CacheCade Pro 2.0

Technical Brief

LSI® MegaRAID® CacheCade™ Pro 2.0 Caching Software

Reduce data access latency bottlenecks for server-based hard disk drive (HDD) volumes by coupling a small number SSDs with CacheCade Pro 2.0 Write and Read Caching software to significantly improve Read and Write IOPS performance

KEY FEATURES

- Accelerate hot data read and write transfers to enhance most real world application performance
- Significantly reduces latencies in IO-Intensive applications
- Uses less space and power compared to adding short-stroked drive spindles and unneeded capacity
- More cost effective than using all SSD storage volumes in storage arrays
- Cached write data protected by non-volatile CacheCade cache pools (RAID 0, 1, 10) and data availability protected by RAID data redundancy
  - RAID 5 in upcoming release (9265 Series only)
- Write cache protected then flushed to HDD volume on reboot or power-up
- Substantially reduce latency in small block, random read and write intensive environments
- Simple, Intuitive VD assignment to CacheCade pool

Today's workload-intensive business applications are constrained by performance limitations of HDDs. Solid state drives (SSDs) provide up to 1000 times more transactions per second, but at a much higher cost per gigabyte (GB).

A more economical approach is to mix both SSDs and HDDs together, however administrators traditionally would need to configure performance-critical applications to access SSDs. CacheCade Pro 2.0 software intelligently and dynamically handles critical application acceleration, data performance requirements without the need to monitor and configure applications to make the best use of SSDs, while at the same time optimizes HDD IO traffic.

Cost-effective Application Acceleration = I/O Performance Optimization

CacheCade technology from LSI intelligently, dynamically manages the performance advantages of SSDs as well as the cost and capacity advantage of SATA and SAS drives. CacheCade software is designed to improve the performance of a server's existing drive volume(s) by utilizing SSD technology as a secondary tier of cache to maximize random read and write performance.

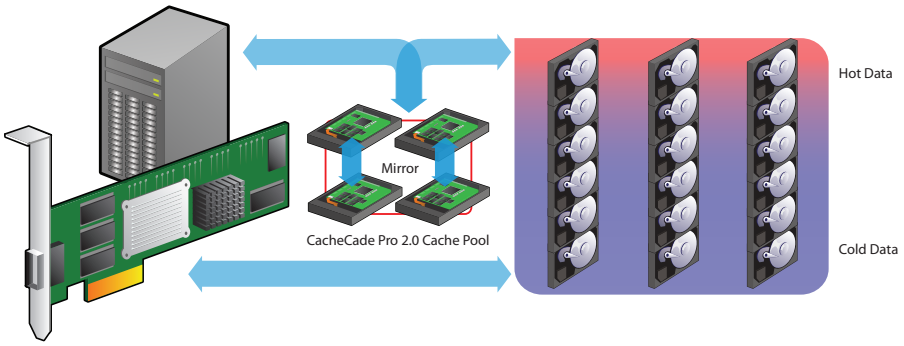
Currently, SAS HDDs can sustain only a few hundred IOPS while SATA drives provide even fewer. SSD devices, on the other hand, are capable of delivering IOs per second in the tens of thousands.

CacheCade software automatically moves frequently-accessed data (or hot spots) on HDD volumes to a second tier of SSD cache (see figure 1), removing many of the latency bottlenecks associated with traditional HDD-based data volumes. This provides significant performance improvement -- two to twelve times that of HDD-only configurations -- for many server applications including web, file, online transaction processing (OLTP) database, data mining, and other transaction-intensive server applications.

CacheCade Pro 2.0 is designed to help avoid development costs of application tuning by optimizing block level I/O, closing the gap between today's powerful multi-core processors and the I/O bottleneck frequently created by spinning storage media.

Figure 1

CacheCade Pro 2.0 software intelligently copies hot data to low latency, redundant SSD cache.



Broadest Workload Profile Acceleration

CacheCade Pro 2.0 software offers protected Read and Write data caching on SSDs, dramatically enhancing the performance gains achieved by the previous generation CacheCade software. With the addition of Write caching support, read/write-intensive workloads such as Exchange server, high performance computing (HPC) applications, Web 2.0 and other IO-intensive online transaction processing (OLTP) database system workloads, experience dramatic performance improvements.

Cost Effective Application Acceleration

The solution is designed to accelerate the I/O performance of HDD-based arrays while minimizing investments in SSD technology. Further, CacheCade software reduces the significant investment in additional hard drives required to attain comparable performance gains achieved by implementing the CacheCade software.

To mitigate the impact of traditional rotating media latency many applications have been tuned to keep working data in host DRAM as cache. Traditionally, IT administrators typically add more memory to improve application performance. However, host memory is expensive, and volatile.

