

Understanding How SSD Caching Improves the Server Performance

Introduction

ZNetLive recently added 120GB SSD caching to all of its VPS nodes. SSDs are many times faster than hard disks, but they are much more costly for the storage space. We use the SSDs to keep a second copy of all of the most frequently accessed data on the server so that performance is dramatically increased.

In this paper, we will be examining the performance of the SSD caching as compared to conventional caching used in web hosting.

What is SSD caching?

SSD Caching is a proprietary caching technology that uses a SSD drive (rather than a traditional HDD) to cache or store commonly accessed data of a website/application. Since SSDs are much faster than traditional hard drives, your website's cached data is loaded much faster than if it had to read the same data directly from the hard drive.

SSD caching combines conventional mechanical HDDs and SSDs and bridges the gap between the two.

It continuously tracks data writes and reads operations on a standard hard drive and caches the data that is accessed most frequently to a faster low capacity solid state drive cache. Thus, servers that use normal HDD for main storage also benefit with SSD like performance and faster access.

Behind the Scenes

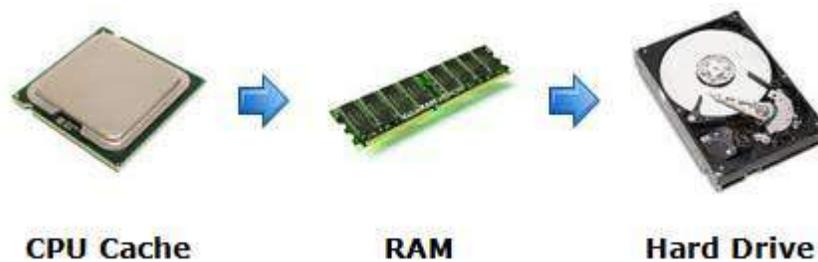
In order to understand the modus-operandi of SSD caching, one needs to understand what goes behind the scene when a visitor is trying to find the data he needs on the server your website is hosted at. When a program is first run, all of the different files needed to launch

Contact ZNetLive's Hosting Infrastructure Specialists

📞 1-800-102-9638 ✉ sales@znetlive.com 🌐 www.znetlive.com

Understanding How SSD Caching Improves the Server Performance

that program are read from the hard drive and loaded into the different levels of temporary storage found on a server. On most computers, the basic hierarchy goes:



Whenever a server needs to find data, it goes through this hierarchy of different storage locations starting with the CPU cache and working all the way back to the hard drive. As you go through the list, the speed of the storage gets slower so ideally you want the most commonly accessed data higher up on the list. For example, reading data from the CPU cache is much faster than reading from the RAM, which itself is much faster than reading directly from the hard drive. SSD caching adds an extra step between the RAM and hard drive, so this process becomes:



Since SSD drives are much faster than traditional hard drives, this gives the system one more place to look for data before having to read from the comparatively slow hard drive.

Contact ZNetLive's Hosting Infrastructure Specialists

☎ 1-800-102-9638 ✉ sales@znetlive.com 🌐 www.znetlive.com

Understanding How SSD Caching Improves the Server Performance

Advantages of SSD caching

SSD caching enables a hybrid SSD/HDD caching system that provides high capacity through HDD and high performance through SSD.

- A system employing SSD caching would be able to attain instantaneous access times, responsiveness and very high transfer speeds with SSD that is totally unattainable with even the fastest HDD if used alone.
- With SSD caching, systems can be configured with mid-size SSD (60GB to 120GB) and larger HDD; thereby optimizing performance and costs, as SSDs are usually very expensive.
- As HDDs are considerably cheaper, they can be employed in larger capacities and then can be used for handling bulk storage; and faster SSDs in lesser capacities can be used for frequently used data, applications and the operating system.

ZNetLive's SSD Caching Performance Testing

To measure the operational efficiency of SSC caching, we picked two sites from each VPS on a specific hardware node and measured how long it took the pages to fully load. Sites were chosen based on which had the highest overall traffic on the server.

