Pick Up Your Web Pace

With Novell Content Exchange

Linda Kennard

Editor's Note: Lest you walk away from this article asking, “Are you talking to me?” we thought we’d better explain something. When we say “you” in this article, we mean anyone who works for a company with a web site that sells or conveys information about products or services. Regardless of your company's specific line of business, if your company's web site publishes large or limited volumes of web content, we’re talking to you.

If you work for a company that publishes content to the web, you are probably aware that meeting web users' expectations is tough. On one hand, users want a snazzy site. On the other hand, they want snappy response—literally. Snap your fingers 20 to 25 times: That's about how long users are willing to wait for a web page to download. (See “You Want It When?” on p. 8.)

Unfortunately, snazzy page designs replete with photos, sound, animation, and video clips can slow content delivery. Ironically, if your site's pizzazz manages—as you hope—to attract new users but attracts them in a sudden burst, this also can slow performance to an unacceptable level. (See “Cases in Point” on p. 10.)

However, flashy content alone cannot be held accountable for less-than-adequate response times. In fact, poor web site performance has several culprits. For example, too much traffic on too few web servers certainly contributes to poor response times. Excessive traffic may also cause users' browsers to “time out,” ultimately preventing users from accessing your company's web site altogether. Similarly, overloaded web servers that have to retrieve content from backend databases or have to encrypt sessions using Secure Sockets Layer (SSL) may leave users drumming their fingers.

A NEW APPROACH TO THE SAME OLD PROBLEM

To solve your web problems, you can simply add more web servers to accommodate the growing numbers of users and applications. But get real. “Who's going to pay for all that hardware?” asks Martin Marsh, an analyst at Zona Research (which is an Internet research and reporting firm). “You're talking some big bucks there.” (See “The Price Is Right?” on p. 12.)

Expense aside, the just-add-more-servers strategy is an ineffective and impractical way to prepare for sudden Internet crowds. After all, as Marshall points out, “How will you ever know how much is enough?”

In lieu of (or in addition to) adding more web servers, you can purchase and install a caching appliance, such as a Novell Internet Caching System (ICS) appliance. A Novell ICS appliance operating in web-acceleration mode accepts requests from web users' browsers and checks to see whether or not the requested data is in cache. If the data is in cache, the appliance returns the data directly—without burdening the web server with requests. This arrangement clearly takes a load off your company's web servers and, thus, certainly improves response times.

However, front-ending web servers with one or more caching appliances does nothing to avoid the other usual suspects of poor performance. A better clearing your company's web site, content still has a long way to travel before reaching its destination. En route from your company's web site to users' desktops, web content may encounter several performance pitfalls, including poorly planned intersections between backbone providers' networks. (For more information, see “Measuring To Tailor Your Company’s Web Site for Performance” on p. 14.)

One way to clear many of the performance-inhibiting obstacles on the Internet is to push content closer to your users. To store content at the Internet's edge, some content publishers are contracting with companies (such as Akamai and Mirror Image) that own and operate content distribution networks (CDNs).

CDNs are hierarchies of worldwide caches that first retrieve and then store much of the content users request. In this way, a local CDN server—rather than a remote web server—can respond to subsequent requests for the same content. The point, of course, is to skirt unreliable Internet routes and thus improve response times.

CDNs sound great and, in fact, provide an effective way to deliver content over private lines. However, CDNs have a
You Want It When?

Have you checked out Keynote’s performance indices lately? (Keynote Systems Inc. is an e-commerce benchmarking and web-performance reporting agency.) Keynote measures and reports on the performance of popular web sites weekly and posts the results on its own web site (www.keynote.com). At the time this article was written, Yahoo! had been among the top five performers on Keynote’s Business 40 Performance Index for 80 weeks running, with download speeds at under one second over T1 and T3 connections.

Sites such as Yahoo! spoil web users. Once users have experienced web pages downloading in subseconds, they expect the same performance from every other dotcom—including your company.

Admittedly, web users aren’t quite this demanding yet, but they’re getting there. Nearly two years ago, Zona Research, an Internet research and reporting firm, concluded that users were willing to wait only eight seconds for a page to download before giving up on a dotcom. (See “The Economic Impacts of Unacceptable Web-Site Download Speeds,” Zona Research. You can download this article from www.keynote.com/services/html/product_lib.html.)