CacheCade software relies on its dynamic ability to accelerate accesses to data hot spots. The highest achievable performance benefit depends upon the size and performance of the SSD relative to the logical volume being cached, and more specifically the total size of hot data compared to the total SSD capacity. (See charts 1 - 4)

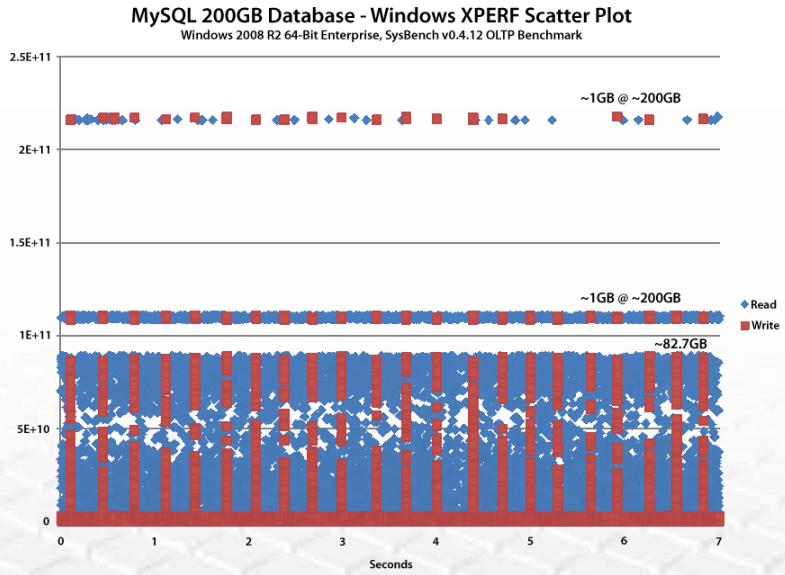
Additionally, this solution allows system builders to install just enough SSD capacity for active data and apply it to one or more HDD storage volumes.

By running a short trace of IO activity on a database application (see Figure 2), we can determine that the majority of the database reads and writes are focused in specific ranges of logical block addresses (LBA). CacheCade software's intelligent caching algorithms detect and maintain frequently accessed hot read and write data in the SSDs, drastically reducing data access response times.

Because the majority of hot data read and write accesses are serviced by the SSDs, the HDD storage volume performance is also enhanced as a significant portion of the HDD IO workload is off-loaded to the SSDs.

Figure 2

Typical database application IO profile shows read and write activity concentrated in specific disk volume regions.



CACHECADE PRO 2.0	
Software License Ordering Pn	MegaRAID® CacheCade™ Pro 2.0 SSD Read/Write Caching software: LSI00293
Physical Key Ordering Pn	MegaRAID® CacheCade™ Pro 2.0 SSD Read/Write caching software: LSI00292
Supported Raid Controllers	MegaRAID SAS 9260-4i, MegaRAID SAS 9260-8i, MegaRAID SAS 9261-8i, MegaRAID SAS 9260-16i, MegaRAID SAS 9280-4i4e, MegaRAID SAS 9280-8e, MegaRAID SAS 9280-16i4e, MegaRAID SAS 9280-24i4e MegaRAID SAS 9265 Series controllers will be supported in a future release.
Supported Operating Systems	All supported operating systems
Supported Ssds	Please visit www.lsi.com/channel/support/marketing_resources for a complete list of tested SSDs.
Max. Number Of Ssd Disks In A Cachecade Cache Pool	32 SSDs
Max. Number Of Ssc Vd Supported Per Controller	Up to 64 (The total number of HDD VDs plus CacheCade VDs must not exceed 64)
Max. Cachecade Capacity Per Controller	512GB (will be >2TB in an upcoming release)

Chart 1: MySQL Benchmarks

In the example below, a 200 GB MySQL database application with an approximately 85GB of frequently accessed data region supports up to 70 transactions per second in a hard drive-only configuration, while solutions employing CacheCade Pro 2.0 Read/Write caching software, scale to more than 3.5 times the number of transactions.

(For more details on application performance benchmark results, please visit the CacheCade software resource center located on the LSI website.)

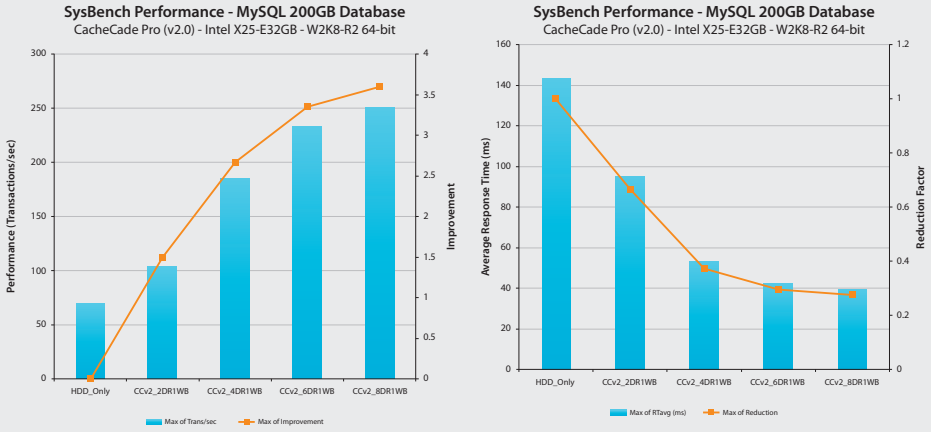


Chart 2: Oracle OLTP Benchmarks

Below, an Oracle database benchmark demonstrates more than a 5x gain in transactional performance using CacheCade Pro 2.0 software with just one 32 GB Intel® X25-E SATA SSDs, compared to an all-HDD baseline. The 300 user load benchmark also illustrates how CacheCade software can dramatically lower user query response times.

