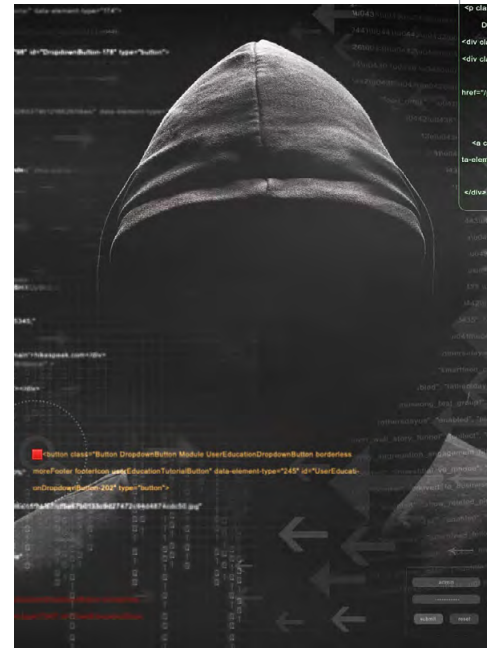


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WHEN IT MATTERS MOST, how to ensure your web and mobile sites are **FAST** and **SECURE**

A guide for retailers on web and mobile site performance and security during peak periods.



A special report from the
editors of Internet Retailer

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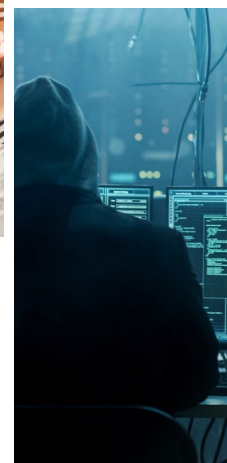
THERE'S A LOT OF PRESSURE FOR ONLINE RETAILERS DURING PEAK SEASONS

You've planned for months for that Black Friday promotion and when it goes live at 6 a.m. on the day after Thanksgiving your site slows to a crawl and thousands of customers anxious to buy your products can't get through. Or hackers pick that crucial moment to flood your site with bots, keeping legitimate consumers from reaching your site.

Nightmare scenarios like these happen to online retailers every holiday season. You can't afford to lose that revenue due to performance or security issues with your e-commerce site. And that's true whether your traffic peaks during the period leading up to Christmas and Chanukah, around Valentine's Day, Mother's Day or Back to School—or during shopping festivals like Singles Day in China, Diwali in India and Boxing Day in many English-speaking countries.

This paper will summarize the best practices and new technologies that can help retailers make sure their web and mobile sites are available and provide a great customer experience when it matters most. It will focus on developments that are changing how e-commerce executives think about site performance and security: the move to cloud computing, the shift to mobile shopping and the ever-growing and changing threats from hackers and bots.

Each of these developments poses new problems for retailers and brands. Fortunately, new technology is helping them find new ways to address these issues, as this white paper will describe.



Does the cloud solve the performance issue?

When online retailers consider website performance these days, it's often in the context of having moved much of their applications to cloud infrastructure services like Amazon Web Services, Microsoft Azure and Google Cloud Platform. These services offer massive computing power and data storage—but moving to the cloud doesn't mean you can stop thinking about optimizing website performance.

One thing to consider is that while a cloud service can add server capacity when your website's traffic peaks, that doesn't happen instantaneously. It may take minutes for that added capacity to come online, and during that time a slow-performing website will cost you sales. And, the content your website is serving to users may not be optimized for their device, or the website application may not efficiently incorporate third-party services.

Akamai data shows that the typical page that leads to a consumer immediately exiting without viewing another page loads in an average of 6.8 seconds versus 4.4 seconds for a page that doesn't cause a consumer to "bounce." Shoppers on mobile devices are even less patient: The mobile bounce rate was lowest (38.24%) at page load times just over 1.5 seconds during the 2017 holiday shopping season. But the bounce rate went up to 44.28% if the mobile page took just 3 seconds to load, a performance many retailers would consider acceptable.