This “eight-second rule still stands,” says Martin Marshall, an analyst at Zona Research. Other analysts don’t credit users with even this much patience. For example, Dan Todd, Keynote director of Public Services, says that the amount of time users are willing to wait for a page to download has decreased over the past couple of years. To support this claim, Todd cites measurements from the Keynote Business 40 Performance Index. This index, Todd says, reflects the performance of the Internet overall and, thus, reflects the “experiences that probably shape users’ expectations.”

Todd points out that when Zona Research deduced from its own research that eight seconds was the average expected response time, Keynote’s measurements on the Business 40 Performance Index also indicated that the average site offered response times of about eight seconds. However, Todd says that since July 2000, the average response time as measured and recorded on the Keynote Business 40 Performance Index has been “below four seconds.” This finding would suggest that today users are willing to wait only approximately four seconds for a page to download.

Whether users are willing to wait the length of time it takes to tie one shoe or two, the question is: Does your company’s web site consistently deliver pages at the rate users expect?  

Figure 1. Web-hosting providers that have partnered with Novell house Novell Content Exchange arrays in each of their data centers. The Novell Content Exchange arrays store cacheable web site content. In this way, web sites are accelerated both locally, by taking a load off web servers, and globally, by storing content closer to users.

Couple of drawbacks. For example, CDNs do nothing to give your company’s web site a boost over the critical first foot of the Internet (that is, from your company’s web servers on to the Internet or to the CDN). Also, the URLs associated with content that should be distributed over a CDN must be translated into a CDN-specific format. (See the “Accelerating the CDN Exchange” section on p. 14.)

If you don’t like the idea of translating URLs, what other options do you have? What else can you do to deliver exciting content to users quickly and consistently, regardless of the number of users that hit your company’s web site? Actually, you have several options, but perhaps none so simple and effective as the service options based on Novell Content Exchange. Leading web-hosting providers are now offering these services through partnerships with Novell.

WHAT IS NOVELL CONTENT EXCHANGE?

Novell Content Exchange is a fully managed web site acceleration service. Did you catch that? Novell Content Exchange is a service—not a product. Novell sells its Content Exchange service to web-hosting providers. These web-hosting providers, in turn, sell their particular version of the service to companies, such as yours, that publish content to the web. In other words, you can purchase a Novell Content Exchange service not from Novell but from web-hosting providers that have partnered with Novell.

For example, GlobalCenter Inc., a Global Crossing subsidiary and a leading Internet Service Provider (ISP), is the first of Novell’s hosting provider partners to offer a Novell Content Exchange service. GlobalCenter calls its implementation of the service Content Acceleration Exchange. GlobalCenter’s Content Acceleration Exchange is already available throughout the United States and Europe and will be available in the Asia-Pacific region later this year. (For more information about GlobalCenter’s Content Acceleration Exchange, visit www.globalcenter.net/cae.)
GlobalCenter’s Content Acceleration Exchange and other providers’ services that are based on Novell Content Exchange work by storing your company’s web site content—as is—in local and global Novell Content Exchange arrays and, optionally, in CDN caches that are closer to users. As a result, Novell Content Exchange significantly reduces the load on your company’s web servers and also avoids unreliable Internet routes.

If this process sounds confusing, don’t worry about it. This article later explains in detail how and why Novell Content Exchange works. For now, just know this: The net effect of using Novell Content Exchange is that web users, even large crowds of them, can consistently download pages from your company’s web site at rates that meet users’ expectations.

“Novell Content Exchange was designed to handle multiple gigabits per second of Internet traffic,” says Arri Newman, Net content director of network operations at Novell. As a result, Novell Content Exchange “is well suited for content publishers with large [web] sites pushing significant bandwidth.”

However, Newman adds, “that’s not to say that the service doesn’t perform well for smaller [web] sites as well.”

Novell Content Exchange currently includes the following components that are specifically designed to improve your company’s web site availability and response times:

- Novell Content Exchange caching arrays
- CDN transformation modules
- SSL enablers

**COOL, EASY CACHE**

The core of Novell Content Exchange is Novell ICS, a proxy caching appliance technology that Novell licenses to partner original equipment manufacturers (OEMs) such as Dell and Compaq. (For more information about Novell ICS, see “Cache In on the Web With Novell ICS Appliances,” Novell Connection, April 2000, pp. 6–19. You can download this article from www.ncmag.com/past.)