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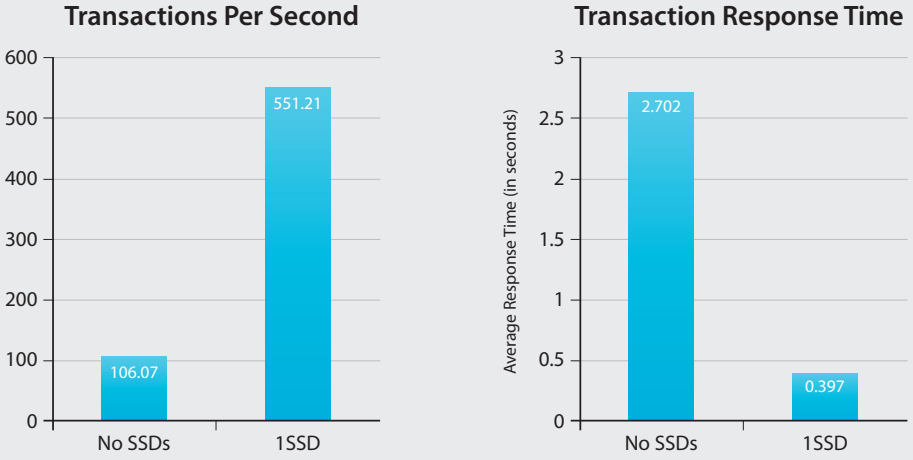

Chart 3: SQL Benchmarks

Below, a Microsoft SQL OLTP database benchmark demonstrates more than 13x transactional performance gain using CacheCade Pro 2.0 software along with 64GB Intel® X25-E SATA SSDs.

(For more details on application performance benchmark results, please visit the CacheCade software resource center located on the LSI website.)

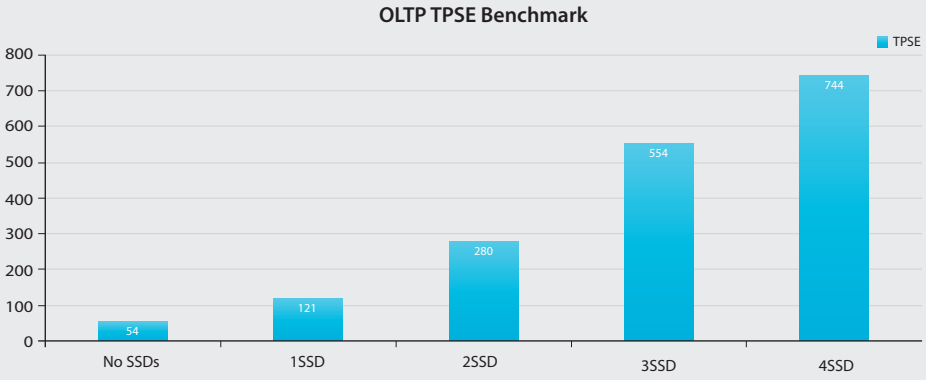

Chart 4: E-mail Server Benchmarks

The JetStress benchmark results below demonstrate how Exchange servers can benefit -- 2.6x the number of transactions per second -- from CacheCade Pro 2.0 along with 32GB Intel® X25-E SATA SSDs.

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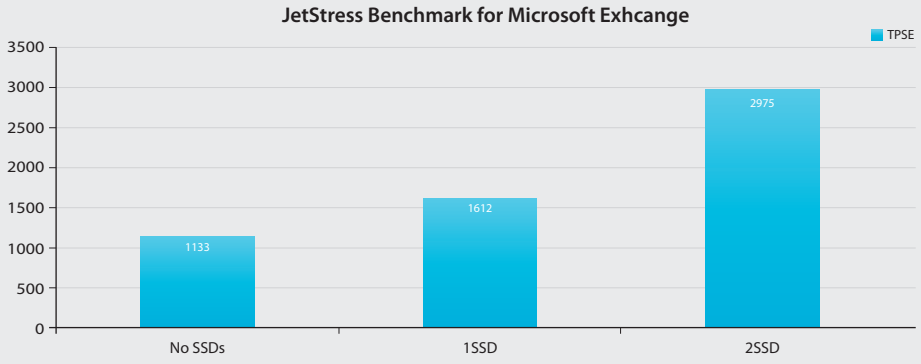

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