There is another important point to consider about relying on cloud services to optimize performance: That cloud compute capacity isn't free. Cloud providers charge for every resource you access, and a website that requires a lot of CPU cycles during peak periods is going to run up big bills.

Using the cloud intelligently

Retailers and consumer goods manufacturers must consider all their options as they move services to the cloud. Done correctly, they can get all the benefits of cloud computing while keeping web and mobile sites and apps running fast and at a reasonable cost.



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One of the most basic steps to reducing cloud-related costs is to offload much of a website's content and logic so that most requests don't ever reach a cloud server. Many of the top retailers do that by caching content on a content delivery network, or CDN, that maintains servers throughout the world. A CDN can send a webpage to a shopper much faster than if the request had to make a journey through a series of internet nodes, grab the data and make the return trip to the consumer. And that's true whether the web content is stored on a retailer's server or that of a cloud provider.

To avoid any possible slowdown from requesting data from a cloud service—and the cost that such a request incurs—retailers can offload static content such as images, JavaScript, Cascading Style Sheets (CSS) and videos to a CDN, which can then deliver that content to website visitors. They can also offload the HTML that provides the logic to assemble a web page. These steps will speed website performance while keeping cloud-computing bills in check.

There is another important value to a CDN when working with a cloud provider. E-retailers moving content to the cloud will want to find a CDN that can find the best route to that cloud provider. The major cloud services all have multiple data centers, so look for a CDN with many servers that can route requests to the cloud-based data center in the most efficient way. And if you operate internationally, you will need a CDN with global reach.

Change web content quickly

Optimizing site performance during peak periods also means paying special attention to the content of an e-commerce site that changes frequently. Especially during the run-up to holidays, retailers want to be able to rapidly swap out promotional banners, change prices and update inventory. All of that can be done quickly with proper preparation and the resources provided by a widely distributed CDN.

Website elements that will change regularly can be cached in a way that makes them easy to update. Prices, for example, may change



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every day, and product inventory every few days. Retailers can cache those elements with a shorter duration and update the content cached on a CDN on a schedule that fits the retailer's business.

Want to change a website promotion to accelerate sales of a slow-moving product, or add a free shipping offer in response to a competitors' move? Prepare now so that you can make those kinds of changes in seconds, ensuring you can provide your customers with the latest and most compelling content.

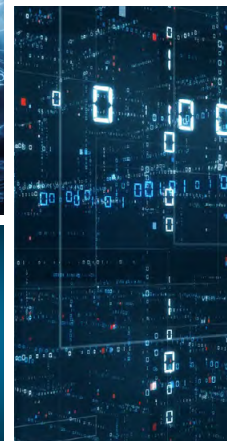
One way to do this is by putting special tags on content you want to be able to modify quickly. A retailer with 50,000 SKUs, for example, may put special "cache tags" on content for 500 of its fastest-moving items. All the content related to those product detail pages can be changed quickly, without making any changes to other pages on the website.

Test each component

A crucial part of preparing for a peak period is to rigorously load test all elements of an e-commerce site to make sure it can withstand higher volumes. Smart retailers multiply normal traffic, sometimes by as much as a factor of five, to ensure that their sites can function well when holiday shoppers flock to their sites.

It's also important to keep in mind that legitimate bot traffic will increase significantly during the holiday season. That's because bots launched by search engines and comparison-shopping sites—good bots—more frequently visit retailers' websites during peak periods to check prices and update inventory availability, all vital information for consumers shopping for holiday gifts. It's not unusual for legitimate bot traffic to increase by 20% during a holiday period. Plan for that increase in traffic, as well as more shopper visits, when making infrastructure capacity decisions in advance of a peak season.