**Take a Load Off**

The Novell Content Exchange array located within the same data center that is hosting your web site—that is, the

Cases in Point

If you don’t have a plan for dealing with sudden Internet crowds, you’d better think twice before you go all out to attract new users. Sneak a peak at Victoria’s Secret experience with “success”: In February 1999, more than one million web users attempted to log on to www.victoriassecret.com for a glimpse of a 21-minute fashion show. Apparently, web site operators had not expected so many visitors. Who could have known that the promise of Tyra Banks and clan parading around in lacy bras and panties would attract an uncommonly large crowd? Go figure.

Overwhelmed by the unexpected traffic rush, the Victoria’s Secret web site prevented many would-be watchers from logging on. The users who were able to log on were aggravated by jerky video and more error messages than satin and skin. (See Bob Trott, “Mentor’s Corner: Victoria’s Secret for Webcasts Is IP Multicasting,” Infoworld, Aug. 16, 1999. You can download this article from www.infoworld.com/articles/hn/xml/99/08/16/990816hnmentors.xml.)

You could mistakenly deduce from Victoria’s Secret experience that you should do nothing to intentionally attract users. Unfortunately, even this anti-e-business strategy is no guarantee that your company’s web site won’t suddenly attract more users than it can handle. Bridgestone/Firestone (www.bridgestone-firestone.com) didn’t have to lure users with partially clad women to suffer the effects of a sudden onslaught of users that rendered the site essentially useless for days this past August. A voluntary recall of 6.5 million Bridgestone/Firestone tires was the source of the Bridgestone/Firestone web event.

According to Dan Todd, director of Public Services at Keynote Systems Inc., shortly after the recall announcement on August 9, Keynote was asked to monitor the tire company’s web site. Todd complied by attempting to access www.bridgestone-firestone.com about once every minute over T1 and T3 connections from 47 locations around the United States. Todd reports that until 9 p.m. PST on August 9, Keynote was unable to download a complete page.

Performance and availability improved during the night, Todd continues, but by 6 a.m. PST on August 10, only 20 percent of the Keynote measurement computers were able to successfully download a complete page. Response time and availability were poor for most of August 10 but improved considerably on August 11, when 76 percent of Keynote’s attempts to download pages from the site were successful.

Sadly, just before midnight, the web site experienced an internal server error, and the web site’s performance and availability dropped again, leaving Keynote unable to download a complete page until 9 a.m. on August 12. From this point on, availability improved to greater than 95 percent and response times to just under five seconds.

The moral of both the Victoria’s Secret and Bridgestone/Firestone stories is this: Have a plan for handling sudden Internet crowds because you can’t always predict when your company might experience one. An event similar to the Victoria’s Secret event could affect any retailer, and any large manufacturer could experience an event similar to the Bridgestone/Firestone event. More important, any organization that publishes content to the web—regardless of that organization’s particular line of business—could experience a sudden Internet crowd. Prepare for that possibility.
FEATURE Novell Content Exchange

The Price Is Right?

Adding web servers is an expensive way to scale your company's web site. Novell Connection researcher Eric Hall did a little scouting around and found that an eight-way web server (or equivalent) typically costs between U.S. $40,000 and U.S. $75,000.

Benchmark tests on web server performance are typically geared toward measuring the number of transactions per minute (tpm) that a web server can support. In this arena, web servers perform admirably, typically handling about 32,000 tpm.

When a web server is subjected to thousands of simultaneous requests for identical files, however, the performance of most web servers deteriorates badly.

Web servers simply aren't designed for the rigors of sustained, high-volume file service or for maintaining extremely large numbers of simultaneous connections. In fact, eight-way web servers typically support only 27,000 concurrent users.

Now think about this: If you wanted to adequately support a flash crowd of one million Internet users, how many eight-way web servers would you need? The answer is about 40. Assuming you purchase 40 web servers at the lowest end of the cost scale, you're talking U.S. $1,600,000 in hardware expenses alone, not to mention the cost of managing these servers.

The simple point is that only adding web servers to prepare for sudden large numbers of Internet users is not a wise financial strategy.

local array—is logically positioned between your company's web site and the Internet. Novell configures this local array to operate in web-acceleration mode so that the array checks its collective cache when a user's web browser makes a request for data. If the requested data is in cache, the array responds directly, without having to retrieve the data from your company's web server. (See Figure 1 on p. 8.)