To account for server performance fluctuations over time, we averaged the load times of all sites on a hardware node over a given period during the week

Once we had a dataset of load times with traditional HDD caching, we activated the SSD caching upgrade and gathered new data.

Contact ZNetLive's Hosting Infrastructure Specialists

📞 1-800-102-9638 ✉ sales@znetlive.com 🌐 www.znetlive.com

Understanding How SSD Caching Improves the Server Performance

The process was repeated over a period of several months with a number of servers and hardware configurations in order to ensure an adequate and representative sample size.

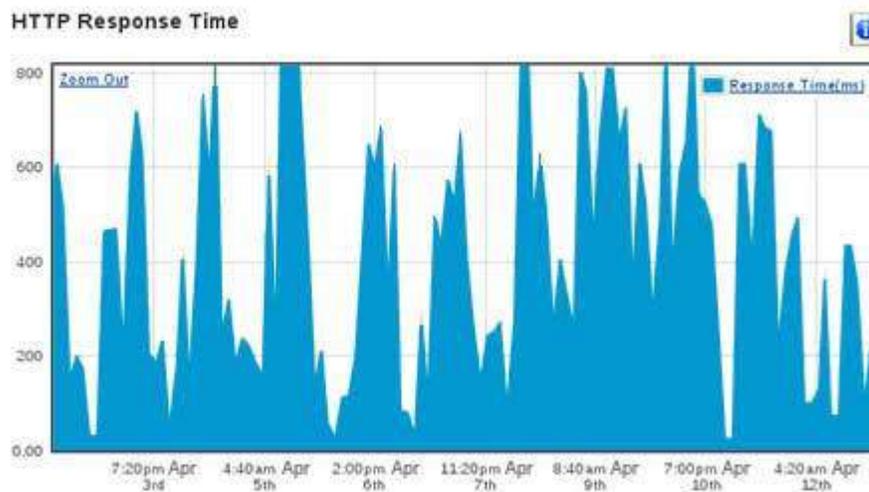
We also compared statistics on the hardware node itself that we already constantly monitor such as load average and RAID array usage.

The SSD caching solution decreased page load times on average by 36% across all of our test nodes!

Here are some examples of the performance increases we have seen on client sites.

These are the actual gains that clients saw. As clearly visible, page load times have decreased and overall performance is much smoother. Also, there are lesser spikes meaning that the user experience improved significantly.

Before:



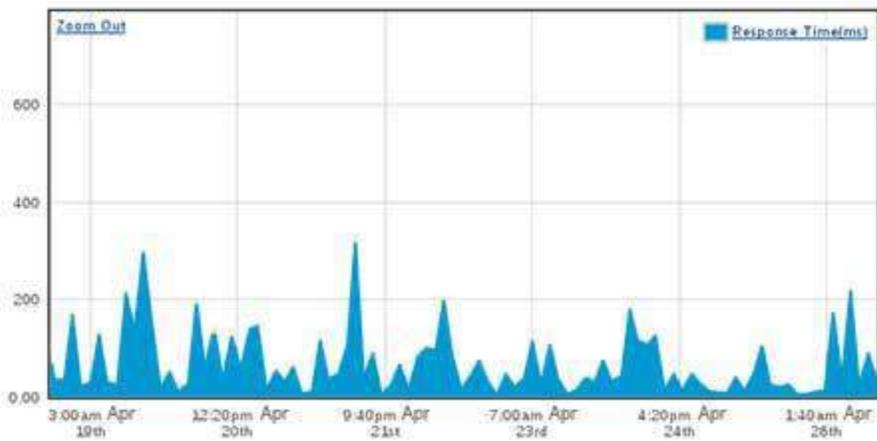
Contact ZNetLive's Hosting Infrastructure Specialists