Besides testing the overall capacity of their e-commerce sites, retailers will want to test crucial pieces of that infrastructure. One process that can slow down significantly during the holidays is providing shoppers with shipping information at checkout. That



Elements of a website that change regularly can be cached in a way that makes them easy to update.

may require API calls to inventory databases, shipping services, even the retailer's customer relationship management system to determine how valuable this customer is before offering shipping options. While all those calls are being made in the background, the customer may be getting frustrated as they wait for the webpage to load. That process should be tested separately to identify any issues that can slow overall page load time.

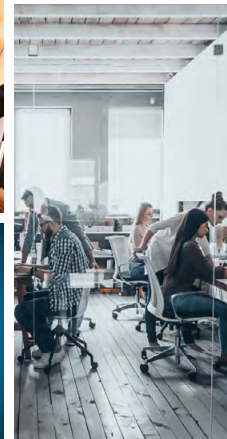
As retailers prepare for larger than normal spikes in business they will want to forecast how many more shipping API calls may be required and the amount of time they expect that spike will continue. That will allow the retailer or its testing provider to create a test plan that is focused on end-to-end integrated load testing of its infrastructure and take the necessary steps to ensure it is supported by the additional resources required to process orders quickly as transaction volume increases.

What does the shopper see?

Retailers not only want to know that the site doesn't crash or slow down measurably, they also want to understand the quality of experience the online shopper is seeing when she visits the site. Is the top part of a web page loading quickly, for example, even as elements not visible to the visitor load more slowly? One traditional testing method uses synthetic tools that fire requests at a retailer's website from several test agents around the world and measures their response time. Those synthetic tools are useful for running controlled experiments and scripting test scenarios to show how a page might be responding to consumer site visits and simulating how a page visually loads like a filmstrip.

But shoppers come from many places around the country, and the world. Synthetic tools operating out of a handful of nodes won't provide an accurate picture of how an e-commerce site is performing everywhere and for all users.

Real user monitoring complements synthetic monitoring and captures 100% of visitor traffic, in real time and on an ongoing basis.



Each piece of a retailer's e-commerce infrastructure should be tested separately and together ahead of peak season to pinpoint the source of potential slowdowns or failures in advance.

That kind of monitoring system will alert retailers in the event that a web page that loads in one second for users on one type of browser or device has slowed to a crawl for another type. That will enable a retailer's operations teams to shine a light on these potential blind spots and focus on the area where the problem is occurring to determine what's causing the slowdown.

Where's the problem?

Problems, however, may not be regional in nature: They can also come from a particular web resource, such as a personalization service or recommendation engine. Retailers can take advantage of available technology that provides detailed data on the performance of every resource on a web page—whether it's an image, pixel, JavaScript or CSS.

Among the metrics that can be monitored are the transfer time for each resource including the time spent over their CDN middle-mile, the number of requests for each resource type on the page, how effectively cache and compression are being leveraged, and what the transfer sizes are of these resources by resource type. That level of data makes it possible for retailers to quickly fine-tune the construction of a web page to optimize that page for performance. They can sniff out poorly performing file types, reduce the number of problematic page elements and also address issues cause by any overweight resources. Heavy images and JavaScript files are the common culprits.

Having this granular insight into what's slowing down a webpage is crucial now that retailers often rely on many third parties for data to inform their business and in some cases augment the user experience, whether that's to offer personalized recommendations or the ability to share favorite products on social networks.

A 2018 study of 80 major retail sites by consulting firm RSR found that a typical retail web page made 139 requests to third parties, a 50% increase over the prior year. Peak periods are busy times for these outside providers as much as for retailers. That makes it more likely their services could have performance issues themselves that



139

Number of requests
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typical retail webpage.

