulltext/-/E-RES113643]

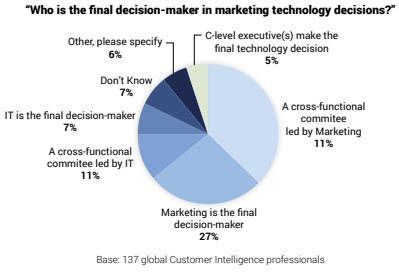
A few firms are also showing that outside-in thinking provides an opportunity to better leverage existing delivery technologies, including CDN and FEO. Facebook, for instance, is leveraging an outside-in model for optimizing advertisement delivery to mobile users based on network connectivity [4]. This also opens doors to entirely new techniques for content delivery, such as Application Sequencing – a method of rendering that breaks away from the traditional browser rendering process and customizes it to the user

[4] [http://techcrunch.com/2014/08/27/facebook-turns-on-bandwidth-targeting-to-match-mobile-ads-to-network-quality/]

The Need for Better Control and Transparency

Dynamics within organizations are changing along with end user behavior. New technology is increasingly being found, funded, and onboarded by marketing departments and other line-of-business groups – not by IT. And budget allocation is shifting to reflect that natural progression.

Figure 3: Marketing Is An Active Participant In Technology Selection



59042 Source: Forrester Research, Inc.

With line-of-business groups becoming technology buyers, they bring their own priorities to the table, namely driving business results. The mentality has gone from reactive to proactive – from "let's spend a dollar on technology today to save two dollars on costs tomorrow" to "let's spend a dollar on technology today to drive ten dollars in new revenue tomorrow". This convergence of business and IT functions is reflected in how companies market and sell information technology services. It's now crucial to provide value to the business holistically, including all departments that touch digital channels.

Yottaa's model concentrates on proving value through metrics like conversion rate, rather than exclusively through IT metrics focused on the speed of bit delivery. This speaks to the priorities of line-of-bu-

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More Effective New Technologies

Yottaa is the leader in providing services that reflect the new model of optimized delivery of digital experiences. Yottaa's technology has been built without the baggage of the traditional CDN model, taking only what's necessary or beneficial from legacy solutions to empower its clients' user experiences. The solution also integrates with cloud infrastructure like CDNs. Rare for an IT service, Yottaa benchmarks its effectiveness via a closed-loop analytics architecture, correlating optimization activities to business and user engagement metrics such as conversion rate and bounce rate.

The outside-in approach identifies the ideal formulation of incoming data based on the needs and limitations of the end user's circumstances. This takes advantage of the strengths, and undercuts the weaknesses, of each user's arrangement. Yottaa then applies the following techniques:

- ***InstantOn:*** In the typical delivery scenario, when a request is sent for a page with dynamic content, the content delivery network passes the request and waits for it to travel to the origin server and back to retrieve the dynamic content, before starting to download.
  The patented InstantOn technology identifies the static (thus cacheable) components on a dynamic application, such as head sections of an HTML document, and instantly delivers them via cache. This vastly improves the metric called "start render time" and, for the user, and kicks off the process of visiting a website instantaneously and makes page to page transitions seamless. No frustrating blank screen or unnerving delays

- ***Application Sequencing:*** With this patented technology, separate elements of a web app are queued and delivered in an optimized, dynamically chosen arrangement. This helps the page load faster, and also causes it to appear to load faster, which promotes user engagement and satisfaction.

  A typical example of Application Sequencing in action is an application that includes calls to an eCommerce security site at the bottom of the page and a product detail image and a Twitter link near the top. The application sequencing algorithm tells the browser, "I want the main picture to load first, the text to load second, the Twitter link to load third, and the footer's eCommerce security seal should not load unless the user scrolls to or clicks on a specific part of the page."

  This allows the important content to load faster. It's substantially different from the existing model, in which all elements load in a standard order, regardless of what the user can, or wants, to see. It's particularly impactful

siness groups that see technology as a gateway to increasing business success. On the other hand, Yottaa also provides value to IT groups through proven stability, scalability, and security, making it easier for DevOps groups to meet service level agreements (SLAs).

Catering to multiple business groups isn't just about appeasement, however. Yottaa promotes the marriage of technology and business through active enablement. It allows marketing and front end groups to innovate more rapidly on user experience features without intervention from IT, thanks to self-service controls that ensure standards are met. By the same token, disparate groups are unified by a single set of analytics and insight – one that speaks to business goals and IT SLAs. With access to the same metrics, these groups can speak the same language, avoiding the confusion and misalignment that causes friction within organizations.

for mobile phones, where the rendering process is prolonged and prone to errors.

- ***Insight:*** The machine learning of the Context Intelligence system drives the InstantOn and Application Sequencing features. But it also drives analytics for Yottaa's customers – deep insight into how fast the application is loading, and what that means for business. It integrates with existing analytics software to show how the performance is affecting business, day by day, week by week, and month by month. In fact, it includes split testing so that users can check different configurations on segments of live traffic, or even turn the optimization service off for a certain percentage of end users.

A New Era for Content Delivery

The CDN industry is facing profound changes. Middle-mile delivery, as measured by metrics such as time to first byte, is still a key part of any web experience, but now represents only a small part of the solution. The companies that form the client base for CDN firms are seeing increasing expectations from users, even while their sites are getting slower.

New challenges are posed by the rise of mobile browsing, and there is more competition from companies like Walmart and Amazon that are developing in-house user experience optimization strategies. Stated simply, the CDN constituency needs new options.

Yottaa represents a new model of content delivery that uses modern outside-in ideas. Yottaa is the first company that elevates content delivery from a utility to a feature, by tracking how performance improves business.

About Yottaa

Yottaa is a SaaS solution to manage, optimize, and secure digital experience delivery.

Yottaa accelerates online and mobile performance, maximizes end user engagement, and delivers instant, actionable insights to drive business results via an intelligent, automated cloud platform. Our ContextIntelligence™ platform is purpose-built to deliver the power and flexibility required by IT organizations to exceed SLAs for uptime, performance, scalability, and security, paired with patented technologies that accelerate the delivery of innovative features and products to improve online and mobile channel execution.

For more information, please visit

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