Novell Eliminates the World Wide Wait - Caching the Web with BorderManager FastCache

Given the increasing popularity of the Internet and in-house intranets, there seems to be no end in sight for the burgeoning demand for web access. As the number of web users grows, so does their impatience with slow web server response times. To make matters worse, traditional solutions for the web's fast-paced growth and slow response times involve expensive hardware upgrades.

Novell's answer to this dilemma is surprisingly simple: take the proven advantages of caching and apply them in the web service environment. Web server acceleration, as provided by Novell's BorderManager FastCache, promises to deliver web access at cached speeds, while at the same time relieving your web server of up to 99 percent of its workload. An accelerated web server thus overcomes the performance mismatch between today's web server technologies and the growing user population's desire for instant access.

What is Caching?

During the 1960s, computer designers discovered that the repetitive portions of their programs could be stored in a small, very high-speed block of memory called a *cache*. This cache was tied closely to the CPU so that its cached contents were immediately available for processing, instead of having to go through the slower processes of being accessed through regular memory or from disk. This dramatically increased the speed by orders of magnitude greater than in systems operating without the cache.

During the mid-eighties, Novell engineers used this same model to benefit from the naturally occurring repetitive use of shared data and services on Novell file servers. Today, all computer users benefit from this design which takes advantage of the repetitive nature of applications and also saves users from having to store all of their applications and data in the expensive high-speed RAM that is used to construct high-speed caches.

The Need for Caching on the Internet and Intranet

In light of the huge benefits that caching provides in other areas of computing, it is only natural that caching should play an integral role in optimizing

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caching should play an integral role in optimizing the performance of intranet and Internet systems and services. The Internet services we enjoy were originally designed without caching in mind. Of course, the designers could not have anticipated the grand scale of today's World Wide Web. But the impact of this oversight is tremendous when you consider the Internet's repetitive usage patterns and the potential benefits caching can offer in such an environment.

Consider the following characteristics of Internet/intranet access that make this the perfect application for reaping the benefits of caching:

- The access patterns of the Internet's global user community closely resemble the kind of patterns seen by videocassette rental businesses, in which 10 percent of the videos account for 90 percent of the rental business. In other words, the overwhelming majority of traffic on the Internet comes from relatively few, but extremely popular, sites. If the contents of these sites were cached in various locations around the world, access times could be significantly increased for users across the globe.

- The access patterns of individual organizations and workgroups within organizations is also repetitive in nature. Workgroups tend to share similar responsibilities and interests, and therefore need access to similar sets of information. Corporate intranets are thus another ideal environment for caching shared content.

As seen in these scenarios, Internet Service Providers (ISPs), corporate webmasters, IS staff, and end-users can all benefit from Internet caching in one form or another.

The Power of Caching

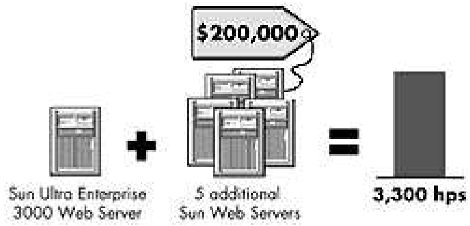
Without the aid of caching, web server performance is inadequate for most web server applications. Web servers quickly become the system bottleneck, with slow response times as the most common ailment. When slow performance is combined with the growing demand for web services, most web servers quickly run out of steam.

As a workaround for relieving heavy web server resource utilization, many organizations typically consider one of two options: (1) upgrade or replace the current system with larger, more expensive systems; or (2) split the site's content across multiple servers. But with the web server acceleration available in Novell's BorderManager product, there is a third, much more cost effective option: using web server acceleration and the power of caching to breathe new life into overburdened web servers.