So how much of your company's total web site data is cacheable? The specific answer to this question will naturally vary. However, "as a rule of thumb," according to Jupiter Communications, "caches have a 'hit' rate of 35 percent, which means that 35 percent of content requested through them can be successfully cached." (See "Caching 101" at www.caching.com/caching101.htm.)

Apparently, 35 percent represents the low end of the potential caching spectrum. It is not uncommon for 55 percent of requested web content to be successfully cached, as the results from a recent Cache-Off sponsored by the Measurement Factory reveal. (Measurement Factory is an independent development and consulting company that provides performance testing and benchmarking services.) At a Cache-Off held in September 2000—the third Cache-Off of its kind—a Novell ICS appliance achieved a hit rate of 56 percent of 58 percent maximum. Seven of the 13 ICS appliances entered in this Cache-Off achieved a hit rate of 50 percent or higher. (Of the 14 vendors that participated in this Cache-Off, the following six vendors entered products based on Novell ICS: IBM, Compaq, Dell, Microbits, and Stratacache. For more information about this Cache-Off, visit www.measurement-factory.com/results/public/cacheoff/N03/report.by-alph.html.)

In real life, Novell configures Novell Content Exchange arrays so that their storage space is sufficient to hold the entire cacheable portion of your company's web site data. This means that if 58 percent of your web site's data were cacheable, then Novell Content Exchange would cache that 58 percent.

In such a case, Novell Content Exchange would respond to at least 58 percent of the requests for data that your company's web server would otherwise have to process. In other words, Novell Content Exchange really takes a load off of your company's web server.

In fact, Novell recently tested a customer's web site accelerated by Novell ICS. (Novell was willing to share statistics regarding this particular customer case, but asked Novell not to identify the customer, which is a large, well-known corporation. This customer felt uncomfortable publishing detailed statistics about its web site.) In this test case, Novell ICS achieved a hit rate of 84 percent. By caching 84 percent of the web site's total data, Novell ICS offloaded 84 percent of the requests that the web servers would otherwise have to process. Not surprisingly, web server CPU utilization dropped from an average of 57.9 percent (with periodic peaks of 100 percent) to an average of 21.1 percent (with periodic peaks of only 37 percent).

Taking a load off web servers suggests that your company may not need as many web servers as it has now. For example, Novell ICS effectively reduced by 80 percent the number of servers at the aforementioned Novell ICS-accelerated web site. (Incidentally, Keynote Systems Inc., an e-commerce benchmarking and web

Figure 2. For Novell Content Exchange, Novell has formed partnerships with leading CDN providers. Novell Content Exchange caching arrays include CDN transformation modules that accelerate the preparation of data for distribution over a CDN.
Measuring To Tailor Your Company’s Web Site for Performance

When your company’s web site slows down, who or what can you blame? Dan Todd, director of Public Services at Keynote Systems Inc. (an e-commerce benchmarking and web performance reporting agency), suggests that “a number of things consistently affect web site performance to a consumer.” Measuring the performance of your company’s web site, using services such as those offered by Keynote, is the only sure way to diagnose the source of a sluggish web site. Of course, diagnosing the problem is the first step toward fixing it.

Potential performance inhibitors (that Keynote measures) include the following:

• The number, size, and complexity of the graphics on a web page, in addition to the ease with which the graphics compress
• The communication between a web server and a backend database where web content resides
• The bandwidth over the connection between your company’s web site and the Internet
• The bandwidth over the connection between the Internet and the user, commonly called the last mile
• The Internet itself

This last area is “the least easy to define but one of the most important to manage,” says Todd. When content crosses the Internet, it probably crosses one or more networks owned and operated by different Internet providers. The peering relationships between the providers—that is, the arrangements they make to interconnect their networks—can negatively impact response times to particular sets of users.

Todd offers this hypothetical scenario to make this point: Suppose a user and the web server from which this user is attempting to download pages were both in San Jose. In this case, however, suppose that the user were connected to the Internet by way of Sprint Communication’s network and that the content publisher were connected to the Internet by way of the cable and wireless backbone.