1-800-102-9638 sales@znetlive.com www.znetlive.com

Understanding How SSD Caching Improves the Server Performance

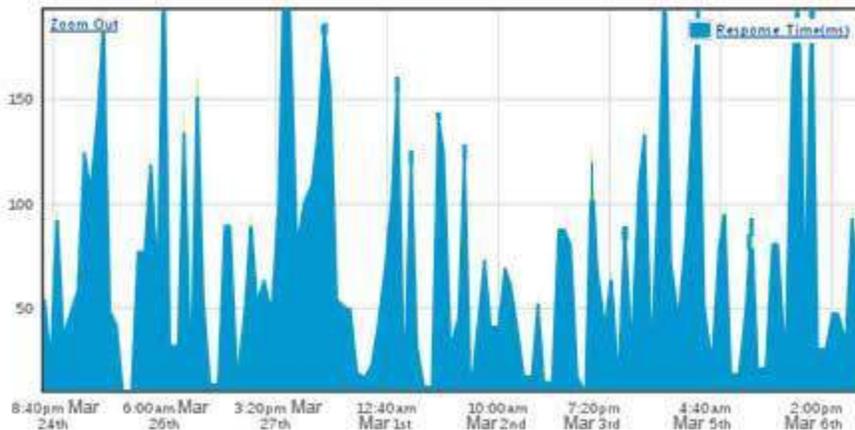
After:

HTTP Response Time



Before:

HTTP Response Time



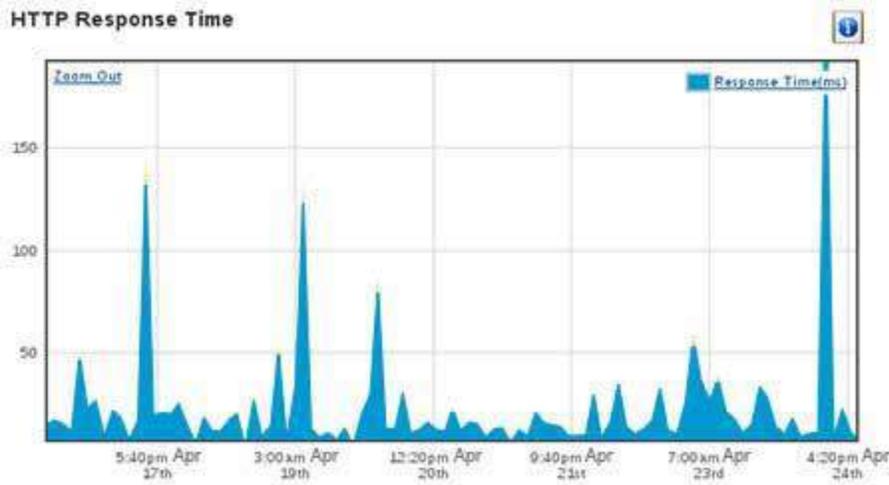
Contact ZNetLive's Hosting Infrastructure Specialists

📞 1-800-102-9638 ✉ sales@znetlive.com 🌐 www.znetlive.com

Understanding How SSD Caching Improves the Server Performance

After:

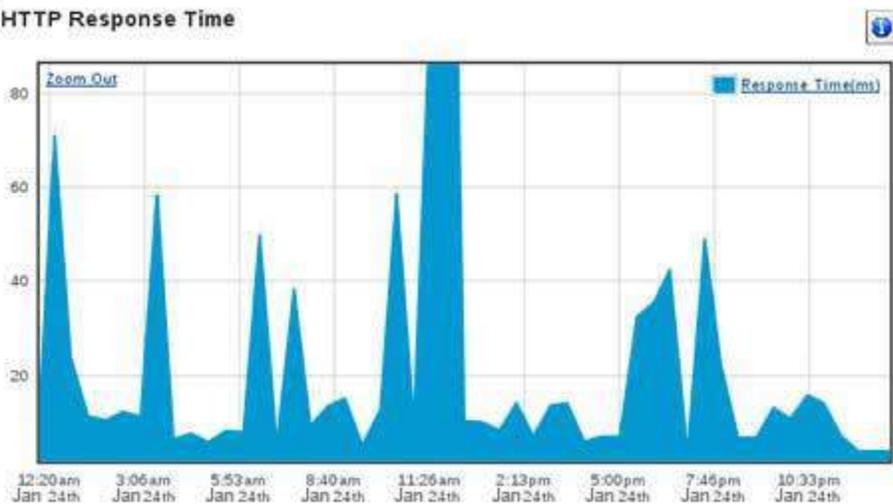
HTTP Response Time



We saw this across the server:

Before:

HTTP Response Time



Contact ZNetLive's Hosting Infrastructure Specialists

📞 1-800-102-9638

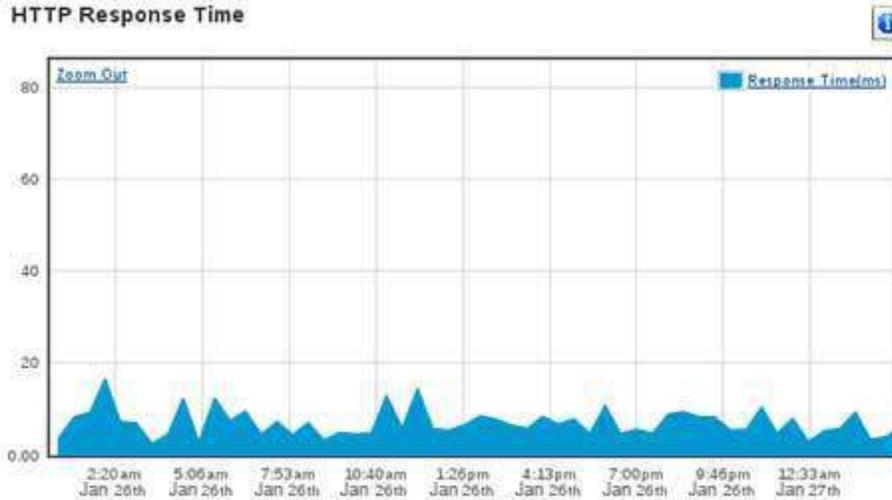
✉ sales@znetlive.com

🌐 www.znetlive.com

Understanding How SSD Caching Improves the Server Performance

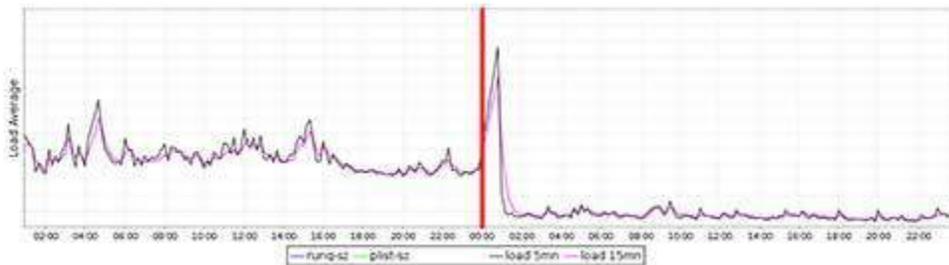
After:

HTTP Response Time



We also saw multiple improvements on our server backend. There was a major drop in the Load Average in most of the cases:

Example node 1:

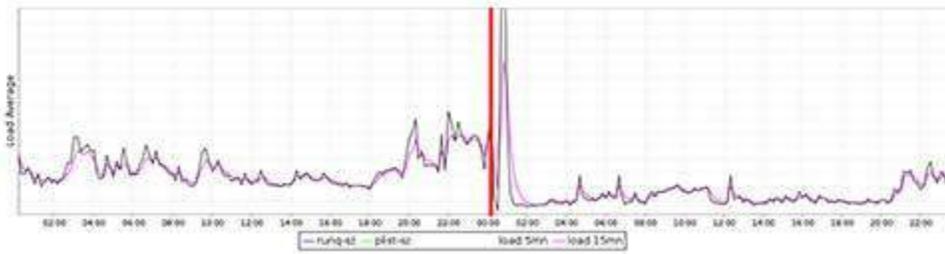


Contact ZNetLive's Hosting Infrastructure Specialists

📞 1-800-102-9638 ✉ sales@znetlive.com 🌐 www.znetlive.com

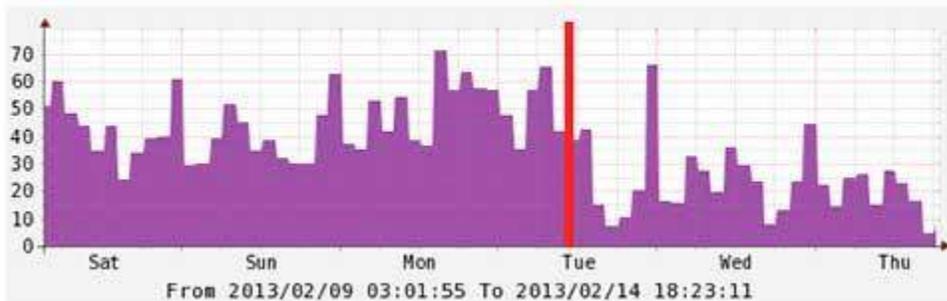
Understanding How SSD Caching Improves the Server Performance

Example node 2:

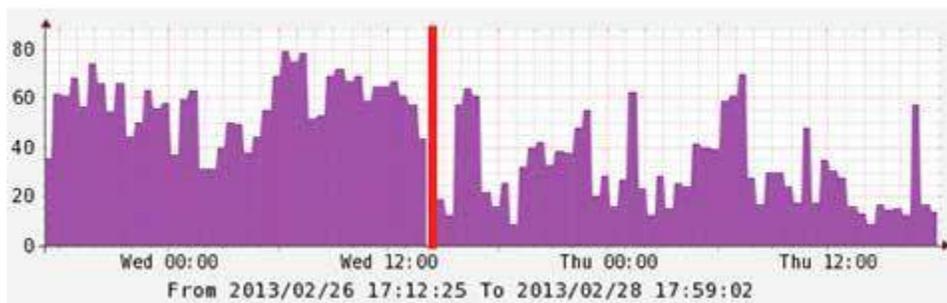


Here you can see the shifting of the load from server's RAID array to faster SSDs:

Example node 1:



Example node 2:

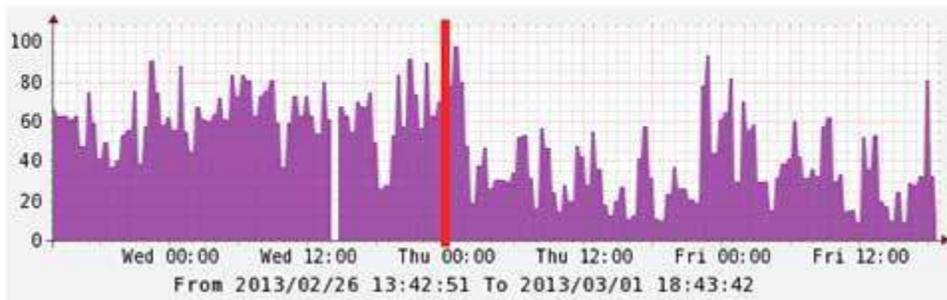


Contact ZNetLive's Hosting Infrastructure Specialists

📞 1-800-102-9638 ✉ sales@znetlive.com 🌐 www.znetlive.com

Understanding How SSD Caching Improves the Server Performance

Example node 3:



Conclusion: Overall, we were very impressed with how much OS and program load times were reduced when using SSD caching.

Contact ZNetLive's Hosting Infrastructure Specialists

📞 1-800-102-9638 ✉ sales@znetlive.com 🌐 www.znetlive.com