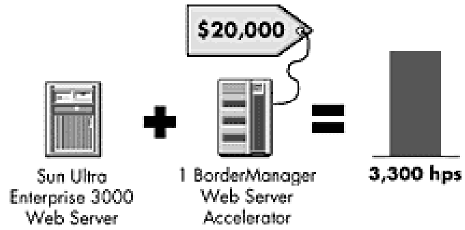
To give you an idea of the power of caching, we measured the performance of a web server system before and after caching was applied. We started with a Sun Ultra Enterprise 3000 system running Netscape Enterprise Server 2.5 web server software, including Sun's Solaris Internet Server Supplement. The Sun system had two UltraSPARC 167MHz CPUs, 256 MB of RAM, and connections to two load-balanced 100 Mbps Ethernet segments. This $40,000 web server was able to achieve only 550 hits per second before the CPU became saturated at 100 percent utilization.

We then added a cache, called a *web server accelerator*, to the web server configuration. The accelerator ran on a Compaq ProLiant 6000 system running Novell's BorderManager suite of Internet services. The Compaq system had one 200MHz Pentium Pro CPU, 256 MB of RAM, and connections to five load-balanced 100 Mbps Ethernet segments. Configured as a web server accelerator, BorderManager cached the Sun web server's site and responded to requests from its own cache. This $20,000 system peaked at 3,300 hits per second before saturating the CPU at 100 percent utilization.

These results suggest you would have to add five more Sun systems to your site to reach the high capacity provided by one standard Intel-architecture, high-volume web server accelerator. This presents an interesting business case.



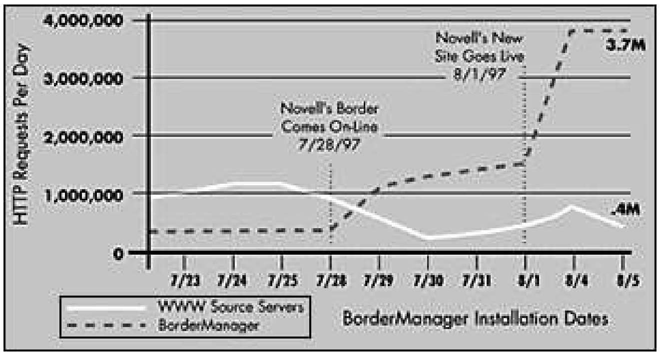
To improve your Sun system's performance, you could add five Sun Ultra Enterprise 3000 web servers to your existing Sun hardware to produce a combined capability of 3,300 hits per second. Individual response times will be just as slow, but you will have achieved greater capacity. Unfortunately, the price tag for this solution is a hefty $200,000.



Another option is to add one Compaq ProLiant 6000 running Novell's BorderManager web server accelerator to your existing Sun system. With this solution you achieve the same combined capacity of 3,300 hits per second, but at $20,000, the cost is one-tenth that of the first solution.

How Caching Has Helped Novell

Novell's public web site (www.novell.com) has grown steadily in popularity since its inception several years ago. In fact, earlier this year Novell's web servers were due for an expensive replacement because they didn't have sufficient capacity for the site's growing demand and were producing slow response times. But rather than sink more money into expensive hardware upgrades, Novell opted for the accelerated approach. On July 28, 1997, Novell installed BorderManager web server accelerators at its Internet border to take advantage of the increased speed and scalability that caching had to offer.



Once BorderManager was implemented, Novell's web server workload fell dramatically while its web site performance skyrocketed.

In Novell's case, all worries about web server performance were eliminated when the average web server workload dropped by 90%. Moreover, three days after implementing BorderManager, Novell introduced an entirely new set of web site content that was much deeper than anything published on the site before. Most web sites could not have handled such an increase due to lack of web server horsepower. In this case, Novell's new web server accelerators allowed Novell to make content changes that would have otherwise cost hundreds of thousands of dollars in upgraded web server hardware to support.

Of course, not every site needs the capacity to handle 3,300 hits per second. Perhaps the more important aspect of these results is the difference individual users see in response time at their workstations. For similar cached responses, BorderManager's response times are approximately six times faster than those serviced by the Sun system.