Source: RSR

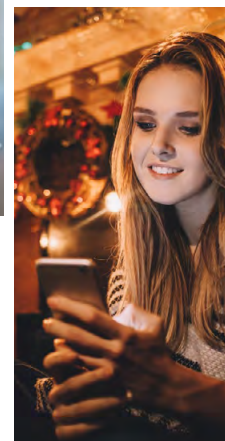
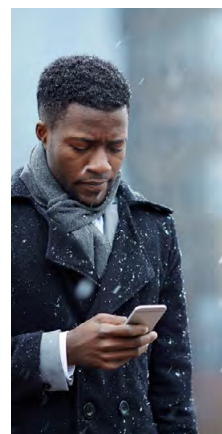
could degrade a retailer's website performance. Being able to quickly identify slowdowns and which third-party page element is causing a problem thus becomes a high priority when seconds of slowness equate to disappointed customers and lost sales.

The right image and video for the device

Retailers today must serve mobile shoppers well. 57% of traffic to retail websites during the early part of the 2018 holiday season came from smartphones and tablets, according to Adobe Analytics, and those devices accounted for 39% of sales. What's more, consumers often use their phones to access e-commerce sites while they are on the go. And connecting through cellular networks that sometimes provide slow service can be troublesome, particularly as you extend to international regions around the world where cellular connectivity is lacking. A Forrester Research survey found 73% of U.S. consumers had used their smartphones while in a store during a recent 3-month period to check prices online, while 46% of shoppers in five major Western Europe countries had researched products on their phones. Data like this underscores the importance of mobile site performance.

Delivering images and video to mobile shoppers is one of the big obstacles to fast mobile site performance. Part of the problem is that consumers' smartphone screens vary in size, typically from 4.0 inches to 6.5 inches, and the resolution can also differ radically from one phone to another, especially with Apple's recent release of its ultra-high-resolution XR and XS phones. There are also regional differences, as many phones in Asia, for example, lack the processing power and battery life of the smartphones carried by shoppers in North America.

According to Google, nearly 70% of mobile users worldwide will use 3G connections through 2020. As a result, consumers on smartphones may be connecting to the web through cellular services that are far less reliable than LTE, wired or Wi-Fi internet connections. Slow web connectivity can be especially problematic when a consumer is trying to watch a video from a retailer's website, as videos require even more bandwidth than images.



57%

Portion of traffic to retail websites from smartphones during the early part of the 2018 holiday season

Source: Adobe Analytics

All those challenges point to the need for retailers to account for all possible combinations of devices, connections, web browsers, operating systems, resolution levels and image formats. That means creating various versions of images and videos to ensure that each consumer gets an image that will render properly.

And it's not just technical issues like resolution and browser type that a retailer must consider when formatting images. For example, a major food manufacturer found that a picture of a cookie package that looked great on a desktop did not work on a smartphone because shrinking the image to fit the smaller screen made the brand name hard to read. It developed a new image that featured a close-up of the package to make the brand name easily visible.

Online retailers today must manage many versions of images and videos to accommodate the variety of devices consumers use to shop online. Companies will want to investigate services that can size and reformat potentially thousands of images and videos without requiring retailers to burden internal IT personnel to handle those tasks.

Security: Tougher than ever

Just as they must take steps in advance of peak season to ensure good site performance, retailers need to prepare to prevent hackers from bringing their sites down at the worst possible time.

It's a scary reality that the security threat is greater than ever. Criminals can easily go online to buy software that allows them to tie together hundreds of thousands of internet-connected devices—not just PCs but security cameras, routers and other systems—to create botnets that allow them to flood a retailer's servers with massive amounts of data.

As hackers create ever-larger networks of captive devices, such distributed denial of service (DDoS) attacks are becoming more difficult to repel. In February 2018, Akamai saw the largest such DDoS attack in its history, one that sent 1.3 terabits (or 1.3 trillion bits) per second of data at target servers.



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That's far more traffic than most e-commerce sites are designed to handle, and well above the typical peak of around 600 gigabits per second observed in past DDoS attacks. Retailers now must prepare for attacks that can exceed 1 terabit per second, and will want to investigate services capable of deflecting attacks of that scale and beyond.