“Where along the Internet do these backbones talk to each other, and how far is that connection from the end user?” Todd asks. The backbones might meet only in Atlanta. If this were the case, when the user requested data, the data would go from San Jose, out to Atlanta, and all the way back to San Jose before the user received the data—a route that would obviously slow download times.

How much control do you have over peering relationships that negatively impact response times to your company’s users? “More than you would think,” Todd claims. The bottom line, according to Todd, is that measuring performance pinpoints problems and thus enables you (or your web hosting provider) to take the appropriate steps to improve the performance of your site.

Performance reporting agency, reports 100 percent availability on this same web site.) Thus, regardless of the number of users your company’s web site attracts, Novell Content Exchange scales to accommodate those users, sparing your company from having to purchase additional web servers—now or ever.

Power Plus

In addition to taking a load off web servers, the local Novell Content Exchange array accelerates your company’s web site by processing requests for data very quickly. Recent independent tests reveal that Novell ICS appliances can process more requests per second than competing caching solutions. According to the results from the September 2000 Cache-Off, Novell ICS can process as many as 3,310 requests per second. The Dell-200x4 ICS appliance achieved this impressive throughput, the highest peak throughput of all of the caching products entered in this Cache-Off. Second place in this Peak Throughput category went to the Compaq-C 2500 ICS appliance, which processed 2,400 requests per second. (See www.measurement-factory.com/results/public/cacheoff/N03.)

Of course, these numbers reflect the capabilities of only a single Novell ICS appliance and, therefore, do not reflect the full power of a Novell Content Exchange array. After all, each Novell Content Exchange array has more than ten Novell ICS appliances. Consequently, each array is capable of handling tens of thousands of requests per second.

Pushing It to the Edge

Despite your best efforts to accelerate your company’s web site locally, if an Internet router or connection goes down between the local Novell Content Exchange array and your users, your company’s web site response times will suffer, right? If you are using Novell Content Exchange arrays, probably wrong.

Recall that Novell installs Novell Content Exchange arrays at each of a web-hosting provider’s data centers. Novell configures the local array serving your company’s web site to push cached content to other Novell Content Exchange arrays closer to users. Thus, if 58 percent of your company’s web data is cacheable, 58 percent of your company’s web data will be cached in both local and global arrays.

Consider the results of caching data at strategic points throughout the world: Suppose a user lived in New Jersey and entered the URL for your company’s web site, which was housed in a data center in California. Further suppose that other users had already requested this URL and three or four layers of links that appeared on the associated page.

In this case, the local Novell Content Exchange array—as well as strategic global arrays—might already have in cache the cacheable portion of your company’s web sites total data. The result? The global Novell Content Exchange array closest to the user—in this case New York—would respond to 58 percent of the total data requested by the New Jersey user. A s a result, 58 percent of the data requested by the New Jersey user would not have to make the journey from California to New Jersey and would thus skirt several performance-degrading obstacles.

ACCELERATING THE CDN EXCHANGE

If your company is using Novell Content Exchange services, you have the option to use a CDN in addition to Novell Content Exchange global arrays. The advantage of using a CDN is that CDNs typically have thousands of points of presence on the Internet (as opposed to the dozen or so data centers a web-hosting provider may have). For example, Akamai has 4,200 servers in about 50 countries worldwide. The sheer number of CDN
servers increases the likelihood of being able to get your company's web content closer to users.

Unfortunately, to use CDNs, you have to transform the URLs associated with CDN-bound content (which is typically static) into a CDN-specific format. The method you use to transform URLs into a CDN-specific format depends on which CDN you use. For example, for some CDNs, you may have to run a CDN utility on your web server. In some cases, you may have to run every time you change the CDN-bound content on your company's web site.

Methods from other CDNs do not require you to down your server. Instead, some such methods transparently convert URLs into the appropriate CDN-specific format as those URLs are requested. Unfortunately, this type of URL transformation usually requires significant processing power and can slow web server response times.

With Novell Content Exchange, you don't have to bother with these transformation methods to use a CDN. Novell has formed partnerships with several leading CDN providers—namely Akamai, Mirror Image, and Digital Island—and has written CDN transformation modules for each of these partner's respective networks. Novell Content Exchange CDN transformation modules run within the Content Exchange arrays and automatically transform URLs into the format that the CDN you are using will recognize. (See Figure 2 on p. 12.) Thus, with Novell Content Exchange, you receive your company's web servers of the processing load (and hassle) of typical CDN preparation processes. (For a glimpse at the interaction between Novell Content Exchange arrays and CDN servers, see "To the Edge and Back.")