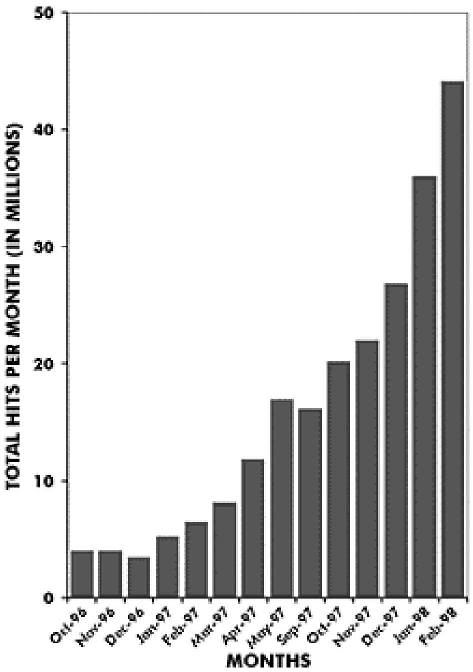
Caching for Internal Use: Utah Link Case Study

Internal corporate use is another area that can benefit by caching shared content to accelerate access and lower costs. When configured as a proxy cache, BorderManager uses its cache to store frequently accessed web pages locally. As users access the Internet, the documents they browse are cached within the proxy's Internet object cache. When a user repeats a previous access, or when another user browses the same Internet site, BorderManager immediately responds to their request from its cache. In this configuration the benefits are two-fold, web page access is significantly improved and the workload on your Internet connection is significantly reduced.

An example of the overwhelming benefit of BorderManager is a pilot system installed for Utah Link, a state-run Internet Service Provider (ISP) for Utah's entire public school system. This program uses BorderManager FastCache to proxy Internet access for all 87,000 of their clients (over 400,000 students).

Before BorderManager FastCache, it took 3 to 5 minutes to download a single page when 25 to 30 lab students simultaneously selected the same site. Response time was so slow that students had to wait 30 to 40 seconds after every mouse click.

After the installation of BorderManger FastCache, Utah Link's customers, both teachers and students, are ecstatic. The entire lab can now download the same page in a fraction of the time, and teachers see a viable "time on task" that really opens up the learning potential of the Internet.



Utah Link Key Statistics:

- Demand has grown from less than 5 million to 44 million hits per month
- Hits per hour have now reached 400,000+
- Response time improvements range from 2 to 100 times faster

Amazingly, these results are being achieved using a single Dell PowerEdge 6100/200 server with a single 200MHz Pentium Pro processor, 1 gig RAM and 30GB disk storage.

These performance improvements make the difference between success and failure in an educational environment. These same advantages can be shared by any organization that needs true Internet performance.

Industry Awards From Around the Globe

Novell BorderManager has now garnered nine industry awards from around the world in just six months. The latest awards were given by Data Communications and Federal Computer Week Magazine.

The Data Communications Hot Products Award was awarded to Novell's BorderManager on the criteria of the product boasting a key technology differentiator that sets it apart from the competition, while the Federal Computer Week Magazine rated BorderManager a "Government Best Buy". These awards further reinforce the value BorderManager offers your organization.

Conclusion

If you are looking for a cost-effective way to provide more efficient web services, look no further than BorderManager from Novell. When configured as a web server accelerator, BorderManager's FastCache provides up to 10 times the scalability of traditional web servers and can offload up to 99 percent of a web server's workload. Moreover, BorderManager can provide these benefits on inexpensive Intel-architecture servers.

Once you experience the performance boost that comes from caching in a web access environment, you'll never want to go back to those non-cached systems that gave rise to the nickname "World Wide Wait."

- This article has focused on the caching technologies available in Novell BorderManager FastCache, a product in the BorderManager family. Novell BorderManager is the industry's first integrated family of directory-based network services that manages, secures, and accelerates user access to information at every network border.

  The caching technologies described in the article are included in Novell BorderManager along with virtual private network (VPN), remote access and routing, and firewall services. Please see the BorderManager web site for a complete description of Novell BorderManager.

  For a more technical treatment of topics discussed in this article and a complete report of the www.novell.com and Utah Link case studies, please see the excellent series of AppNotes and Performance Reports for Novell BorderManager.