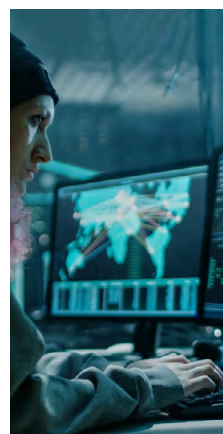
Not only are DDoS attacks more intense, they are also more numerous: A summer 2018 Akamai report on internet security reported a 16% increase this year in such attacks. That trend is likely to continue during the holiday season, because that's the ideal time for a criminal gang to launch a DDoS attack on an e-commerce site, then demand ransom to stop the attack. E-retailers, knowing they're losing sales every minute a site is unavailable, are most likely to cave into demands during a peak sales period.

To avoid facing that kind of situation, retailers must prepare to prevent DDoS attacks that can ruin their holiday season. For many online retailers, even 15 minutes of disruption on a big day like Black Friday or Cyber Monday can reduce sales by millions of dollars. The best strategy is to stop DDoS attacks before they impact a website—which requires careful advance planning and taking advantage of state-of-the-art security services.

Is this good traffic?

One of the primary ways providers can prevent DDoS attacks is by evaluating incoming traffic before it hits a client's servers. CDNs that serve many clients can make use of the data they see about millions of consumers to score the trustworthiness of each website visitor based on the visitor's IP address—even while ensuring that the consumer data remains anonymous.

There are many ways to score traffic from a particular IP address. Human beings hold and manipulate their mobile phones in particular ways, and there are patterns to how they move a mouse when on a desktop computer. Being human, legitimate consumers sometimes make mistakes, and they don't strike keys on a keyboard in exactly the same way every time. Bots, on the other hand, tend to



16%

Year-over-year increase
in DDoS attacks in 2018

exhibit patterns that are typical of machines, not people, making it possible for security providers to identify traffic that is likely to be from automated systems.

A CDN with the technology to distinguish human from non-human traffic can treat each webpage request according to rules set by a retailer client. Someone who has visited many websites and behaved normally will get a high score from a security provider and that traffic can safely be funneled to client servers. However, hits from IP addresses associated with suspicious behavior can be blocked, based on a retailer's directions. That kind of separating of good traffic from bad can prevent a retailer's website from being slowed down by bot traffic, even before there is any noticeable problem with website performance.

Be ready for the worst case

Even retailers that diligently prepare for peak season may run into problems. That can come from unexpectedly high levels of legitimate traffic, problems with third-party services or from malicious attacks. And though each is a risk related to flashes of increased traffic volume, the way in which you'll need to respond to each will need to be different.

A problem can arise that does not originate within a company's own infrastructure. One well-publicized attack in October 2016 against Dyn, an important provider of DNS services that route web traffic, seriously disrupted internet activity on the East Coast of the United States for several hours.

The attack crashed or slowed down websites operated by such major players as Amazon, Overstock and Etsy, as well as the online retailers that rely on web-based e-commerce software from Shopify. The attack, which came in three waves, lasted the better part of a day. With that in mind, every retailer should have a plan in place for what it will do in the event its e-commerce site is slowed during a peak period. This plan encompasses everything from capacity planning to being prepared to purchase additional capacity quickly and should be in place well in advance of peak traffic events.



Humans move a computer mouse in certain ways. Traffic that exhibits non-human patterns can be stopped before it impacts performance.

Serve your best customers

If there is a problem, give priority to your most-valued customers. If the incoming traffic is from someone who is logged into your site, that is probably someone who has bought from you before. That traffic should be served first. Other hits may be coming from consumers just comparing your prices with those of competitors, and can be moved down in priority.

If your site can't handle all the incoming traffic, be ready to route some incoming visitors to a virtual waiting room. While they're there, show them a coupon or some other content that will let them know they have not been abandoned and that will make them more likely to wait until you can usher them into your website.

Peak seasons pose big challenges from a performance and security standpoint. But a combination of preparation, adequate technology and strong partners can enable an online retailer to be confident it can serve its online customers without interruption when it matters the most. ●



If there is a problem, give priority to your most-valued customers.

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