The web-hosting providers that offer Novell Content Exchange services may support one or more of the CDNs with which Novell has formed partnerships. GlobalCenter, for example, currently supports Akamai and plans to support additional CDNs, according to Alene Ipsaro, GlobalCenter's vice president of Global Product Marketing.

To the Edge and Back

If you choose to use a content distribution network (CDN) as part of your Novell Content Exchange service, Novell Content Exchange automatically transforms the appropriate URLs into the CDN-specific format. An overview of the interaction between Novell Content Exchange and a CDN may help clarify how Novell Content Exchange CDN transformation services work:

1. A user requests Object A from your company's web site, which is fronted by Novell Content Exchange. The proxy for your company's web site, Novell Content Exchange receives the request.
2. In this case, Object A is not yet in cache, so Novell Content Exchange passes the request through to your company's web server.
3. The web server returns Object A to Novell Content Exchange.
4. Based on the URL, the CDN transformation module identifies Object A as having content that should be migrated to the CDN.
5. Novell Content Exchange rebuilds Object A, replacing the appropriate embedded URLs with the equivalent CDN links.
6. Novell Content Exchange stores the new object in cache and will handle all subsequent requests for Object A until its copy of Object A expires.
7. Novell Content Exchange also responds to the user, redirecting the user's browser to the CDN for additional URLs associated with Object A.
8. The user's browser requests additional URLs associated with Object A from the CDN, which accepts and processes those requests from the nearest CDN server.
9. In this case, the CDN server has not yet cached Object A. The CDN server requests a copy of Object A from Novell Content Exchange.
10. Novell Content Exchange returns the transformed Object A to the CDN server, which in turn delivers it to the client.
11. The CDN handles all subsequent requests by the same or other users for Object A until the CDN's copy of Object A expires.
This processing load can be significant. According to Marshall, SSL encryption "is a huge problem" that can slow a web site "by a factor of 100." In fact, Marshall reports that Zona Research has seen instances of web servers processing at a rate of 453 requests per second drop to only three requests per second when handling SSL encryption. In contrast, Novell Content Exchange handles SSL encryption while maintaining its top performance potential, thus enabling you to offer secure exchanges without slowing your company's web site.

ALL THAT SNAZZ—IN A SNAP
The goal of any content publisher is to attract and retain users. To achieve that feat these days, you need to deliver snazzy page views in a snap—or at least 20 snaps. Novell Content Exchange offers an easy way for you to do just that.

With Novell Content Exchange, you can accelerate your company's web site—without having to change your company's web site infrastructure. Because it is based on Novell ICS, Novell Content Exchange takes a load off your web servers, picking up the pace over that critical first foot of the Internet. With Novell Content Exchange, the cacheable portion of your company's web site data is stored not only in local arrays but also in global arrays. Web content is not only safe but also is stored closer to users for even speedier delivery.

Furthermore, because Novell ICS has such an efficient caching engine, Novell Content Exchange offers additional performance-enhancing services, including the CDN transformation modules and the SSL enabler, and will undoubtedly offer more services in the future. The CDN transformation modules enable you to reap all of the benefits of a CDN, without the hassle and inconvenience (not to mention the processing load) associated with traditional methods of preparing content for delivery over CDNs.

Perhaps the best news is this: To accelerate your company's web site by using a Novell Content Exchange service, you only need to contact a web-hosting provider that has partnered with Novell. Days or weeks later (depending on whether or not your company's web site is already hosted by this provider), your company's web site will perform better than ever.

Your company's users, in the interim, will experience no loss of service. On the contrary, users will notice only that on one day, they checked your company's web site and waited perhaps a bit longer than they'd like. Days later, after your company started using Novell Content Exchange, users downloaded page views at a rate that either met or exceeded their expectations. In other words, with Novell Content Exchange, speedy delivery of snazzy web content is a snap.

For more information about Novell Content Exchange and partners that are using it, visit www.novell.com/products/contentexchange.

Linda Kennard works for Niche Associates, an agency that specializes in writing and editing technical documents. Niche Associates is located in Sandy, Utah.

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