



## Achieve Maximum Performance with LSI™ MegaRAID® Technology

*System Builders Guide to a Top-Performing 6Gb/s Solution*

Your customers' investment into a 6Gb/s ecosystem can net higher performance results. The benefits greatly outweigh the costs, as the products deliver superior I/O performance.

Review the test system, actual results, and additional tuning tips with your customers.

Use this guide to further your customers' system migration plans.

Customers who need top performance for intensive computing applications can benefit by migrating to a full end-to-end 6Gb/s ecosystem. LSI 6Gb/s SATA+ SAS MegaRAID technology is a crucial part of the storage solution and provides superior I/O performance for high-end applications. The speed of the controller can be up to twice as fast as its predecessors, delivering more reads and writes. LSI 6Gb/s MegaRAID technologies provide scalable performance in larger capacity arrays and enhance system efficiencies. You can connect more hard drives through a single controller and benefit from the combined drive throughput to achieve a higher level of performance.

### Solutions for Common Applications

The superior read/write performance of the LSI 6Gb/s MegaRAID solution makes it ideally suited for a broad range of application workloads, from data center applications such as web servers and database servers to more compute-intensive applications such as cloud computing and the clustered systems used with high-performance computing.



#### Cloud Computing:

Customers who offer highly-scalable and virtual resources need reliable and high performing solutions. They will benefit from being able to deliver more data in and out of the cloud.



#### Web Servers:

A large number of users access these storage servers at all times of the day. Always-on access is critical, along with speed of reads and writes. Top of the line performing systems is a business requirement to support the users that rely on these systems.



#### Database Servers:

Customers who build and maintain servers that run database programs can benefit from migration to 6Gb/s. They can boost the retrieval of specific information from their massive set of data.



#### S Camera (Video Surveillance):

The most sophisticated video surveillance applications require increased throughput to support higher resolution pt used by today's technology. These powerful systems need performance, capacity, reliability and data security.



#### High-Performance Computing (HPC):

Clustered systems with massive storage require the reliability of protected data while supporting more nodes by offering higher throughput.

### Optimize LSI 6Gb/s MegaRAID Performance

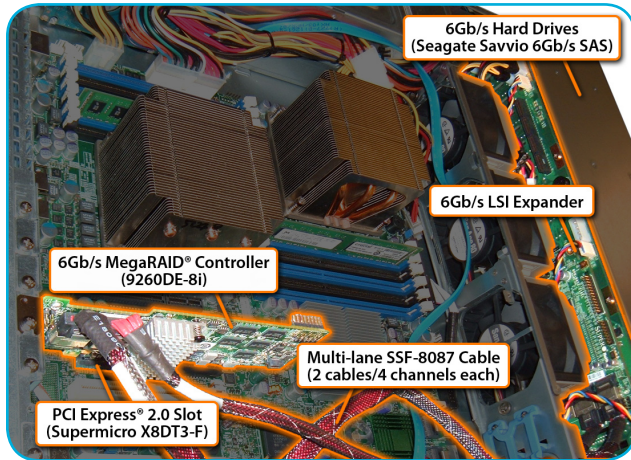
LSI 6Gb/s RAID controller cards and the LSI 6Gb/s SATA+SAS expander achieved read rates of up to 2,500MB/sec and write rates of up to 3,000MB/sec. in a recent system test. To achieve these results, LSI 6Gb/s MegaRAID was the storage solution for a full test 6Gb/s ecosystem.

The full test solution included LSI, Seagate and Supermicro 6Gb/s technologies. Together, these leading brands form a powerful end-to-end 6Gb/s channel solution – one of the first of its kind. Major performance advantages across the board are available for your customers.

This LSI 6Gb/s MegaRAID test system guide presents a measurement summary of the read and write throughput observed with various RAID levels, and offers performance tuning tips for different types of processing scenarios.

## LSI 6G MegaRAID Test System

The LSI 6Gb/s MegaRAID test system, which runs on Windows Server 2003, was configured to include essential components from LSI, Supermicro and Seagate.



### System Configuration

Supermicro 6Gb/s SAS 216 chassis with an internal expander. The expander is a Supermicro BPN-SAS2-216L board rev 1.01, based on a LSI chip.

- Supermicro motherboard X8DT3-F, board rev 1.02, based on the Intel® 5520 (Tylersburg) Chipset
- AMI BIOS build date 07/18/09 AMI BIOS Core Ver 08.00.15
- Dual Xeon CPU E5520 @2.27 GHz
- 2x2GB ECC DRAM

MegaRAID SAS 9260-8i PCIe RAID controller with two four lane cables to the LSI based Supermicro internal expander.

Supermicro supplies a single four lane SAS cable with the chassis which was not long enough to work with the 9260-8i board, as it has the SAS connectors on top. It is a Supermicro CBL-0108L-02 Rev D. For the test, we used two Molex 36CKT cables part # 79576-2103. The Supermicro cables are 12 inches long; the Molex cables are 17 inches in length, plus connectors.

Two disk drives were used for this demonstration. We found no performance differences between them.

- Seagate SAS 2.0 6Gb/s 68GB 2.5" form factor drives ST973452SS
- Seagate SAS 2.0 6Gb/s 73GB SED 2.5" form factor drives ST973352SS

The OS used was Microsoft Windows Server 2003 R2 Enterprise Edition with Service Pack 2 running on a separate SATA drive connected to a SATA interface on the motherboard.

### Read/Write Test Results

The results are based on a single machine observation, visually transcribed 15 seconds into the test, after a 0 second ramp time. Stripe size for RAID 0 and RAID 5: 256 KB. Stripe size for RAID 6: 64 KB. Strip size for RAID 10: 1 MB.

RAID Type Iometer Workload	Read	Write
<b>RAID 0</b> 1MB sequential reads, 1MB sequential writes	<b>2510 MB/sec</b> (256k_WT_NORA)	<b>3005 MB/sec</b> (256k_WT_NORA)
<b>RAID 5</b> 64KB sequential reads, 64KB sequential writes	<b>2510 MB/sec</b> (256k_WB_NORA)	<b>1344 MB/sec</b> (256k_WB_NORA)
<b>RAID 6</b> 64KB sequential reads, 64KB sequential writes	<b>2510 MB/sec</b> (256k_WB_NORA)	<b>1295 MB/sec</b> (256k_WB_NORA)
<b>RAID 10</b> 1MB sequential reads, 1MB sequential writes	<b>2392 MB/sec</b> (256k_WT_NORA)	<b>1497 MB/sec</b> (256k_WT_NORA)

#### Legend:

64k = 64KB virtual stripe size  
 256k = 256KB virtual disk stripe size  
 WT = write cache "write through" setting  
 WB = write cache "write back" setting  
 NORA = read cache, "no read ahead" setting

## Top Tuning Tips for Best I/O Performance

Use these tips to achieve the maximum I/O performance with the LSI 6Gb/s MegaRAID hardware.

- 1. Configure Sequential Access Patterns:** To achieve maximum sustained MegaRAID controller throughput, use sequential access patterns in the range of 64 KB to 1 MB. Use random access patterns in the range of 0.5 KB to 8 KB.
- 2. Connect More Drives:** To achieve maximum performance, connect enough drives to saturate the MegaRAID controller. Use 12 drives or more to see performance scale.
- 3. Use Adaptive Read Policy:** This policy should be used for all configurations and directs the controller to use read-ahead if the two most recent disk access occurred in sequential sectors. If all read requests are random, the algorithm automatically changes to *No Read Ahead* while still evaluating all requests for possible sequential operation. LSI does not recommend using the *Always Read Ahead* policy.
- 4. Write Policy: Write-Through** With the *Write-through* caching strategy, data is written to disk before a completion status is returned to the host operating system. This is considered more secure, because a power failure is less likely to cause undetected drive write data loss. LSI recommends using the *Write-through* policy for RAID 0, RAID 1, and RAID 10 configurations with streaming or sequential data reads, because it can avoid copying data into a cache.
- 5. Write Policy: Write-Back** With the Write-back caching strategy, a completion status is sent to the host operating system as soon as data is written to the RAID cache. Data is written to the disk when it is forced out of the controller cache memory. Write-back is more efficient in environments with "bursty" write activity.

LSI recommends using the Write-back policy to achieve optimum performance in RAID 0, RAID 1, and RAID 10 configurations with transactional (random real-world) reads. LSI recommends using the Write-back policy to achieve optimum performance in all RAID 5 and RAID 6 configurations because it can improve the performance of data redundancy generation.

- 6. Cache Policy:** Direct I/O recommended for all RAID level configurations.

### Build Today

You can build high-performing 6Gb/s systems solutions by mirroring a system like the LSI 6Gb/s MegaRAID Test System. With LSI, Seagate, and Supermicro 6Gb/s systems components, customers can get the performance they seek for high computing applications.

For more information email [david.graas@lsi.com](mailto:david.graas@lsi.com) or visit [lsichannelgateway.com](http://lsichannelgateway.com).

For more information and sales office locations, please visit the LSI web site at: [lsi.com](http://lsi.com)

LSI, LSI and Design logo, MegaRAID, are trademarks or registered trademarks of LSI Corporation. All other brand and product names may be trademarks of their respective companies.

LSI Corporation reserves the right to make changes to any products and services herein at any time without notice. LSI does not assume any responsibility or liability arising out of the application or use of any product or service described herein, except as expressly agreed to in writing by LSI; nor does the purchase, lease, or use of a product or service from LSI convey a license under any patent rights, copyrights, trademark rights, or any other of the intellectual property rights of LSI or of third parties.

Copyright ©2009 by LSI Corporation. All rights reserved.

October 2009

